

# 2015-2016 Specialized HIGH SCHOOLS Student Handbook

- Fiorello H. LaGuardia High School of Music & Art and Performing Arts
- The Bronx High School of Science
- The Brooklyn Latin School
- Brooklyn Technical High School
- High School for Mathematics, Science and Engineering at the City College of New York
- High School of American Studies at Lehman College
- Queens High School for the Sciences at York College
- Staten Island Technical High School
- Stuyvesant High School

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nyc.gov/schools/ChoicesEnrollment**

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## MESSAGE TO STUDENTS AND PARENTS/GUARDIANS ABOUT SPECIALIZED HIGH SCHOOLS ADMISSIONS

This 2015-2016 Specialized High Schools Student Handbook contains useful information, including:

- Specialized High School admission procedures
- Registration for the Specialized High Schools Admissions Test (SHSAT) and Fiorello H. LaGuardia High School of Music & Art and Performing Arts (LaGuardia High School) auditions
- Confirming testing accommodations for SHSAT and LaGuardia High School auditions
- Calendar of important dates
- Sample SHSAT tests with test-taking tips

**There are nine Specialized High Schools in New York City. They are:**

<b>ADMISSIONS DETERMINED BY AUDITION(S)</b>	<b>FIORIELLO H. LAGUARDIA HIGH SCHOOL OF MUSIC &amp; ART AND PERFORMING ARTS</b>	
	Dance	Drama
	Instrumental Music	Technical Theatre
	Fine Arts	Vocal Music
<b>ADMISSIONS DETERMINED BY SHSAT</b>	<b>THE BRONX HIGH SCHOOL OF SCIENCE</b>	
	<b>THE BROOKLYN LATIN SCHOOL</b>	
	<b>BROOKLYN TECHNICAL HIGH SCHOOL</b>	
	<b>HIGH SCHOOL FOR MATHEMATICS, SCIENCE AND ENGINEERING AT THE CITY COLLEGE OF NEW YORK</b>	
	<b>HIGH SCHOOL OF AMERICAN STUDIES AT LEHMAN COLLEGE</b>	
	<b>QUEENS HIGH SCHOOL FOR THE SCIENCES AT YORK COLLEGE</b>	
	<b>STATEN ISLAND TECHNICAL HIGH SCHOOL</b>	
	<b>STUYVESANT HIGH SCHOOL</b>	

These schools were established under New York State Law 2590 – Section G. Entrance into these schools is determined by the SHSAT, except for LaGuardia High School, which is based on a competitive audition and review of academic records. Students must be residents of New York City and current eighth grade or first-time ninth grade students in order to apply, register, sit for, and receive results for the Specialized High Schools Admissions Test (SHSAT) and LaGuardia High School audition(s).

The Specialized High Schools Student Handbook is a project of the New York City Department of Education.

## THE BRONX HIGH SCHOOL OF SCIENCE

75 West 205th Street, Bronx, New York 10468

Phone: (718) 817-7700 ■ Website: [www.bxscience.edu](http://www.bxscience.edu)

Email: [golanc@bxscience.edu](mailto:golanc@bxscience.edu)

**Overview:** The Bronx High School of Science educates an academically gifted community of learners through a rigorous Science, Technology, Engineering and Mathematics (STEM) curriculum. All academic disciplines are taught through the lens of inquiry to emphasize critical thinking and problem solving. The school cultivates a diverse community of lifelong learners who discover their passions through a collaborative and supportive network of students, educators and alumni. Utilizing a balance of theoretical and applied learning, students explore complex problems and have access to a rich offering of resources to develop solutions. Drawing upon a long tradition of academic success, the Bronx High School of Science prepares students to flourish in the best colleges and universities. The school creates the leaders and visionaries of the future. Included among the school's alumni are eight Nobel Prize winners and six Pulitzer Prize winners.

**Academic program:** The Bronx High School of Science offers 30 Advanced Placement (AP) courses and many post-AP courses (second-year college courses). The school offers seven foreign languages, numerous electives in biology, chemistry, physics, mathematics, technology, the humanities, music and a three-year independent research course in STEM or social science. Students may also select sequences in computer science and engineering that emphasize hands-on applications of scientific principles. The school's website provides full course descriptions.

**Extracurricular activities:** Extracurricular activities include over 70 after-school clubs, 43 athletic teams, an internationally acclaimed speech and debate team, mock trial team, two robotics teams, two theatrical productions, SING, a newspaper and yearbook, and scholarly journals.

**2015 Admissions:** 19,556 students listed Bronx Science as a choice on the SHSAT, and 973 offers were made.

## THE BROOKLYN LATIN SCHOOL

223 Graham Avenue, Brooklyn, New York 11206

Phone: (718) 366-0154 ■ Website: [www.brooklynlatin.org](http://www.brooklynlatin.org)

Email: [parents@brooklynlatin.org](mailto:parents@brooklynlatin.org)

**Overview:** Modeled after the prestigious Boston Latin school and founded in 2006, The Brooklyn Latin School (TBLS) provides a liberal arts curriculum, with an emphasis on the Classics and Latin language instruction. Early instruction

emphasizes the acquisition of core knowledge of the key academic disciplines that students use as a foundation for deeper exploration in the upper grades. Widely regarded around the world as the most rigorous and comprehensive course of study at the high school level, the International Baccalaureate (IB) Programme is integral to the TBLS curriculum. In all classes, students experience a strong and consistent emphasis on structured writing and public speaking, as well as numerous opportunities for analytical thinking, which prepares them for the challenges of college work.

**Academic program:** All students are required to complete four years of study in Latin, history, mathematics, English, science, at least two years of a world language, and one year of art history. In Humanities classes, students participate in Socratic Seminars and Declamation (public speaking exercises). Non-Humanities classes feature labs, math expositions, discussions, and problem sets. The IB Programme's emphasis on student-led inquiry, global perspectives, and personal integrity conform perfectly with the ideals on which the school was founded. In addition to rigorous class work, IB stresses independent thinking and community engagement. In order to earn the IB Diploma, students are expected to complete a 4,000 word independent essay on a subject of choice, a task which correlates closely to college-level research writing. They are required to take a two year epistemology course called Theory of Knowledge (TOK) that challenges students to consider the ways knowledge is constructed, and which culminates in a final research paper and presentation. In addition, students are required to engage in a total of 150 hours of creativity, action, and service (CAS), which may include volunteering or engaging meaningfully with the community outside TBLS. These requirements of the IB Diploma help our students become well-rounded citizens of the world.

**Extracurricular activities:** To provide enrichment for students outside of the classroom, and to facilitate the completion of their CAS requirements, TBLS currently supports over 40 extracurricular activities, including athletic teams such as coed cross country, badminton and soccer, boys and girls basketball, boys wrestling, and girls volleyball clubs; fine and performing arts offerings like studio art, photography, literary magazine, dance, and a cappella; and various other groups such as the school newspaper, STOKED, Math Club, Science Olympiad, Model United Nations, and many more.

**2015 Admissions:** 16,723 students listed The Brooklyn Latin School as a choice on the SHSAT, and 384 offers were made.

## BROOKLYN TECHNICAL HIGH SCHOOL

29 Fort Greene Place, Brooklyn, New York 11217

Phone: (718) 804-6400 ■ Website: [www.bths.edu](http://www.bths.edu)

Email: [info@bths.edu](mailto:info@bths.edu)

**Overview:** Brooklyn Technical High School (Brooklyn Tech) is the nation's largest public high school. Housed in a state-of-the-art physical plant reborn for the 21st century, the school is a national model for excellence and a stimulating environment that fosters transformational education and personal growth. With modern technology at its core and labs and classrooms on par with university and industry standards, Brooklyn Tech serves as a vibrant intellectual arena for faculty and students to explore and embrace the ideas, technology and instructional methods that will shape the future.

**Academic program:** In the 9th and 10th grades, all students take an academic core which includes college credit-bearing courses in Design & Fabrication and Digital Electronics. In the 11th and 12th grades, Brooklyn Tech students choose one of the following major areas of concentration: Aerospace, Architecture, Biological Sciences, Chemistry, Civil Engineering, College Prep, Electro-Mechanical Engineering, Environmental Science Research, Gateway to Medicine, Industrial Design, Law & Society, Applied Mathematics, Media & Graphic Arts, Physics, Social Science Research, or Software Engineering. In addition, the school offers unique electives in performance-based music, competitive mathematics, and research opportunities.

**Extracurricular activities:** Brooklyn Tech's unparalleled learning environment is enriched with 42 PSAL teams and more than 100 activities and clubs. Partners in industry and higher education, as well as an active alumni community help sustain the level of excellence through classroom enrichment, mentoring, internships and more.

**2015 Admissions:** 23,100 students listed Brooklyn Tech as a choice on the SHSAT, and 1,960 offers were made.

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## HIGH SCHOOL FOR MATHEMATICS, SCIENCE AND ENGINEERING AT THE CITY COLLEGE OF NEW YORK

240 Convent Avenue, New York, New York 10031

Phone: (212) 281-6490 ■ Website: [www.hsmse.org](http://www.hsmse.org)

Email: [info@hsmse.org](mailto:info@hsmse.org)

**Overview:** Founded in September 2002, The High School for Mathematics, Science and Engineering (HSMSE) at The City College of New York (CCNY) provides a unique and unparalleled collaborative educational experience. The school's mission is to encourage students to develop the habits of inquiry, written and verbal expression, and critical thinking. HSMSE enrolls approximately 450 students, drawn from all five boroughs, making it one of the most ethnically diverse schools in New York City. The academically rigorous learning environment focuses on mathematics, science, and engineering, while emphasizing civic responsibility and the value of acquiring knowledge for its own intrinsic reward. HSMSE faculty work together regularly to plan

lessons, develop curricula, and share best practices. Their deep professional and personal experiences enrich the learning community; many faculty members have earned doctorates, and all have advanced degrees. Many have distinguished themselves in business, engineering, and other fields prior to becoming teachers.

**Academic program:** HSMSE faculty plan lessons that include student discussion and cooperative learning to develop and improve problem-solving skills. All students take four years of math and science courses. Core classes meet every other day for 90 minutes, allowing time to engage in hands-on activities and in-depth discussions. Students attend a 45-minute elective enrichment course daily; course options include: Gastronomy, Astronomy, Microsoft Office User Certification, Art, Poetry Writing, Jazz Band, and Classical Guitar. There are three major concentrations that students select from in the spring of their sophomore year: Mathematics, Mount Sinai Medical Biomedical Research Program, or Engineering. HSMSE has the largest German Language program in New York State. College credit courses are offered in multiple ways: Advanced Placement courses are offered to all. CUNY courses are offered to eligible students through the CCNY partnership and the City University of New York (CUNY) College Now program.

**Extracurricular activities:** CCNY's Baskerville Hall faces the college quad, giving students green space in which to eat lunch, socialize, and relax on sunny days. Students may participate in a wide variety of extracurricular activities and PSAL sports after school, including Junior Statesmen of America, Moot Court, Mock Trial, Model UN and the Key club. Additionally, HSMSE offers ping-pong, volleyball, dance, cheerleading, and Strategy Games clubs. HSMSE students compete in national competitions, sponsored by the Goethe Institute and American Association of Teachers of German, for study abroad opportunities to Germany. Every year, at least one HSMSE student competes successfully enough to earn two weeks free travel to Germany. During the school year, HSMSE sponsors trips to colleges such as Boston College, Massachusetts Institute of Technology, Princeton, Brown and University of Michigan.

**2015 Admissions:** 19,035 students listed HSMSE at CCNY as a choice on the SHSAT, and 180 offers were made.

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## HIGH SCHOOL OF AMERICAN STUDIES AT LEHMAN COLLEGE

2925 Goulden Avenue, Bronx, New York 10468

Phone: (718) 329-2144 ■ Website: [www.hsas-lehman.org](http://www.hsas-lehman.org)

Email: [atrebofiore@schools.nyc.gov](mailto:atrebofiore@schools.nyc.gov)

**Overview:** The High School of American Studies at Lehman College (HSAS) emphasizes the study of American History and offers students a well-rounded academic program that aims to prepare students for admission to highly competitive colleges and for a range of careers in politics, law, journalism, business, science, mathematics and the arts. In all endeavors, HSAS seeks to encourage in students a love for learning and an inquisitive spirit.

**Academic program:** The academic program focuses on the development of college-level methodologies; throughout their time in high school, students are supported by faculty in the process of pursuing individualized research projects. All students engage in a three-year chronological study of American history, so that history comes alive through the use of primary source documents, films, biographies, literature, and creative teaching techniques. With the support of the Gilder-Lehrman Institute, students gain first-hand knowledge of the key events in American History, taking trips to sites and cities of historic importance and participating in seminars with guest speakers. HSAS also offers honors-level and Advanced Placement courses in mathematics, science, constitutional and criminal law, literature, foreign languages, history, and the arts. Through a partnership with Lehman College, students have access to the College's campus library and athletic facilities and may take credit-bearing college classes and seminars in their junior and senior years.

**Extracurricular activities:** After school, students may participate in a wide variety of clubs, join one of the school's many athletic teams, and take part in competitive activities, such as moot court, mock trial, debate, and Model UN.

**2015 Admissions:** 16,771 students listed HSAS at Lehman College as a choice on the SHSAT, and 161 offers were made.

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## QUEENS HIGH SCHOOL FOR THE SCIENCES AT YORK COLLEGE

**94-50 159th Street, Jamaica, New York 11433**

**Phone:** (718) 657-3181 ■ **Website:** [www.qhss.org](http://www.qhss.org)

**Email:** [lgibson4@qhss.org](mailto:lgibson4@qhss.org)

**Overview:** Queens High School for the Sciences at York College is dedicated to providing a rigorous curriculum in collaboration with York College that emphasizes the sciences and mathematics. The school philosophy is students are more successful when nurtured in a small learning community. The school mission is to develop a community of diligent learners and independent thinkers who are inspired to attain academic excellence and prepare them for the competitive environment and challenges of higher education.

**Academic program:** In line with offering small sized classes for standard high school courses (such as English, Social Studies, Science, and Mathematics), the school offers a wide range of elective courses in all academic subjects, as well as art, music and language. Advanced Placement courses, including Biology, Calculus AB, Calculus BC, Chemistry, Chinese, English Language and Composition, Environmental Science, Physics 1, Spanish, U.S. History, and World History, are available to those who qualify. Students also have the opportunity to enroll in City University of New York (CUNY) College Now courses, such as Biology, Sociology, Health Services, Nutrition and Health, Pre-Calculus, and Psychology. Course offerings vary from year to year. Besides offering nurturing, small classes, students are further supported with tutoring by teachers and honors

students. Guidance counselors support and assist students in all areas of concern, especially the selection of and application to colleges.

**Extracurricular activities:** Since the school is located on the campus of York College, students enjoy state-of-the-art facilities such as the College's library, gymnasium, pool, theater, and cafeteria/food court throughout their high school career. A variety of clubs (determined by student suggestion and staff capacity) are available to all students, including Model UN, Amnesty International, chess, Sigma sorority, philosophy, basketball, Key club and many others. Boys and Girls Swimming, Girls Bowling, and Coed Tennis and Handball comprise the school's athletic teams.

**2015 Admissions:** 16,648 students listed Queens High School for the Sciences at York College as a choice on the SHSAT, and 155 offers were made.

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## STATEN ISLAND TECHNICAL HIGH SCHOOL

**485 Clawson Street, Staten Island, New York 10306**

**Phone:** (718) 667-3222 ■ **Website:** [www.siths.org](http://www.siths.org)

**Email:** [BMalenfant@schools.nyc.gov](mailto:BMalenfant@schools.nyc.gov)

**Overview:** Staten Island Technical High School's college preparatory curriculum provides a robust liberal arts curriculum that includes courses in Science, Technology, Engineering, Arts and Mathematics (STEAM), and a cutting edge Career and Technical Education (CTE) program. All 9th grade students receive an iPad to use in school and take home for four years via a 1:1 Digital Education Initiative. Over 60% of the faculty members teach Advanced Placement (AP) and other college level courses.

**Academic program:** Students advance beyond the core curriculum by taking four years of mathematics and a wide array of science and AP courses. Students also have the option of participating in the Science & Engineering Research program, in which they compete in the New York City Science and Engineering Fair, Intel Science Talent Search, Google and Quality of Life competitions. All freshmen take an Intensive Writing course and English and Language Arts College Board Common Core-aligned Springboard curriculum, which prepares them for AP Language and AP Literature and Composition curricula. All students graduate with at least two AP Social Studies courses and take three years of Russian language courses. There is an optional fourth-year of a second language offered via a blended learning program.

The CTE program features pre-engineering, autoCAD, digital-analog electronics, and computer science courses and an extensive Work Based Learning- College and Career Exploration sequence featuring career talks, job shadowing, career and college fairs, and internships. All students participate in the CTE program.

Partnerships with CUNY College Now, SUNY University in the High School, St. John's University College Advantage and the College of St. Rose provide students with the opportunity to earn and graduate with 15 to 60 college credits.

**Extracurricular activities:** The extracurricular program features over 90 afterschool clubs and activities (e.g., robotics, debate, Science/ Russian Olympiad) and 42 PSAL teams. The Student Organization, National Honor Society and Junior Statesmen of America serve as the pipeline for our student leaders, while students interested in the arts can participate in nine different bands, including jazz, marching band and ensembles, as well as theatrical productions.

**2015 Admissions:** 15,209 students listed Staten Island Technical High School as a choice on the SHSAT, and 337 offers were made.

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## STUYVESANT HIGH SCHOOL

**345 Chambers Street, New York, New York 10282-1099**

**Phone:** (212) 312-4800 ■ **Website:** [www.stuy.edu](http://www.stuy.edu)

**Email:** [02M475@schools.nyc.gov](mailto:02M475@schools.nyc.gov)

**Overview:** Stuyvesant High School's mission is to provide students with a rigorous curriculum that nurtures and rewards their intellectual curiosity. Although Stuyvesant is historically recognized for its strengths in math, science and technology instruction, the school also has a dynamic and diverse Humanities program, as well as unique educational opportunities outside the classroom.

**Academic program:** The school's enriched curriculum includes required courses for graduation and also affords its students the opportunity to take many advanced courses and electives in various subjects. These course selections include Research, Multivariate Calculus, Organic Chemistry, Existentialism, and Wall Street, in addition to a wide array of Advanced Placement courses.

**Extracurricular activities:** The school is proud of its 45 PSAL sports teams and extensive extracurricular activities such as Robotics, Math Team, Speech and Debate, Science Olympiad, chess, Model UN, and Junior State of America. There are a number of major publications, over 100 student-run clubs, and an active student government. Students interested in music may participate in symphonic band, symphony orchestra, jazz band, and a number of choral groups.

**2015 Admissions:** 22,662 students listed Stuyvesant High School as a choice on the SHSAT, and 953 offers were made.

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## IORELLO H. LAGUARDIA HIGH SCHOOL OF MUSIC & ART AND PERFORMING ARTS

**100 Amsterdam Avenue, New York, New York 10023**

**Phone:** (212) 496-0700 ■ **Website:** [www.laguardiahs.org](http://www.laguardiahs.org)

**Email:** [admissions@laguardiahs.net](mailto:admissions@laguardiahs.net)

The Fiorello H. LaGuardia High School of Music & Art and Performing Arts enjoys an international reputation as the first

and foremost high school committed to nurturing students dedicated to the arts. LaGuardia High School's dual mission provides a uniquely balanced educational experience that includes both demanding conservatory-style training and a rigorous, comprehensive academic program.

Below are brief descriptions of the pre-conservatory studio programs: Dance, Drama, Fine Arts, Instrumental and Vocal Music, and Technical Theatre.

Students in the **Dance** program study ballet and modern dance; supplementary courses include dance history, choreography, theater dance (tap and jazz), career management, and professional skills. Students in the **Drama** program, focus on theater preparation through courses in acting, voice and diction, physical techniques, theater history, and script analysis. In the **Fine Arts** program, students receive two years training in traditional skills and disciplines, which include drawing, painting in water-based media, graphic design, and painting in oils and acrylics. After taking the core art courses, students round out their arts education with advanced courses in the subjects listed above and with other elective offerings, such as architecture, art history, ceramics, computer graphics, mural painting photography, print making, and sculpture. Students in the **Technical Theatre** program receive practical training in scenic carpentry, lighting technology, costume construction, sound properties, stage management, technical drawing, and design. Technical Theater students participate in both the production and the performance aspects for the various LaGuardia High School events.

Students in the **Instrumental Music** and **Vocal Music** programs study sight singing, music theory, and music history.

The Instrumental Music Studio performing groups include four symphony orchestras, two concert bands, two jazz bands, and three musical pit orchestras. Students also have the opportunity to compose, conduct and perform original repertoire.

The Vocal Music Studio performing groups include Elementary, Mixed, Girls, Women's, and Senior Choruses; Gospel Choir; Show Choir; and an opera production. In voice classes, students receive training in Italian, German, and French vocal literature. Music elective courses include chamber music, guitar, music technology, and songwriting.

Each studio requires a substantial time commitment after school, including rehearsals and performances, as well as the practical application of technical theater and gallery management techniques. Longer school days are expected during performance times, and students are required to be present and participate in program-related, after-school performances and activities.

**Auditions** will be held at the school. Student must register for auditions with their guidance counselors. See pages 11-12 for LaGuardia High School audition information.

**2015 Admissions:** 1,179 students received one or more offers to the programs at LaGuardia High School from a pool of 13,625 students.

# SPECIALIZED HIGH SCHOOLS ADMISSIONS TEST SHSAT DATES AND LOCATIONS

**A**ll current eligible 8th and first-time 9th grade students in public, private, and parochial schools applying to one or more of New York City's Specialized High Schools (with the exception of LaGuardia High School) must take the SHSAT. Approximately 29,000 students took the SHSAT for September 2015 admission.

Students interested in taking the SHSAT should speak with their guidance counselor within the Request for Testing (RFT) period.

Students will be issued a Test Ticket, which will indicate the date, time and location assigned to the student for testing.

Students must test on the date and at the location assigned. Testing locations are specified on page 10, and students are assigned to a test site based on the geographic district in which the student's school is located. Conflicts should be reported to the student's guidance counselor prior to the test date.

## September 10 – October 15, 2015

### RFT Period

Students register for the SHSAT and LaGuardia audition(s) with guidance counselors.

## October 21, 2015

Test Tickets available for distribution

### TEST DATES (For locations, see page 10)

- All current 8th grade students

**Saturday, October 24, 2015**  
**Sunday, October 25, 2015**

- All current 9th grade students
- 8th and 9th grade students who are English Language Learners or students with disabilities who have Individualized Education Programs (IEPs) or 504 Plans.\*
- Make-up test requests

**Saturday, November 7, 2015**  
**Sunday, November 15, 2015**

- Students new to New York City (Records must show that student arrived in NYC after the November make-up test.)

**End of summer 2016**

### ALTERNATE TEST DATE

- If students observe a religion on a Saturday or Sunday, they must notify their guidance counselors so that they are scheduled for a test date that does not conflict with a religious observance. The appropriate date should be indicated on the student's SHSAT Ticket. If this is not the case, students should speak to their guidance counselors so that the ticket can be modified.
- If a student is ill and unable to take the test on a scheduled date, the student must immediately notify his/her guidance counselor upon return to school, present medical documentation, and request to schedule a make-up date for the SHSAT through their guidance counselor.
- Documentation is required to confirm a valid make-up request. Guidance counselors must submit requests with required documentation by October 30 for the November 7 test and by November 10 for the November 15 test.

\*More information about eligible English Language Learners and former English Language Learners is on page 14.

## SPECIALIZED HIGH SCHOOLS ADMISSIONS TEST

# SHSAT DATES AND LOCATIONS

TEST LOCATIONS		
8th and 9th Grade students attending schools in:	TESTING SITE	ADDRESS
Manhattan	Stuyvesant High School	<b>345 Chambers Street, New York, NY 10282</b> Tel: (212) 312-4800 <b>Subways:</b> 1, 2, 3, A, C, E to Chambers Street; R to City Hall <b>Buses:</b> M20, M22, M5, M9, X1, X10
Bronx	The Bronx High School of Science	<b>75 West 205 Street, Bronx, NY 10468</b> Tel: (718) 817-7700 <b>Subways:</b> 4, to Bedford Park Boulevard-Lehman College; B, D to Bedford Park Boulevard <b>Buses:</b> Bx1, Bx10, Bx2, Bx22, Bx26, Bx28, Bx3
Brooklyn Districts 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 32	Brooklyn Technical High School	<b>29 Fort Greene Place, Brooklyn, NY 11217</b> Tel: (718) 804-6400 <b>Subways:</b> 2, 3, 4, 5 to Nevins Street, A to Hoyt & Schermerhorn; B, Q, R to DeKalb Avenue; C to Lafayette Avenue; D, N to Atlantic Avenue-Barclays Center; G to Fulton Street <b>Buses:</b> B103, B25, B37, B38, B41, B45, B52, B54, B62, B63, B65, B69
Brooklyn District 19 Queens Districts 27, 28, 29	Hillcrest High School	<b>160-05 Highland Avenue, Jamaica, NY 11432</b> Tel: (718) 658-5407 <b>Subway:</b> E, J, Z to Jamaica Center-Parsons/Archer; F to Parsons Boulevard <b>Buses:</b> Q1, Q110, Q111, Q112, Q114, Q17, Q2, Q20A, Q20B, Q24, Q3, Q31, Q34, Q36, Q40, Q41, Q43, Q56, Q6, Q65, Q76, Q77, Q8, Q83, Q9, X68
Queens Districts 24, 25, 26, 30	Long Island City High School	<b>14-30 Broadway, Long Island City, NY 11106</b> Tel: (718) 545-7095 <b>Subways:</b> N, Q to Broadway <b>Buses:</b> Q100, Q102, Q103, Q104, Q18, Q66, Q69
Staten Island	Staten Island Technical High School	<b>485 Clawson Street, Staten Island, NY 10306</b> Tel: (718) 667-3222 <b>Subways:</b> Staten Island Railway (SIR) to New Dorp <b>Buses:</b> S57, S74, S76, S78, S79-SBS

Note: Not every site will be available on November 15. Please check your Test Ticket for precise testing location.

## TEST RESULTS

Please note that the SHSAT is not a requirement for admission to LaGuardia High School. For all other Specialized High Schools, offers are made to students based upon their SHSAT scores, how they ranked the Specialized High Schools on the SHSAT answer sheet, and seat availability. SHSAT scores are available in March 2016 with High School Admissions Round One results. To determine offers to a Specialized High School:

- All scores of the students who took the test are ranked from highest score to lowest score.
- The student with the highest score is placed in his/her first choice (highest prioritized school).
- Starting from the highest score on down, each student, in turn, is placed in his/her highest prioritized school in which seats are still available. Therefore, if all the seats in a student's first-choice school have been offered to students who scored higher, he/she is placed in his/her second-choice school if seats are available. If all the seats in his/her second-choice school have been offered to students who scored higher, the student is offered a seat in his/her third-choice school if there are still seats available, and so on. This process continues until there are no seats available in any of the eight Specialized High Schools where admission is based on the SHSAT.

From year to year, the number of offers and projected seats for each Specialized High School may be subject to an increase or decrease based on school enrollment.

# FIORIELLO H. LAGUARDIA HIGH SCHOOL OF MUSIC & ART AND PERFORMING ARTS AUDITIONS



**September 10 – October 15, 2015**

Register for LaGuardia High School audition(s) with your guidance counselor.

**October 21, 2015**

Audition Tickets available for distribution

## 2015-2016 AUDITION DATES

All auditions are held at LaGuardia High School. Dates are scheduled according to the borough in which your school is located, not your current home address, and by the first letter of your last name.

BOROUGH	LAST NAME	AUDITION GROUP	DATE	START TIME
Bronx	A-Z	Students auditioning for a single or multiple studios	Sunday, November 22, 2015	8:00 AM
Brooklyn	A-Z	Students auditioning for two or more studios or Technical Theatre	Saturday, November 14, 2015	8:00 AM
Brooklyn	A-L	Students auditioning for a single studio except Technical Theatre	Sunday, November 15, 2015	8:00 AM
Brooklyn	M-Z	Students auditioning for a single studio except Technical Theatre	Sunday, November 15, 2015	11:30 AM
Manhattan	A-Z	Students auditioning for two or more studios or Technical Theatre	Saturday, October 31, 2015	8:00 AM
Manhattan	A-L	Students auditioning for a single studio	Sunday, November 01, 2015	8:00 AM
Manhattan	M-Z	Students auditioning for a single studio	Sunday, November 01, 2015	11:30 AM
Queens/Staten Island	A-Z	Students auditioning for a single or multiple studios	Saturday, November 21, 2015	8:00 AM

### AUDITION EXCEPTIONS

If a student's audition date conflicts with a religious observance, the student may audition on either the Saturday or Sunday of the student's school's scheduled weekend.

If a student's scheduled SHSAT date/time conflicts with his/her scheduled LaGuardia High School audition, the student must contact LaGuardia High School directly via phone or email to schedule a different audition date.

### AUDITIONS FOR STUDENTS NEW TO NEW YORK CITY

End of summer 2016 (official records must indicate that the student became a New York City resident after November 1, 2015).

### ADMISSIONS PROCESS

- Admission to LaGuardia High School is based on a competitive audition and review of a student's academic record to ensure success in the school's demanding studio work and challenging academic program.
- To audition for one or more of the studios at LaGuardia High School, students must inform their guidance counselors of their intention to audition and indicate for which studio(s) they wish to audition. Guidance counselors will provide students with a receipt to reflect their intention during the RFT period, and an Audition Ticket prior to the audition date.

- Successful candidates are expected to exhibit an intermediate to advanced level of proficiency in their art forms. Students are evaluated based on their preparation for the audition, level of commitment to their art form, technical proficiency, and artistic expression. Most students receiving an offer for one or more of the studios typically score between 80-100 points on the studio rubric in addition to having a satisfactory academic record.

- All applicants must bring to each audition their Audition Ticket for entrance. Printed receipts from the RFT process are not acceptable. One copy of the previous academic year's report card and/or transcript is required for each studio audition for which the student is registered. For example, if the student

# MUSIC & ART AND PERFORMING ARTS AUDITIONS

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is auditioning for two studios, then she/he must provide two copies of the Audition Ticket and report card. Students are evaluated solely on the official marks awarded during the previous academic school year. No reevaluation will be done based on any subsequent improved academic performance.

## REGISTERING FOR LAGUARDIA HIGH SCHOOL AUDITIONS

- If students are interested in applying to one or more of the six studios at LaGuardia High School, they should review the audition requirements listed in this handbook and also in the *2016 Directory of the New York City Public High Schools* to prepare for their audition(s).
- Students registered to audition for more than two studios may be asked by LaGuardia High School to audition over more than one day. Students should ask their guidance counselors to follow up with LaGuardia High School directly if they are in this situation.
- English Language Learners eligible for testing accommodations and students with disabilities whose Individualized Education Plans (IEPs) or 504 Plans provide for testing accommodations will receive those accommodations for the LaGuardia High School audition(s) as long as the accommodations do not interfere with the content or the skill being measured.
- Students with disabilities or English Language Learners and eligible former English Language Learners who will be using their accommodations for LaGuardia High School auditions must send directly to LaGuardia High School any relevant documents related to the accommodations prior to the RFT deadline (e.g., student's IEP, 504 Plan, or signed letter on school letterhead describing English Language Learner supports received by student in school setting). Documentation for LaGuardia High School can be faxed to 212-724-5748 or emailed to [admissions@laguardiahs.net](mailto:admissions@laguardiahs.net).
- Students must arrive on time for audition(s), although the arrival time indicated on the Audition Ticket may not be the actual start time of the audition. Students should bring a light snack and/or water.
- At the LaGuardia auditions, there is a designated waiting/reunion area for parents/guardians, as they are not allowed in the audition areas. Parents/guardians also may choose to leave and re-enter the school building at any time. It is important that the student has food/water and that any other communication with families is made prior to the beginning of the audition process.

## AUDITION INFORMATION FOR EACH STUDIO

13,625 students auditioned for LaGuardia High School for an offer to one or more of the school's six studios for the 2015-2016 school year. Students may audition for the studios listed below. Only students who are residents of New York City are eligible to apply and audition.

**DANCE** Applicants participate in both a ballet class and a modern dance class. Female applicants must wear a leotard, footless or convertible tights and ballet shoes. Males should wear a fitted t-shirt, black leggings, fitted black sweatpants or black tights, and ballet shoes. Applicants are evaluated for their potential to succeed in the specific training offered.

**DRAMA** Applicants should be prepared to perform two contrasting one-minute monologues. Applicants will be asked to do an impromptu reading and participate in an interview. Attire should allow free movement since applicants may be asked to demonstrate how well they move physically.

**FINE ART** Applicants must bring a portfolio of 8-15 pieces of original artwork done in a variety of media. The artwork should be from observation, imagination, and memory, and labeled appropriately. Photographs—not originals—of three-dimensional (3D) works may be included. For the audition, applicants will be given three drawing assignments, including drawing the human figure from observation, drawing a still life from memory, and creating a drawing in color based on imagination. All drawing materials for auditions will be supplied by the school at the time of the audition.

**INSTRUMENTAL MUSIC** Applicants should prepare a solo selection to perform without accompaniment and bring one copy of the music they plan to perform. Applicants should bring their instruments to the audition, except those auditioning on piano, percussion, tuba, double bass, and harp. These instruments will be provided by the school at the audition. Amplifiers also will be provided at the audition for electric guitarists. Applicants will be tested for rhythm and tonal memory and will be asked to complete a sight-reading of a given selection.

**TECHNICAL THEATRE** Applicants are expected to bring a prepared 3D design model for presentation.

They will be asked to participate in a small-group, hands-on practical in one or more aspects of technical theatre.

**VOCAL MUSIC** Applicants should prepare a song to sing without accompaniment for the audition. The musical selection can be classical or popular in style. In the audition applicants will be asked to sing back melodic patterns and tap back rhythmic patterns. LaGuardia High School has a suggested online song list ([www.laguardiahs.org](http://www.laguardiahs.org)); applicants are not required to select from the song list.

## APPLYING TO THE SPECIALIZED HIGH SCHOOLS

**1 CONTACT GUIDANCE COUNSELOR**

Students should contact their guidance counselor to indicate intention to take the SHSAT and/or audition for LaGuardia High School within the RFT period, starting in early September.

**2 OBTAIN A TEST OR AUDITION TICKET**

Prior to the testing/audition date(s), school guidance counselors will provide students with a SHSAT Test Ticket and/or a LaGuardia High School Audition Ticket. This ticket will indicate the location of the test/audition site, the date and time of the SHSAT/audition, the student's ID number, and the school code number of the student's current school. If a student has a conflict with the test or audition date assigned, the student should inform his/her guidance counselor immediately to arrange an alternate test or audition date. Once Test and Audition Tickets have been issued, students are expected to arrive on the date and time indicated on their tickets. SHSAT test sites are based on the location of students' current schools, not current home address. LaGuardia High School audition dates and times are based on the borough where students currently attend school.

**3 REVIEW TEST OR AUDITION TICKET**

Students and parents/guardians should review all information on the Test or Audition Ticket for accuracy. English Language Learners and students with disabilities should check their ticket and make sure they are scheduled for the appropriate testing date (see pages 9 and 11) with the appropriate accommodations. They should inform their guidance counselors immediately if there are any errors on the Test or Audition Ticket.

**4 COMPLETE AND OBTAIN PARENT/GUARDIAN SIGNATURE ON TEST OR AUDITION TICKET**

Students and parents/guardians must sign the Test or Audition Ticket prior to the exam or audition. Those taking the SHSAT should rank, in priority order, up to eight Specialized High Schools to which they want to apply. Students will copy these choices onto the test answer sheet on test day. Students may choose to apply to only one school, or may apply to as many as all eight schools to increase their chances of being offered a seat in one of those Specialized High Schools. Students should only list schools that they wish to attend if they are offered a seat. Once choices have been submitted on the day of the test, they may not be changed. The LaGuardia High School Audition Ticket will display the studio(s) for which the student requested to audition when the RFT was submitted. Students should make a copy of the Audition Ticket for each audition they attend.

**5 ATTEND SHSAT OR AUDITION**

Students taking the SHSAT must bring their Test Ticket to their assigned test site on the day of the test. Students auditioning for one or more studios at LaGuardia High School must bring their Audition Tickets to their audition(s) as well.

Students arriving without an Audition or Test Ticket may not be guaranteed admittance. Although sites will make every effort to confirm a student's registration and accommodate those with missing tickets, another test or audition date may need to be scheduled. Students should arrive at the time indicated on the Test or Audition Ticket; but it is important to note that the test or audition may start after the arrival time listed on the Test or Audition Ticket.

Students are allowed to bring cell phones to the SHSAT test site and/or LaGuardia High School, but cell phones must be turned off and not in use while in school buildings. No other electronic devices are allowed. Prior to the start of the audition or SHSAT, students must be prepared to turn in their cell phones when it is requested.

For both the SHSAT and LaGuardia High School auditions, students may bring a snack and water; however, test and audition site staff, including proctors and adjudicators, will determine when consuming these items is allowed.

**6 RECEIVE RESULTS**

Students must be residents of New York City in order to receive results of the SHSAT and/or offers to LaGuardia High School studio(s). In March 2016, students will be notified through the High School Admissions Round One result letters as to whether or not they received offer(s) to the Specialized High Schools. It is possible for students who audition for one or more of the studios at LaGuardia High School to receive offer(s) to one or more of the studios at LaGuardia High School. Students who receive offers to a Specialized High School may, at the same time, receive an offer to one of the other high school choices that were submitted on his/her New York City High School Admissions Application. At this time, the student will have to choose between the Specialized High School offer(s) and the High School Admissions application offer.

## TESTING AND AUDITION ACCOMMODATIONS

# APPLYING TO THE SPECIALIZED HIGH SCHOOLS

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Students with disabilities who have IEPs or 504 Plans and English Language Learners, including current and former English Language Learners who achieved proficiency on the New York State English as a Second Language Achievement Test (NYSESLAT) within the past two years, are eligible to receive testing and/or audition accommodations on the SHSAT and LaGuardia High School auditions.

Testing accommodations are changes to test format and/or the way tests are administered so that eligible students have the support they need in order to demonstrate their skills, knowledge, and abilities without being unnecessarily impacted by their disabilities or English proficiency. Families are encouraged to review the New York City Department of Education's (NYCDOE) resources on testing accommodations for additional information: <http://schools.nyc.gov/Academics/SpecialEducation/Classroom/instruction/accommodations.htm>.

■ **Important note:** Parents/guardians and students should be mindful that accommodations on the SHSAT must be aligned to testing accommodations the student already receives as part of his or her IEP, 504 Plan, or English Language Learner program. Requests for accommodations solely for the SHSAT are not permitted, except in emergency situations. Students who demonstrate disabilities or temporary impairments within 30 days of the SHSAT may receive certain testing accommodations, if approved by the principal. Please see the section on “**Emergency Testing and/or Audition Accommodations**” for more information.

## TESTING ACCOMMODATIONS ON THE SHSAT

Students with disabilities will be provided with the accommodations listed in their IEPs or 504 Plans, unless the accommodation is not permitted on the SHSAT, or if the accommodation is not necessary on the SHSAT. Students and families should contact guidance counselors at their current schools directly with questions about testing accommodations on the SHSAT.

English Language Learners and eligible former English Language Learners taking the SHSAT are granted extended testing time of 225 minutes (1.5x standard testing time) and a separate location. Bilingual mathematics glossaries will also be provided by the NYCDOE on the day of the SHSAT at each test administration site in the NYCDOE's nine major languages: Arabic, Bengali, Chinese (Traditional and Simplified), French, Haitian-Creole, Korean, Russian, Spanish, and Urdu. Students are not permitted to bring their own bilingual mathematics glossaries.

English Language Learners with IEPs or 504 Plans will receive the accommodations to which they are entitled, as long as the accommodations are permitted for the SHSAT (see below).

Students whose IEPs or 504 Plans specify use of assistive technology, such as a Frequency Modulation (FM) Unit, or other aids, such as masks or markers, must bring these with them on the day of the SHSAT and/or audition. Please note: assistive technology and other aids will not be provided on testing and/or audition days.

## Testing Accommodations Not Permitted for SHSAT

Certain testing accommodations are not permitted for any student on the SHSAT because providing these accommodations would change what the test is trying to measure:

- Students are not permitted to use calculators and/or mathematics tables on the Mathematics section, because this section of the SHSAT measures students' mathematical computation skills.
- No part of the Reading section of the SHSAT will be read aloud to any student, because this section of the SHSAT measures students' reading comprehension skills. This includes directions, passages, questions, and answers.
- Oral translations of test directions, questions, and answers are not permitted because this changes the standardization of the test. English Language Learners who need translations are permitted to use bilingual mathematics glossaries on the Math section of the SHSAT only.

## Testing Accommodations That Do Not Apply for the SHSAT

In addition, some accommodations that students may use on other tests may not be applicable on the SHSAT. For example, students who use a computer, word processor, or scribe for tests with writing responses will not need to use this accommodation on the SHSAT because there are no essays on the test. However, it is critical for families to notify the NYCDOE of any need to have a test administrator bubble in answers on the SHSAT answer sheet.

## TESTING ACCOMMODATIONS FOR LAGUARDIA HIGH SCHOOL AUDITIONS

If there is any question as to whether an accommodation is permitted for an audition, please have your guidance counselor contact LaGuardia High School directly by phone at 212-496-0700 or email at [admissions@laguardiahs.net](mailto:admissions@laguardiahs.net). For information about arranging for accommodations for LaGuardia High School auditions, please see the next section.

## CONFIRMING TESTING ACCOMMODATIONS FOR THE SHSAT AND LAGUARDIA HIGH SCHOOL AUDITIONS

■ During the SHSAT RFT period, a student's current school, including non-public schools (private and parochial schools), is responsible for entering the appropriate testing accommodations in the NYCDOE's Student Enrollment Management System (SEMS). For students with 504 Plans or similar school-based accommodation plans (only for students not in NYCDOE schools), all documentation must be submitted to the NYCDOE for review via email to **shsataccommodations@schools.nyc.gov**. Students and families should directly contact their guidance counselors at their current schools with questions about testing accommodations on the SHSAT.

■ Students arranging accommodations for LaGuardia High School auditions must have their guidance counselor send supporting documentation directly to LaGuardia High School prior to the RFT deadline (e.g., student's IEP, 504 Plan, or signed letter on school letterhead describing English Language Learner supports received by student in school setting). Documentation for LaGuardia High School can be faxed to 212-724-5748 or emailed to **admissions@laguardiahs.net**. Guidance counselors should contact LaGuardia High School directly with any questions about audition accommodations.

■ Non-public school students with disabilities who do not have an IEP or 504 Plan indicating their need for testing accommodations must complete a NYCDOE Request for Accommodations form and work with their school guidance counselor to submit the form and supporting documentation to the NYCDOE for review and approval by the RFT deadline. Students' current schools are responsible for ensuring that an appropriate review process takes place, and that students' accommodations and relevant documentation are submitted by the RFT deadline. The NYCDOE reserves the right to request additional information about schools' processes for granting accommodations and verify that the requested accommodation addresses a documented need. After accommodations plans are approved by the NYCDOE, the documentation should be sent directly to LaGuardia High School so that accommodations can be arranged for the audition(s).

## STUDENTS WITH ACCOMMODATIONS WHO FINISH THE TEST BEFORE THE END OF THE EXTENDED TIME PERIOD

Before the RFT deadline, parents/guardians of English Language Learners and students with IEPs or 504 Plans may opt out of certain testing accommodations for their children on the SHSAT or LaGuardia High School auditions. Before the RFT deadline, parents/guardians must contact their child's guidance counselor to indicate in writing their desire to opt out of testing accommodations for their child. Neither guidance counselors nor students may opt out of testing accommodations; written consent by a parent/guardian is required.

If it is not possible to provide written consent to opt out of testing accommodations before the RFT deadline, parents/guardians must provide their written consent on testing day to opt out of the testing accommodations listed on their child's Test or Audition Ticket.

On testing day, students cannot modify or opt out of the testing accommodations listed on their Test or Audition Ticket (unless parent/guardian consent has been provided in writing on the Test or Audition Ticket).

■ All students must stay in testing rooms until at least the end of the standard test administration time (150 minutes), with the exception of bathroom breaks.

■ Once the standard test administration time has lapsed, students with an accommodation of extended time on tests who have finished their work on the exam may leave the testing room before the end of their extended time.

■ Students entitled to extended time who leave before the end of their extended time will be required to indicate in writing that they had the opportunity to use the full amount of the extended time period but chose to leave early.

■ If a parent/guardian does not want his/her child to leave the testing room before the full amount of the extended time period has ended, the parent/guardian is responsible for communicating this to his/her child.

■ Re-tests will not be provided to students who leave before the end of their extended time after they have acknowledged in writing that they had the opportunity to use the full extended time but chose to leave earlier.

## EMERGENCY TESTING AND/OR AUDITION ACCOMMODATIONS

Emergency testing accommodations are intended for use by students whose disabilities or injuries occur after the RFT deadline but before their scheduled testing/audition day, and without enough time to develop an IEP or 504 Plan. For the SHSAT, students and families should ask their guidance counselor to email **shsataccommodations@schools.nyc.gov** as soon as possible prior to the testing day that emergency accommodations may be needed.

If a family requests an accommodation without giving the NYCDOE sufficient time to review the request before the regular SHSAT administration date, the student's SHSAT may be rescheduled to ensure that the request for accommodations may be properly reviewed.

If a student requires emergency accommodations for a LaGuardia High School audition, the family or guidance counselor must contact LaGuardia High School directly to request the accommodation.

**Students and families should contact their current guidance counselor for additional information about testing accommodations.**

The SHSAT assesses knowledge and skills. These skills consist of the ability to comprehend English prose, to think through a verbal problem in order to reach a reasoned conclusion based on given information, and to use problem-solving skills in mathematics. The test measures knowledge and skills students have gained over the years. Keeping up with schoolwork throughout the year is the best possible preparation.

The SHSAT has two sections, Verbal and Mathematics. Students have 150 minutes to complete the test.

### VERBAL SECTION (45 QUESTIONS)

The verbal section consists of verbal reasoning and reading comprehension components. Verbal reasoning is measured through five scrambled paragraph items, which require students to place sentences in the correct order to form a paragraph, and 10 logical reasoning questions. The reading comprehension section requires students to read five reading selections, each of which is followed by six questions assessing students' ability to understand, analyze, and interpret what they have read.

### MATHEMATICS SECTION (50 QUESTIONS)

The mathematics section consists of word problems and computation questions.

**Students may choose to complete either the Verbal or Mathematics section first. Students who finish early may go back to questions in either section.**

### TEST MATERIALS

**Students must bring to the testing session:**

- a SHSAT Test Ticket signed by parent/guardian with student's Specialized High School choices
- sharpened Number 2 pencils (a ballpoint pen or other ink cannot be used for machine scoring)
- an eraser
- a non-calculator watch to keep track of your working time

**The test site will provide:**

- a test booklet with an answer sheet and scrap paper attached
- optional extra scrap paper

Scrap paper may be used to solve logical reasoning and mathematics problems, and will be collected at the end of the test.

### SHSAT TESTING PROCEDURES

**Students, it is important to review the instructions below with your parent/guardian to ensure understanding prior to testing.**

#### ARRIVING AT THE TEST SITE

■ It is important to arrive at the test site at the time indicated on your SHSAT Test Ticket. Please note the test may not begin immediately after the stated arrival time. You may bring snacks and water, but the test site will determine the appropriate time to consume them. All cell phones will be collected by the proctor and stored in the testing room prior to the test and will be returned at the conclusion of the test. You may not use a cell phone until after the test is completed and you have been dismissed from the building.

■ Prior to the test, you will be asked to read and sign a statement on your answer sheet indicating that you are a resident of New York City, are well enough to take the test, and are taking it at the appropriate grade level. Students who sign this statement but do not meet the requirements specified will be disqualified from acceptance to any of the Specialized High Schools.

■ If you do not feel well and do not have an approved medical 504, you should inform the test proctor immediately; you should not begin the test, or sign the statement. Once you have begun the test, you may not be able to request a make-up test due to illness. Any requests for a make-up test made after you have started the test may not be honored.

■ Students will be photographed in the testing rooms prior to the start of the test. These photographs will be used for test security purposes only.

**Do not bring personal electronic devices such as a calculator watch, calculator, iPod, tablet/iPad or ebook reader to the test.**

As per NYCDOE testing policy, cell phones and other prohibited electronic devices will be collected from all students entering the room in which the test is being administered and returned to the student after the student finishes the test and leaves the testing room. Students may not access prohibited devices during break periods.

During testing, schools will establish a collection point upon students entering the classroom prior to the test administration. Students will be instructed to store cell phones/electronic devices in their back pack/bag, or a school provided container, and place it in the front of the classroom until the conclusion of the test administration. Admission to the test shall be denied to any student who refuses to relinquish a prohibited device. Possession of a prohibited device at any time during the test administration, even if powered off, shall result in the test being invalidated. Students will not be provided with an opportunity to make up the exam on a subsequent day.

## FILLING IN THE ANSWER SHEET

Answer sheets will be attached to test booklets. When the proctor instructs you to do so, you must detach the answer sheet and a sheet of scrap paper from the test booklet along the perforations, being careful not to tear the answer sheet or break the seal on the test booklet.

Before taking the test, you will need to provide information such as name, student ID number, school number, and school choices on the answer sheet.

It is important to fill in the bubbles completely so that scoring is not delayed. The following grids from the answer sheet collect important identifying information as well as information that affects admission to a Specialized High School.

In Grid 4 you will bubble in your name as it appears in your school record and on your high school application. You should not use a nickname. For example, if your name on your school record is Robert, you should bubble in that name, even if most people call you "Robbie." Or if your name on your school record is Mei-Ling, you should bubble in that name, even if most people call you "Melanie."

Grid 5 is for your choice of Specialized High Schools only. If you mark Grid 5 incorrectly, your admission to a Specialized High School may be affected. Admission is based on your score and the order in which you rank your school preferences in Grid 5, as well as the number of

seats available at each school. Therefore, it is very important that you make your decisions about ranking schools before the day of the test. Discuss with your family the schools you are interested in, and determine the order in which you will list them on the answer sheet. Enter these rankings on the Test Ticket so that you will be able to carefully copy them onto Grid 5 on your answer sheet at the test site. Only choices made in Grid 5 will be counted.

### EXAMPLES OF CORRECT GRID 5

5. CHOICES OF SPECIALIZED HIGH SCHOOLS								
Indicate your school choice in order of preference.								
<ul style="list-style-type: none"> <li>Fill in only one school for each choice.</li> <li>You <b>must</b> fill in a first choice school.</li> <li>Fill in only one circle in a row and only one circle in a column.</li> </ul>								
School choices indicated on the answer sheet are final.	CHOICES							
	1st choice	2nd choice	3rd choice	4th choice	5th choice	6th choice	7th choice	8th choice
SCHOOLS								
Bronx Science	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brooklyn Latin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Brooklyn Tech	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HS Math, Sci., & Engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HS American Studies/Lehman	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Queens Sci./York	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Staten Island Tech	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stuyvesant	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. CHOICES OF SPECIALIZED HIGH SCHOOLS								
Indicate your school choice in order of preference.								
<ul style="list-style-type: none"> <li>Fill in only one school for each choice.</li> <li>You <b>must</b> fill in a first choice school.</li> <li>Fill in only one circle in a row and only one circle in a column.</li> </ul>								
School choices indicated on the answer sheet are final.	CHOICES							
	1st choice	2nd choice	3rd choice	4th choice	5th choice	6th choice	7th choice	8th choice
SCHOOLS								
Bronx Science	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brooklyn Latin	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brooklyn Tech	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HS Math, Sci., & Engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HS American Studies/Lehman	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Queens Sci./York	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>					
Staten Island Tech	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stuyvesant	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**You MUST fill in a first choice school.**

### EXAMPLES OF INCORRECT GRID 5

5. CHOICES OF SPECIALIZED HIGH SCHOOLS								
Indicate your school choice in order of preference.								
<ul style="list-style-type: none"> <li>Fill in only one school for each choice.</li> <li>You <b>must</b> fill in a first choice school.</li> <li>Fill in only one circle in a row and only one circle in a column.</li> </ul>								
School choices indicated on the answer sheet are final.	CHOICES							
	1st choice	2nd choice	3rd choice	4th choice	5th choice	6th choice	7th choice	8th choice
SCHOOLS								
Bronx Science	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brooklyn Latin	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brooklyn Tech	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HS Math, Sci., & Engineering	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HS American Studies/Lehman	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Queens Sci./York	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Staten Island Tech	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>				
Stuyvesant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**DO NOT fill in more than one circle in a column.**

5. CHOICES OF SPECIALIZED HIGH SCHOOLS								
Indicate your school choice in order of preference.								
<ul style="list-style-type: none"> <li>Fill in only one school for each choice.</li> <li>You <b>must</b> fill in a first choice school.</li> <li>Fill in only one circle in a row and only one circle in a column.</li> </ul>								
School choices indicated on the answer sheet are final.	CHOICES							
	1st choice	2nd choice	3rd choice	4th choice	5th choice	6th choice	7th choice	8th choice
SCHOOLS								
Bronx Science	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brooklyn Latin	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brooklyn Tech	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HS Math, Sci., & Engineering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HS American Studies/Lehman	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Queens Sci./York	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Staten Island Tech	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stuyvesant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**DO NOT fill in more than one circle in a row.**

5. CHOICES OF SPECIALIZED HIGH SCHOOLS								
Indicate your school choice in order of preference.								
<ul style="list-style-type: none"> <li>Fill in only one school for each choice.</li> <li>You <b>must</b> fill in a first choice school.</li> <li>Fill in only one circle in a row and only one circle in a column.</li> </ul>								
School choices indicated on the answer sheet are final.	CHOICES							
	1st choice	2nd choice	3rd choice	4th choice	5th choice	6th choice	7th choice	8th choice
SCHOOLS								
Bronx Science	<input type="radio"/>							
Brooklyn Latin	<input type="radio"/>							
Brooklyn Tech	<input type="radio"/>							
HS Math, Sci., & Engineering	<input type="radio"/>							
HS American Studies/Lehman	<input type="radio"/>							
Queens Sci./York	<input type="radio"/>							
Staten Island Tech	<input checked="" type="radio"/>							
Stuyvesant	<input type="radio"/>							

**DO NOT fill in the same school for each choice.**

# SHSAT DESCRIPTION AND MATERIALS

You must fill in one and only one circle for each school for which you wish to be considered. You may make as few as one or as many as eight choices. To increase your chances of receiving an offer to one of the Specialized High Schools, you are encouraged to make more than one choice. You must fill in a first choice school, and you may fill in only one school for each choice. You must fill in only one circle in a row and only one circle in a column. You must not fill in a school more than once. You must not fill in the same school for each choice.

In Grid 7, you must print the name of the school where you are now enrolled. You will then print your school code exactly as it appears on your Test Ticket or in the Feeder School List available from the test proctor. After that, you will bubble in the corresponding number or letter for each digit of your school code. Bubble in the letter "P" if you attend a private or parochial school. For example, a student who attends Abraham Lincoln IS 171 in Brooklyn should complete Grid 7 as shown in the example on the right. Fill in Grid 7 carefully: a bubbling error in Grid 7 may delay the reporting of your score.

Grid 9 is labeled "STUDENT ID NUMBER." Write your nine-digit student ID number in Grid 9. You will find this number on your SHSAT Test Ticket. Below each box, fill in the circle containing the same numeral as the box. (See the example on the right.)

When you are told to begin the test, mark your answers on the answer sheet by completely filling in the appropriate bubble (see example). Make sure your marks are heavy and dark. Be careful not to make any stray marks on the answer sheet.

**SAMPLE ANSWER MARKS**

1	(A)	(B)	(C)	(D)	●	RIGHT
2	⊗	(B)	(C)	(D)	(E)	WRONG
3	(A)	⊗	(C)	(D)	(E)	WRONG
4	(A)	(B)	●	(D)	(E)	WRONG
5	(A)	(B)	●	●	(E)	WRONG

If you change an answer, completely erase your first answer. Do not fold or tear the answer sheet. There is only one correct answer to each question. If your answer sheet shows more than one mark in response to a question, that question will be scored as incorrect.

**You may write in your test booklet or on the scrap paper provided to solve verbal or mathematics problems, but your answers must be recorded on the answer sheet in order to be counted. It will not be possible to go back and mark your answers on the answer sheet after time is up. Information in the test booklet or on scrap paper will not be counted.**

**GRID 7**

**7. SCHOOL WHERE YOU ARE NOW ENROLLED**

*Abraham Lincoln IS 171*  
NAME OF SCHOOL

**School Code**

1	9	K	1	7	1
0	0	●	0	0	0
●	1	(M)	●	1	●
2	2	(Q)	2	2	2
3	3	(X)	3	3	3
4	4	(R)	4	4	4
5	5	(W)	5	5	5
6	6		6	6	6
7	7		7	●	7
8	8		8	8	8
9	●		9	9	9

(P) Fill in for private or parochial schools only

**GRID 9**

**9. STUDENT ID NUMBER**

3	2	1	-	4	5	6	-	7	7	8
0	0	0		0	0	0		0	0	0
1	1	●		1	1	1		1	1	1
2	●	2		2	2	2		2	2	2
●	3	3		3	3	3		3	3	3
4	4	4		●	4	4		4	4	4
5	5	5		5	●	5		5	5	5
6	6	6		6	6	●		6	6	6
7	7	7		7	7	7		●	●	7
8	8	8		8	8	8		8	8	●
9	9	9		9	9	9		9	9	9

## STUDENT MISCONDUCT

It is important to note that test security is CRITICAL for the SHSAT. During the test, you may not communicate with other students in any way. This includes, but is not limited to: speaking, writing and passing notes, sharing test booklets or answer sheets, looking at other students' answers, and/or possession of a personal electronic device. Students found to be engaging in any of these activities will have their tests invalidated and will not be allowed to take the test again until the following school year (for current 8th grade students; 9th grade students will not have any additional opportunities to take the test after 9th grade).

## CLAIMS OF TESTING IRREGULARITIES

If you believe there is interference or testing irregularity during any part of the SHSAT test, you should bring the matter to the immediate attention of the proctor. This may include a misprinted test booklet, undue distraction, or improper student behavior. The proctor will attempt to remedy the situation and may take a written statement from you at the end of the test.

Students and parents/guardians may also report any suspected proctoring or testing irregularities, in the form of a letter, to the address below:

**Office of Student Enrollment  
52 Chambers Street, Room 415  
New York, NY 10007**

Mailed letters must be sent by certified mail with proof of delivery and postmarked no later than one week after the test administration. For all claims, please include parent/guardian and student names, as well as telephone and/or email contact information. Any claims of testing irregularity postmarked later than one week after the test date may not be considered. Claims will be responded to on an individual basis.

## SHSAT SCORING

SHSAT scores are based on the number of correct answers marked. There is no penalty for wrong answers. If you are not sure of an answer, you should mark your best guess. You should not spend too much time on any one question. Answer each question as best you can or skip it and keep going. If you have time at the end of the test, you may go back.

Each answer sheet is scanned and scored electronically, and the number of correct answers, called a raw score, is determined for each test taker. Because there are several forms of the SHSAT, raw scores from different test forms

cannot be compared directly. The test forms were developed to be as similar as possible, but they are not identical.

To make valid score comparisons, a raw score must be converted into another type of score that takes into account the differences between test forms. In a process called calibration, verbal and mathematics raw scores are converted into scaled scores. The raw scores and scaled scores are not proportional. In the middle of the range of scores, an increase of one raw score point may correspond to an increase of three or four scaled score points. At the top or bottom of the range of scores, an increase of one raw score point may correspond to 10-20 scaled score points. The reason for this difference is that the scaled scores have been adjusted to fit the normal curve. Scaled scores are on a scale that is common to all test forms, making it possible to compare these scores directly. The composite score is the sum of the verbal and mathematics scaled scores. The composite score is used to determine admission to a Specialized High School.

## REVIEW PROCEDURES

After receiving results, you and your parents/guardians may review a copy of their answer sheet by requesting an appointment with a representative from the Office of Assessment. Copies of answer sheets are not available for distribution but will be reviewed at the scheduled appointment. Appointments may be arranged in one of the following ways:

- 1) By submitting an electronic request via the SHSAT website, [www.nyc.gov/schools/Accountability/resources/testing/SHSAT](http://www.nyc.gov/schools/Accountability/resources/testing/SHSAT), or
- 2) By sending a written request via certified mail with proof of delivery to:

**Office of Assessment, SHSAT Review  
52 Chambers Street, Room 309  
New York, New York 10007**

Electronic requests must be submitted and letters must be postmarked no later than April 1, 2016. Requests must include:

- Student's name, date of birth, and OSIS number
- Parent/guardian's phone number and email address

Within four weeks of receipt of the request, the Office of Assessment will provide appointment details. If there are days or times during normal business hours in the months of April through June that the students and parents/guardians will not be available, be sure to indicate them on your request, as rescheduling may not be possible.

## DISCOVERY PROGRAM

As stated in New York State law, the Specialized High Schools may sponsor a Discovery Program to give disadvantaged students of demonstrated high potential an opportunity to participate in the Specialized High School program. Students will be notified which schools will be sponsoring a Discovery Program and if they are eligible to apply no earlier than May 2016.

### **To be eligible, the student must:**

1. have scored below and close to the lowest qualifying score on the SHSAT. Eligible scores will vary from year to year and will be based on seat availability; and
2. have ranked one of the Specialized High Schools that plans to host a 2016 Discovery Program as among the choices on his/her 2015 SHSAT answer sheet; and
3. be certified as disadvantaged by his/her middle school according to the following criteria:
  - a. attend a Title 1 school and be from a family whose total income is documented as meeting federal income eligibility guidelines established for school food services by the NYS Department of Agriculture, effective July 1, 2015; or
  - b. be receiving assistance from the Human Resources Administration; or
  - c. be a member of a family whose income is documented as being equivalent to or below Department of Social Services standards; or
  - d. be a foster child or ward of the state; or
  - e. initially have entered the United States within the last four years and live in a home in which the language customarily spoken is not English; and
4. be recommended by his/her local school as having high potential for the Specialized High School program.

Once notified of eligibility, families should meet with the school counselor to discuss the Discovery Program application. Documentation supporting student eligibility must be attached to the recommendation form submitted on behalf of the student by the middle school. Not all students recommended can be accepted into the Discovery Program. Those students who are successful in meeting the demands of the summer program will be granted an offer to the school sponsoring the Discovery Program. Those students who are not successful will attend the school to which they had previously been assigned. Students should speak to their guidance counselors if they have any questions.

**PARENTS/GUARDIANS ARE ENCOURAGED TO REVIEW THE FOLLOWING TIPS WITH THEIR CHILDREN SO THAT THEY ARE WELL PREPARED FOR THE TEST.**

## BEFORE TEST DAY

**The best way to improve your verbal skills is to read many books and articles on different topics.** Reading widely will help you expand your vocabulary and improve your comprehension. While reading, ask yourself: What is the main point? What can be deduced? Why does the author use certain words? Is this article well written?

**Knowing what to expect on the test and having some practice in test taking is beneficial.** This handbook describes each part of the test and contains two sample tests to use as practice. Each sample test contains questions from previous tests and has been updated to match the 2015 tests as closely as possible. A list of correct answers is provided for each test, along with explanations.

**Simulating the actual testing situation helps.** You will have two and a half hours (150 minutes) to complete the test. During your practice test, how you allot the time between the verbal and mathematics sections is up to you. You may start with either section. Use the practice test to decide how much time you will spend on each section to keep yourself on pace and manage your time on test day. For example, will you spend 75 minutes on each section, or will you spend more time on one section than another? Will you leave certain questions for the end? You may return to one section if you have time remaining after finishing the other section. Mark your answers on the answer sheet provided in this handbook. Remember, on the actual test, you will not be given extra time to mark your answers on the answer sheet after time is up.

**After you complete the practice test, check your answers against the list of correct answers.** Read the explanations of the correct answers to see the kinds of mistakes you may have made. Did you read too quickly and misunderstand the question? Did you make careless errors in computation? Did you choose answers that were partially correct, but were not the best answers? Were many of your wrong answers guesses? You also should check to see whether there is a pattern to your errors. For example, did you get all of the inequality questions wrong? Did you leave any answers blank? Seek out opportunities to do more practice in areas that challenged you.

**Put this handbook away for a few days, and then take the second sample test, following the same procedure.** Be aware that how well you do on these sample tests is not a predictor of your score on the actual test. However, these tests will give you an idea of what to expect when taking the SHSAT.

## DAY OF THE TEST

**Prepare yourself.** The night before the test, remember to get a good night's sleep. Bring your signed Test Ticket with you to your assigned test site and make sure it includes a parent/guardian signature and your ranked choices of Specialized High Schools. Arrive at your assigned test site on time. Wear comfortable clothes and bring a non-calculator watch to keep track of the time. Make sure that you have several sharpened Number 2 pencils and an eraser that erases cleanly. Do not bring personal electronic devices such as an iPod, calculator, tablet/iPad or ebook reader to the test. You may bring a cell phone but it will be turned off and collected by your proctor for the duration of the test.

**Plan your time.** Be aware of the total number of questions and the amount of time you have to complete the test. Work carefully, but keep moving at a comfortable pace and keep track of the time. Listen carefully to your test proctor and all instructions regarding time. Be sure to place all answers on the answer sheet. You will not be given additional time to transfer your answers from the test booklet or any scrap paper to the answer sheet after time is up.

**Read the instructions carefully.** Be sure you understand the task before marking your answer sheet. For each question, read all the choices before choosing one. Many questions ask for the best answer; it is important to compare all the choices to determine the choice that best answers the question.

**Mark your answers carefully.** This is a machine-scored test, and you can lose credit by marking the wrong answer bubble or marking the answers to two questions on the same line. Make sure the number on the answer sheet matches the number of the question in your test booklet. To change an answer, erase the original mark completely. If two bubbles are filled in for a question, that question will be scored as incorrect. Avoid making stray pencil marks on your answer sheet. You may write in your test booklet to solve verbal or mathematics problems, but remember that only answers recorded on the answer sheet will be counted.

**There is no penalty for a wrong answer.** Your score is based on the number of correct answers marked on the answer sheet. Therefore, omitting a question will not give you an advantage, and wrong answers will not be deducted from your right answers. Fill in any blanks when the time limit is almost up.

**Make an educated guess** when you do not know the answer to a question. Do this by eliminating the answer choice(s) that are definitely wrong, and then choose one of the remaining answers.

**Be considerate of other students** during the test. Do not chew gum or make noises or movements that would be distracting to others.

**If you finish before time is up,** go back over your work to make sure that you followed instructions, did not skip any questions, and did not make careless mistakes. Students must remain in the testing room for the entire duration of the test (150 minutes).

**SCRAMBLED PARAGRAPHS**

The scrambled paragraph portion of the test measures your ability to organize written material according to the sequence of ideas and/or cues provided by transitional words and phrases. There are five paragraphs, each consisting of six sentences. The first sentence is provided, with the remaining five presented in random order. You are to arrange the sentences in the author’s original order using cues contained in the sentences. Only one arrangement of each set of sentences will form a well-organized, cohesive, grammatically correct paragraph. **Each correctly ordered paragraph is worth double the value of a question in any other section of the test.**

The sentences contain words and phrases that help to identify the flow of ideas from one sentence to the next, perhaps describing a procedure or tracing a historical event. The sentences may also provide grammatical cues as to how to construct the paragraph. For example, the pronoun “she” may refer to someone mentioned in a previous sentence. Transitional words such as “although” and “however” also provide cues about how the sentences relate to one another.

As you put the sentences in order, it may help to write the correct position of each sentence in the blank to the left.

For example, write “2” next to the sentence that you think follows the first sentence, “3” next to the sentence you think follows “2,” and so on.

Read **Example 1**. After reading all the sentences, you should have an idea of what the paragraph is about. Now go back to the given sentence and determine which sentence should come next. The given sentence reveals the secret to teaching a parakeet to talk—realizing that the bird just repeats what it hears. The “realization” in the given sentence leads to U, which begins “for this reason” and explains how the realization in the previous sentence affects how a teacher presents the “lessons.”

The next step of the teaching process is in R. The many times the phrase is repeated in R is followed by “your repetitions” in S, which advises the teacher to leave the bird after teaching. Q explains how to leave the bird. The closing sentence is T. The “word of farewell” in Q refers to “Goodbye” in T. URSQT creates a paragraph that is logically and grammatically correct.

RSQTU might look appealing, but the transition from the given sentence to R is poor. R does not follow up on the “secret” presented in the given sentence. Another problem is the placement of U at the end of the paragraph. T provided a specific example of distraction. U refers to a range of distractions, including, but not limited to, other noises. The resulting paragraph is disjointed and poorly organized.

**Example 1**

The secret to teaching a parakeet to talk is the realization that a “talking” bird is simply imitating what it hears, not putting its own ideas into words.

- \_\_\_\_\_ Q. As you leave, don’t give a word of farewell.
- \_\_\_\_\_ R. Stay just out of sight of the bird and repeat the phrase you want it to learn for at least 15 minutes every morning and evening.
- \_\_\_\_\_ S. After your repetitions, leave the bird alone for a while.
- \_\_\_\_\_ T. Otherwise the bird might combine that word, such as “Goodbye,” with the phrase you are trying to teach it.
- \_\_\_\_\_ U. For this reason, when you train your bird to repeat your words, eliminate any distractions, especially other noises, during its “lessons.”

**Example 1**

The second sentence is	Q	R	S	T	●
The third sentence is	Q	●	S	T	U
The fourth sentence is	Q	R	●	T	U
The fifth sentence is	●	R	S	T	U
The sixth sentence is	Q	R	S	●	U

URQTS might also appear appealing, but QTS is an awkward progression of sentences. A well-organized paragraph would not place Q (which assumes that you are leaving) prior to S (which suggests that you should leave). Another problem is that the phrase “after your repetitions” in S does not have a clear referent in T. It refers back to U and R, and placing it at the end of the paragraph creates a gap in the flow of ideas.

## LOGICAL REASONING

This section consists of 10 questions that assess your ability to reason logically, using the facts, concepts, and information presented. **You must guard against jumping to conclusions that are not warranted from the information given.** There are different types of questions: figuring out codes, determining the relative positions of things or people, identifying correct assumptions, and drawing valid conclusions.

The most important strategy is to read the information carefully and make no assumptions that are not supported by the given information. Certain words must be read carefully. For example, **between** cannot be assumed to mean **between and right next to**; other things may be between these two objects as well. The same may be true of words such as **above**, **below**, **before**, and **after**.

Another good strategy is to look for information that is definitely stated, such as, “The red box is the largest,” or “Jane is not standing next to Erik.” This information makes it easier to determine the relative relationships.

For **Example 2**, draw a diagram to help you determine the order in which the students stood:

Shortest	1st
	2nd
	3rd
	4th
Tallest	5th

The question provides information about the students’ heights relative to one another. It does not provide definite information that would allow us to place a student in any particular location.

Add the information given in the three conditions about the students’ heights to the diagram. Remember that the information is relative, so don’t place anyone in a definite space yet.

	Condition 1	Condition 2	Condition 3
Shortest	J	N	P
	G	R	N
		G	J
Tallest			

The first and third conditions can be combined like this:

P
N
J
G

The diagram shows that Gina is taller than everyone else, so she is in fifth place, which is Option D. Notice that it is not possible to determine who is in fourth place—Jorge or Rafael—but this does not affect Gina’s place. Gina’s position can be definitely determined, so Option E is incorrect.

### Example 2

Five students stood in order of height. The shortest student stood in the first place, and the tallest student stood in the fifth place.

- 1) Jorge is shorter than Gina.
- 2) Rafael is taller than Nick but shorter than Gina.
- 3) Nick is shorter than Jorge but taller than Priscilla.

In which place is Gina?

- A. second
- B. third
- C. fourth
- D. fifth
- E. Either fourth or fifth, but it is not possible to determine which one.

For **Example 3**, read each option and decide whether it **must** be true based on the given information. Reread the given information as often as needed so that you do not make an incorrect assumption. Option F is not necessarily true. The given information does not say anything about a requirement that 75 people must watch the film. Nor is Option G necessarily true. It might be a good idea, but we cannot conclude that it **must** be true. We cannot conclude that Option J is true; we do not know how many people are interested in the film. Option K may seem like a reasonable answer. It could explain why video room A is being used. However, even though the explanation sounds plausible, the given information does not say why the film is being shown in video room A rather than somewhere else. It simply says that video room A was used. Therefore, we cannot say that Option K must be true. Only Option H **must** be true because we know that the capacity of video room A is 75 people.

**Example 3**

Because video room A is being used to show this film, no more than 75 people can attend the showing.

Based only on the information above, which of the following **must** be true?

- F. At least 75 people must be present in order to show the film in video room A.
- G. If more than 75 people are interested in seeing this film, another video room will show the film at the same time.
- H. If more than 75 people want to see this film, some will not be able to attend this showing in video room A.
- J. More than 75 people are interested in seeing this film.
- K. Because fewer than 75 people want to see this film, video room A is being used.

When the question involves a code, as in **Example 4**, do not solve for all parts of the code. Solve only those parts that relate to the question. Read the directions carefully. The letters in a sentence may or may not appear in the same order as the words they represent in that sentence. For example, in the first sentence, the first letter (R) may or may not represent the first word (“Tito”).

In **Question 1**, the word “Tito” appears only in the first and fourth sentences, so its corresponding letter must appear only in those sentences. Letter J (Option B) meets that requirement, and it is the correct answer. The other options cannot be correct. The letter Y appears only in the fourth sentence. The letters B and R appear in the first and fourth sentences, but they also appear in the second and third sentences. Thus, neither of them can represent the word “Tito.” Option E is ruled out because the letter representing “Tito” **can** be determined from the information given.

In **Question 2**, the letter K appears in all four sentences. The words “wants to meet” also appear in all four sentences. Is it possible to determine which of those words is represented by

**Example 4**

Questions 1 and 2 refer to the following information.

In the code below, (1) each letter always represents the same word, (2) each word is represented by only one letter, and (3) in any given sentence, the letters may or may not be presented in the same order as the words.

R      J      K      B      L      means  
 “Tito    wants    to    meet    Shu.”

M      R      C      B      K      means  
 “Bianca wants    to    meet    Michael.”

B      R      D      K      Z      means  
 “Anjel    wants    to    meet    Kim.”

K      J      Y      R      B      means  
 “Imani    wants    to    meet    Tito.”

1. Which letter represents the word “Tito”?
  - A. B
  - B. J
  - C. R
  - D. Y
  - E. Cannot be determined from the information given.
2. Which word is represented by the letter K?
  - F. wants
  - G. to
  - H. meet
  - J. Michael
  - K. Cannot be determined from the information given.

the letter K? No, it could represent any of those words. The directions state that “the letters may or may not be presented in the same order as the words.” Thus, the letter K appears above the words “to” and “meet,” but that does not mean it represents either of those words. It is impossible to determine which word is represented by K, so the correct answer is Option E, “Cannot be determined from the information given.”

READING

This section measures your ability to read and comprehend five informational passages. Each passage is 400 to 500 words long. The subjects include short biographies, discussions of historical events, descriptions of scientific phenomena, brief essays on art or music, discussions with a point of view, and human interest stories.

Example 5

Several animal species, although they remain “wild,” are comfortable living in close proximity to people. Some of these animals, such as squirrels and pigeons, are plentiful even in big cities. Many make their homes in buildings and have developed a taste for human food. Among these species, few have a larger appetite for the products of human civilization than sea gulls.

Despite the name, not all gulls live near the sea. Of the 44 gull species, some are found in deserts or mountain regions, though most inhabit shorelines. On the California coast, western gulls far outnumber other gull species. Glaucous-winged gulls dominate the Pacific Northwest; herring gulls, the North Atlantic coast; ring-bills, the Great Lakes and other inland fresh water; and California gulls, despite their name, the Great Salt Lake in Utah. Because of special glands above their eyes, all gulls can drink salt water as well as fresh water.

Gulls have a varied natural diet, ranging from fish, shellfish, and rodents to insects. They typically break shellfish open by carrying them while they fly, then dropping them onto a hard surface. Some gulls have been seen trying to dine on some rather unusual substances. For example, gulls have attempted to eat golf balls, perhaps mistaking them for the eggs of another species of bird. Others have dropped metal objects, such as nuts and bolts, from the sky onto the ground.

Gulls have learned that human habitation usually means a plentiful, easy food supply. They accept handouts eagerly and will drive off more mild-mannered birds, such as ducks, rather than share food with them. Gulls follow fishing boats and garbage scows, knowing that these are reliable sources of easy pickings. They find landfills, with their plentiful food scraps, especially inviting. Unfortunately, this causes a serious problem when the landfills are located near airports. Gulls have been sucked into the air intakes of jet engines, resulting in fatal plane crashes.

Many gulls have adapted to living among city skyscrapers. The buildings’ high roofs and straight sides resemble the cliffs where gulls nest in the wild and provide the same kind of updrafts that allow sea gulls to glide and soar with little effort. Apart from an occasional hawk, sea gulls have few natural predators in urban settings. And city living provides easy access to plenty of garbage.

Indeed, gulls are not the best of neighbors. They are noisy and have been known to damage buildings and farm crops, and to pester humans carrying food. A whole “gull control” industry has sprung up to discourage sea gulls from congregating near human communities. For example, electronic devices produce flashing lights or the sounds of predators, and spikes and sprinklers on buildings and fences deter the birds from roosting. As long as people continue to provide them with food, however, gulls will probably remain the birds next door.

Each passage has six questions that ask you to identify and analyze key ideas and details, as well as draw conclusions from the information presented.

In order to ensure a thorough understanding of the text, read the passage carefully rather than skimming it. This will help prevent you from making inaccurate assumptions based on only a few details. After reading the passage, try answering each question before reading the answer choices. Then look at the choices to see which is closest to your answer. If none seem to be your answer, read the question again. You may also reread the passage before you choose your answer.

Be wary of choices that are too broad or too narrow. Ask yourself whether the question requires you to draw a conclusion or inference from statements in the passage or simply to identify a restatement of the facts.

Base your answers only on the information presented in the passage. Do not depend solely on your prior knowledge of the topic. Enough information will be given for you to arrive at the correct answer.

**Example 5 continued...**

1. Which of the following best tells what this passage is about?
  - A. the harm that gulls do to people
  - B. how gulls have adapted to living near human communities
  - C. the characteristics of animal species that benefit from living near humans
  - D. how gulls have become tame
  - E. how gulls' intelligence helps them to survive
2. Where are gulls most dangerous to people?
  - F. in big cities
  - G. at golf courses
  - H. on seacoasts
  - J. on farms
  - K. at airports
3. Which of the following statements about the eating habits of gulls is suggested by the passage?
  - A. Gulls prefer food with strong flavors.
  - B. Gulls have developed a taste for metal objects.
  - C. Gulls eat only food that people have thrown away.
  - D. Gulls sometimes steal and eat the eggs of other birds.
  - E. Gulls are fussy eaters compared with other birds.
4. What is the most likely reason that the gulls mentioned in the passage dropped nuts and bolts from the sky?
  - A. They were trying to frighten off competitors.
  - B. They didn't like the taste of them.
  - C. They were trying to crack them open.
  - D. They behave that way with all food.
  - E. They were unable to hold them any longer.
5. What species of gull would have the **least** use for the special glands mentioned in line 21?
  - A. ring-bill
  - B. herring
  - C. western
  - D. California
  - E. glaucous-winged
6. Which of the following is most likely part of a gull control strategy?
  - F. building taller skyscrapers
  - G. building landfills near airports
  - H. eliminating hawks and other predators
  - J. paving over parks and green spaces
  - K. installing flashing lights on rooftops

**QUESTION 1**

The correct answer for this question must encompass the main points without being overly broad. Option A is a detail, not a main point. Option C describes only the first paragraph. Options D and E are not mentioned. The best answer is Option B. The passage describes how gulls benefit from living in human-created surroundings.

**QUESTION 2**

To answer this question, read every option before choosing the best one. According to the passage, while gulls may be nuisances to people and may damage property, they do not pose a threat to the lives of human beings in cities, golf courses, seacoasts, or farms. The only reference to gulls' potential danger to people is in lines 47-49: gulls sucked into airplane engines have resulted in fatal plane crashes. The correct answer is Option K, "at airports."

**QUESTION 3**

The eating habits of gulls are mentioned in several places throughout the passage. You must keep all of these in mind in order to answer correctly. The passage does not mention strong flavors, ruling out Option A. Option B is incorrect; although the passage describes how gulls pick up and drop metal objects, it does not say that they actually eat them. Gulls eat just about everything, including but not limited to garbage, making Options C and E incorrect. Lines 30-33 imply that gulls eat the eggs of other bird species, which is Option D.

**QUESTION 4**

The statement about gulls dropping nuts and bolts from the sky is in lines 33-35. To find the reason why they do this, read the entire third paragraph. Lines 24-28 say that gulls break open shellfish by dropping them onto a hard surface. Apparently they can't open the shellfish by other means. A logical inference is that gulls drop metal objects for a similar reason--to try to crack them open--which is the correct answer (Option H). Frightening off competitors (Option F) is mentioned in the context of driving ducks away from food (lines 38-40), not with regard to dropping objects from the sky. The other options are not supported by the passage.

**QUESTION 5**

The special glands mentioned in line 21 allow gulls to drink salt water as well as fresh water. All of the gull species in the second paragraph, except the ring-bills, live near salt water oceans or the Great Salt Lake. Thus, they need the special glands in order to drink salt water. Ring-bill gulls live near the Great Lakes and other inland fresh water. Fresh water is easily accessible to them, so they have little use for the special glands (Option A).

**QUESTION 6**

The gull control industry is described in the last paragraph. Its purpose is to discourage sea gulls from congregating near human communities. Options F, G, and H may attract gulls, not discourage them. Option J can be eliminated because the passage does not say anything about parks and green spaces, or the lack of them. Option K is mentioned in lines 65-66 as a way to deter gulls from roosting on buildings and fences.

This section includes arithmetic, algebra, probability, statistics, and geometry problems. The technical terms and general concepts in these test questions can be found in the New York State Education Department **P-12 Common Core Learning Standards for Mathematics**. Most problems involve application of topics covered in the **Common Core**; however, since the **Common Core** is just an outline, not all details of a topic are provided. Consequently, some aspects of a question may not be mentioned. As one of the purposes of this test is to identify students who will benefit from an education at a Specialized High School, the SHSAT contains many questions that require using mathematical ability to respond to novel situations. The NYSED P-12 Common Core Learning Standards for Mathematics can be downloaded from the New York State Education Department website: [www.nysed.gov](http://www.nysed.gov).

## TIPS FOR TAKING THE MATHEMATICS SECTION OF THE SHSAT

**T**o improve your mathematics skills, choose a mathematics textbook for your grade level and solve five to ten problems every day. Do both routine and challenging problems. Routine problems reinforce basic mathematical facts. More challenging problems help you understand mathematics concepts better. Do not give up if you cannot complete some of the problems. Skip them and move on. You may be able to solve them after you have practiced different types of problems. Also, do not limit yourself to types of problems that test what you have learned in your mathematics class only.

**YOU MUST KNOW THE MEANINGS OF TECHNICAL TERMS** such as “parallel” and “perpendicular” that are appropriate to your grade level, as well as the customary symbols that represent those terms. You also need to **know various formulas** such as those for the perimeter and area of different figures. You can find these technical terms, symbols, and formulas in your mathematics textbook. These terms, symbols, and formulas will **NOT** be given in the test booklet. Practice using them until you are comfortable with the terms and formulas.

**READ EACH PROBLEM CAREFULLY** and work out the answer on scrap paper or in your test booklet. **Do not calculate on your answer sheet.**

**MOST PROBLEMS SHOULD BE DONE** by **working out the answer**. This is more efficient than trying out the options to see which one fits the question. The only exception is when you are explicitly asked to look at the options, as in, “Which of the following is an odd number?”

**IF THE QUESTION IS A WORD PROBLEM**, it often is helpful to **express it as an equation**. When you obtain an answer, look at the choices listed. If your answer is included among the choices, mark it. If it is not, reread the question and solve it again.

**THE INCORRECT CHOICES** are often answers that people get if they misread the question or make common computational errors. For this reason, it is unwise to solve a problem in your head while looking at the possible choices. It is too easy to be attracted to a wrong choice.

**IF YOUR ANSWER IS NOT AMONG THE ANSWER CHOICES**, write your answer in a different form. For example,  $10(x + 2)$  is equivalent to  $10x + 20$ .

**YOU MAY DRAW FIGURES OR DIAGRAMS** for questions that do not have them.

**SOME QUESTIONS ASK YOU** to combine a series of simple steps. Take **one step at a time**, using what you know and what the question tells you to do.

**THE SAMPLE TESTS IN THIS HANDBOOK** are Grade 8 forms. If you are taking the Grade 9 test, work the problems on pages 108-110 as well. These problems cover topics that are introduced in the Common Core for Grade 8.

**EXAMPLE 6**

$$^{-}4(x - 2) \leq 16$$

What is the solution to the inequality shown above?

- A.  $x \geq ^{-}6$
- B.  $x \geq ^{-}2$
- C.  $x \leq 2$
- D.  $x \geq 6$
- E.  $x \leq ^{-}2$

**IN EXAMPLE 6**,  $^{-}4(x - 2) \leq 16$

Divide both sides by  $^{-}4$ , remembering to change the direction of the sign since both sides are divided by a negative number.

$$x - 2 \geq ^{-}4$$

$$x \geq ^{-}2$$

**EXAMPLE 7**

The measures of the angles of a triangle are in the ratio 1:2:3. What is the measure of the largest angle?

- F.  $30^{\circ}$
- G.  $60^{\circ}$
- H.  $90^{\circ}$
- J.  $150^{\circ}$
- K.  $180^{\circ}$

**IN EXAMPLE 7**, let  $x$  equal the smallest angle of the triangle. Then, the three angles are  $x$ ,  $2x$ , and  $3x$ . The sum of the angles of a triangle is  $180^{\circ}$ . Set up an equation using this to find  $x$ :

$$x + 2x + 3x = 180$$

$$6x = 180$$

$$x = 30$$

Since the question asks for the measure of the largest angle,  $3x = 3(30) = 90^{\circ}$ .

**EXAMPLE 8**

What is the greatest common factor of 98 and 42?

- A. 2
- B. 3
- C. 6
- D. 7
- E. 14

**IN EXAMPLE 8**, first find the prime factorizations of 98 and 42:

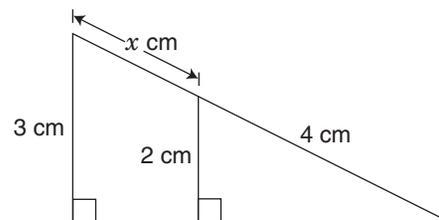
$$98 = 2 \cdot 7 \cdot 7$$

$$42 = 2 \cdot 3 \cdot 7$$

Next, find the prime numbers that are in both prime factorizations (2 and 7). The product of those prime factors is the greatest common factor ( $2 \cdot 7 = 14$ )

**EXAMPLE 9**

(9th Grade item)



In the figure above, what is the value of  $x$ ?

- F.  $^{-}6$  cm
- G.  $\frac{^{-}5}{2}$  cm
- H.  $\frac{^{-}4}{3}$  cm
- J. 2 cm
- K. 6 cm

**IN EXAMPLE 9**, the two triangles are similar, so set up a proportion to solve for  $x$ :

$$\frac{x + 4}{3} = \frac{4}{2}$$

$$x + 4 = 6$$

$$x = 2$$

**TAKING THE SAMPLE TESTS**

Now you are ready to try sample test Form A. Begin by carefully reading the Directions on pages 30 and 31 and filling out side 1 of the Answer Sheet on page 32. For Form A, use side 2 of the Answer Sheet (page 33). When you are ready for Form B, use the Answer Sheet on page 71. You may tear out pages 33 and 71 to make it easier to mark your answers.

If you are taking the Grade 9 test, work the problems on pages 108-110 as well.

# NEW YORK CITY PUBLIC SCHOOLS

## 2015 Specialized High Schools

### ADMISSIONS TEST

#### GENERAL DIRECTIONS

##### Identifying Information

Turn to Side 1 of the answer sheet. **Line 1** says, “I am well enough to take this test and complete it. I understand that once I break the seal of the test booklet, I will not be eligible for a make-up test. I am a New York City resident and a Grade 8 student taking a Grade 8 test. I understand that a student who is not a New York City resident, who takes the test more than once in a given school year, or who takes the test at the wrong grade level will be disqualified from acceptance to any of the specialized high schools.” Sign your name in the space following the word “signature.” Do not print your name. **Notify the proctor immediately if you are ill or should not be taking this test. Do not sign the statement or begin the test. Return your answer sheet to the proctor.**

On **Line 2**, print today’s date, using the numbers of the month, the day, and the year. On **Line 3**, print your birth date with the number of the month first, then the number of the day, then the last two digits of the year. For example, a birth date of March 1, 2001, would be 3-1-01.

In **Grid 4**, print the letters of your first name, or as many as will fit, in the boxes. Write your name exactly as you did on the application. If you have a middle initial, print it in the box labeled “MI.” Then print your last name, or as much as will fit, in the boxes provided. Below each box, fill in the circle that contains the same letter as the box. If there is a space in your name, or a hyphen, fill in the circle under the appropriate blank or hyphen.

Make **dark marks** that **completely fill the circles**. If you change a mark, be sure to erase the first mark completely.

**Grid 5** is for your choice of specialized high schools. If Grid 5 is not marked correctly, your admission to a specialized high school will be affected because your admission is based on the score you attain and the order in which you rank your school preferences. The school choices indicated on your answer sheet are final. Therefore, carefully copy the order in which you ranked the schools on your admission ticket onto Grid 5.

**Fill in one and only one circle for each school for which you wish to be considered.** You may make as few as one or as many as eight choices. To increase your chances of being assigned to one of the specialized high schools, you are encouraged to make more than one choice. You **must** fill in a first choice school. Do not fill in a school more than once. Do not fill in the same school for each choice. Fill in only one circle in a row and only one circle in a column.

**Grid 6** is labeled “BOOKLET LETTER AND NUMBER.” In most cases, Grid 6 is already filled in for you. If it is not, copy the letter and numbers shown in the upper-right corner of your test booklet into the boxes. Below each box, fill in the circle containing the same letter or number as the box.

##### For **Grid 7**:

1. Print the name of the school where you are now enrolled in the space at the top of the grid.
2. In the boxes marked “SCHOOL CODE,” print the six-digit code that identifies your school and fill in the circle under the corresponding number or letter for each digit of the school code. (You can find your school code on your Test Ticket. If it is not there, you or the proctor should look in the Feeder School List under the borough in which your school is located to find the code for your school.)
3. If you attend a private or parochial school, fill in the circle marked “P”.

**Grid 8** asks for your date of birth. Print the first three letters of the month in the first box, the number of the day in the next box, and the year in the last box. Then fill in the corresponding circles.

**DO NOT OPEN THIS BOOKLET  
UNTIL YOU ARE TOLD TO DO SO  
TURN YOUR BOOKLET OVER TO THE BACK COVER**

## GENERAL DIRECTIONS, continued

**Grid 9** is labeled “STUDENT ID NUMBER.” All SHSAT test-takers should write their student ID number in Grid 9. The student ID number is found on your Test Ticket. In the boxes, print your nine-digit student ID number. Below each box, fill in the circle containing the same number as in the box.

Now review Side 1 to make sure you have completed all lines and grids correctly. Review each column to see that the filled-in circles correspond to the letters or numbers in the boxes above them.

Turn your answer sheet to Side 2. Print your test booklet letter and numbers, and your name, first name **first**, in the spaces provided.

### Marking Your Answers

Be sure to mark all your answers in the row of answer circles corresponding to the question number printed in the test booklet. Use a Number 2 pencil. If you change an answer, be sure to erase it completely. **You may write in your test booklet to solve verbal or mathematics problems, but your answers must be recorded on the answer sheet in order to be counted.** Be careful to avoid making any stray pencil marks on your answer sheet.

Each question has only one correct answer. If you mark more than one circle in any answer row, that question will be scored as incorrect. Select the **best** answer for each question. Your score is determined by the number of questions you answered correctly. **It is to your advantage to answer every question, even though you may not be certain which choice is correct.** See the example of correct and incorrect answer marks below

SAMPLE ANSWER MARKS					
1	(A)	(B)	(C)	(D)	● RIGHT
2	⊗	(B)	(C)	(D)	(E) WRONG
3	(A)	⊗	(C)	(D)	(E) WRONG
4	(A)	(B)	●	(D)	(E) WRONG
5	(A)	(B)	●	●	(E) WRONG

AA

### Planning Your Time

You have 150 minutes to complete the entire test. How you allot the time between the Verbal and Mathematics sections is up to you. **If you begin with the Verbal section, you may go on to the Mathematics section as soon as you are ready. Likewise, if you begin with the Mathematics section, you may go on to the Verbal section as soon as you are ready.** It is recommended that you do not spend more than 75 minutes on either section. If you complete the test before the allotted time (150 minutes) is over, you may go back to review questions in either section.

Work as rapidly as you can without making mistakes. Don't spend too much time on a difficult question. Return to it later if you have time.

Students must remain for the entire test session.

#### Example 1

**DIRECTIONS:** Solve the problem. Find the **best** answer among the answer choices given.

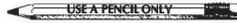
**E1.** If four ice cream cones cost \$2.00, how much will three ice cream cones cost?

- A. \$0.50
- B. \$1.00
- C. \$1.25
- D. \$1.50
- E. \$1.75

EXAMPLE ANSWER					
E1.	(A)	(B)	(C)	●	(E)

**DO NOT OPEN THIS BOOKLET UNTIL  
YOU ARE TOLD TO DO SO**





Student's First Name (please print) \_\_\_\_\_

Student's Last Name (please print) \_\_\_\_\_

**PART 1 VERBAL**

**SCRAMBLED PARAGRAPHS**

**Paragraph 1**

- The second sentence is    Q    R    S    T    U
- The third sentence is    Q    R    S    T    U
- The fourth sentence is    Q    R    S    T    U
- The fifth sentence is    Q    R    S    T    U
- The sixth sentence is    Q    R    S    T    U

**Paragraph 2**

- The second sentence is    Q    R    S    T    U
- The third sentence is    Q    R    S    T    U
- The fourth sentence is    Q    R    S    T    U
- The fifth sentence is    Q    R    S    T    U
- The sixth sentence is    Q    R    S    T    U

**Paragraph 3**

- The second sentence is    Q    R    S    T    U
- The third sentence is    Q    R    S    T    U
- The fourth sentence is    Q    R    S    T    U
- The fifth sentence is    Q    R    S    T    U
- The sixth sentence is    Q    R    S    T    U

**Paragraph 4**

- The second sentence is    Q    R    S    T    U
- The third sentence is    Q    R    S    T    U
- The fourth sentence is    Q    R    S    T    U
- The fifth sentence is    Q    R    S    T    U
- The sixth sentence is    Q    R    S    T    U

**Paragraph 5**

- The second sentence is    Q    R    S    T    U
- The third sentence is    Q    R    S    T    U
- The fourth sentence is    Q    R    S    T    U
- The fifth sentence is    Q    R    S    T    U
- The sixth sentence is    Q    R    S    T    U

**LOGICAL REASONING**

- |              |              |
|--------------|--------------|
| 11 A B C D E | 33 A B C D E |
| 12 F G H J K | 34 F G H J K |
| 13 A B C D E | 35 A B C D E |
| 14 F G H J K | 36 F G H J K |
| 15 A B C D E | 37 A B C D E |
|              | 38 F G H J K |
| 16 F G H J K |              |
| 17 A B C D E | 39 A B C D E |
| 18 F G H J K | 40 F G H J K |
| 19 A B C D E | 41 A B C D E |
| 20 F G H J K | 42 F G H J K |
|              | 43 A B C D E |
|              | 44 F G H J K |

**READING**

- |              |              |
|--------------|--------------|
| 21 A B C D E | 45 A B C D E |
| 22 F G H J K | 46 F G H J K |
| 23 A B C D E | 47 A B C D E |
| 24 F G H J K | 48 F G H J K |
| 25 A B C D E | 49 A B C D E |
| 26 F G H J K | 50 F G H J K |

**PART 2 MATHEMATICS**

**MATHEMATICS PROBLEMS**

- |              |              |              |               |
|--------------|--------------|--------------|---------------|
| 51 A B C D E | 66 F G H J K | 81 A B C D E | 96 F G H J K  |
| 52 F G H J K | 67 A B C D E | 82 F G H J K | 97 A B C D E  |
| 53 A B C D E | 68 F G H J K | 83 A B C D E | 98 F G H J K  |
| 54 F G H J K | 69 A B C D E | 84 F G H J K | 99 A B C D E  |
| 55 A B C D E | 70 F G H J K | 85 A B C D E | 100 F G H J K |
| 56 F G H J K | 71 A B C D E | 86 F G H J K |               |
| 57 A B C D E | 72 F G H J K | 87 A B C D E |               |
| 58 F G H J K | 73 A B C D E | 88 F G H J K |               |
| 59 A B C D E | 74 F G H J K | 89 A B C D E |               |
| 60 F G H J K | 75 A B C D E | 90 F G H J K |               |
| 61 A B C D E | 76 F G H J K | 91 A B C D E |               |
| 62 F G H J K | 77 A B C D E | 92 F G H J K |               |
| 63 A B C D E | 78 F G H J K | 93 A B C D E |               |
| 64 F G H J K | 79 A B C D E | 94 F G H J K |               |
| 65 A B C D E | 80 F G H J K | 95 A B C D E |               |

# SAMPLE TEST, FORM A

## PART 1 — VERBAL

*Suggested Time — 75 Minutes*

45 QUESTIONS

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### SCRAMBLED PARAGRAPHS

PARAGRAPHS 1-5

**DIRECTIONS:** In this section, arrange each group of sentences to create the best paragraph. The first sentence for each paragraph is given; the remaining five sentences are listed in random order. Choose the order for these five sentences that will create the **best** paragraph, one that is well-organized, logical, and grammatically correct. Each correctly ordered paragraph is worth **double** the value of a question in any other section of the test. No credit will be given for responses that are only partially correct.

To keep track of your sentence order, use the blanks to the left of the sentences. For example, write “2” next to the sentence you think follows the first sentence, write “3” next to the sentence you think follows “2,” and so on. You may change these numbers if you decide on a different order. When you are satisfied with your sentence order, mark your choices on your answer sheet.

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#### Paragraph 1

Some traditional households in sub-Saharan Africa serve two meals a day, one at noon and the other in the evening.

- \_\_\_\_\_ **Q.** African food can be very spicy, and the starch cools the burning effect of the main dish.
- \_\_\_\_\_ **R.** The starch serves another purpose as well.
- \_\_\_\_\_ **S.** Diners then use the starch to scoop up a portion of the main dish.
- \_\_\_\_\_ **T.** A typical meal consists of a thick stew or soup as the main course, along with some sort of starch—bread, rice, or *fufu*, a starchy grain paste similar in consistency to mashed potatoes.
- \_\_\_\_\_ **U.** The main dish is usually served on individual plates, and the starch is served on a communal plate, from which diners break off a piece of bread or scoop rice or fufu in their fingers.

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**Paragraph 2**

In most dictionaries, the first meaning listed for “bluegrass” refers to a bluish-green grass frequently grown in Kentucky; the second meaning usually refers to a type of country music.

- \_\_\_\_\_ **Q.** You won’t hear that style at any of the dozens of traditional bluegrass festivals held each year across the United States.
- \_\_\_\_\_ **R.** Included among the non-amplified strings will be guitars, banjos, mandolins, and fiddles, but never drums or accordions.
- \_\_\_\_\_ **S.** If, on the other hand, either the instruments or the music is non-traditional, the music may be called “newgrass.”
- \_\_\_\_\_ **T.** The traditional rapid-fire bluegrass sound that was Monroe’s trademark is played on non-amplified stringed instruments and features free improvisation.
- \_\_\_\_\_ **U.** The connection between those two meanings is a band called the Blue Grass Boys—named in honor of the state of Kentucky—whose leader, Bill Monroe, effectively created this style of music.

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**Paragraph 3**

Ancient people of the Mediterranean thought that volcanoes were caused by Vulcan, the Roman blacksmith god.

- \_\_\_\_\_ **Q.** In the same park, Mauna Loa, at 28,000 feet above the ocean’s floor, is the largest active volcano in the world.
- \_\_\_\_\_ **R.** There are dozens of active and potentially active volcanoes within the United States, including Kilauea, the most active volcano in the world.
- \_\_\_\_\_ **S.** Both of these are shield volcanoes, which means that they were formed as lava flowed in all directions from a central vent to form low, gently sloping mountains.
- \_\_\_\_\_ **T.** Volcanoes, which were named for Vulcan, are vents in the crust of the earth from which molten lava and ash erupt.
- \_\_\_\_\_ **U.** That volcano, located in Hawaii Volcanoes National Park, has been spewing lava since 1983.

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**Paragraph 4**

Macaws, a type of parrot found in South America, are among the largest and most beautiful birds in the world.

- \_\_\_\_\_ **Q.** Scientists believe that the birds may eat the clay in order to counteract poisons contained in some of these fruit seeds.
- \_\_\_\_\_ **R.** The birds do not appear to eat clay to satisfy hunger; they ingest it even when fruit seeds, their favorite foods, are available.
- \_\_\_\_\_ **S.** Like many other parrot species, they are very intelligent as well, yet some of their behaviors have baffled scientists.
- \_\_\_\_\_ **T.** This theory is supported by the fact that the birds eat more clay in the dry season, when less-poisonous food is scarce.
- \_\_\_\_\_ **U.** For example, macaws regularly flock to riverbanks to eat the clay found in river mud.

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**Paragraph 5**

The now-abandoned settlement of Nan Madol, located on a coral reef off the shore of the Micronesian island of Pohnpei, was built over a thousand years, beginning around A.D. 500.

- \_\_\_\_\_ **Q.** The new building materials—some pieces were twenty feet long and weighed nearly six tons—were transported to Pohnpei on rafts.
- \_\_\_\_\_ **R.** The ancestors would build a great fire around a column, then pour cool seawater on it, causing it to split along natural fracture lines.
- \_\_\_\_\_ **S.** Then they were placed in their present positions by means of hibiscus fiber ropes and the inclined trunks of coconut palm trees.
- \_\_\_\_\_ **T.** The islanders say that their ancestors obtained the stone from quarries on a nearby island, where large basalt columns were formed naturally by the cooling of molten lava.
- \_\_\_\_\_ **U.** The structures of Nan Madol are remarkable for the sheer size of the stone “logs” or columns used to create the retaining walls of the offshore community, and anthropologists must rely on information provided by local people to learn how Nan Madol was built.

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# LOGICAL REASONING

## QUESTIONS 11-20

**DIRECTIONS:** Read the information given and choose the **best** answer to each question. Base your answer **only on the information given**.

In a logical reasoning test, certain words must be read with caution. For example, “The red house is **between** the yellow and blue houses” does not necessarily mean “The red house is **between and next to** the yellow and blue houses”; one or more other houses may separate the red house from the yellow house or from the blue house. This precaution also applies to words such as **above, below, before, after, ahead of, and behind**.

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11. A star named Quil is the center of four orbiting planets, which are named Dorb, Needer, Sly, and Tyne. Each planet travels in a separate orbit, and each orbit is a circle. All four orbits lie in one plane. The farther a planet is from Quil, the faster it travels.
- 1) Planet Needer is closest to Quil.
  - 2) The orbit of planet Dorb is next to the orbit of Sly.
  - 3) The orbit of Sly is farthest from the orbit of Needer.

Which planet travels fastest?

- A. Needer
- B. Dorb
- C. Sly
- D. Tyne
- E. Cannot be determined from the information given.

12. If it is snowing, I cannot ride my bike. If it is dark, I cannot ride my bike.

Based only on the information above, which of the following **must** be true?

- F. If I cannot ride my bike, then it must be dark.
- G. If I cannot ride my bike, then it must be snowing.
- H. I do not have a headlight on my bike.
- J. If I ride my bike, then it is not dark or snowing.
- K. If it is snowing, then it must be dark.

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13. One prize was awarded each week in a three-week contest. The prizes were a trip to Disney World, a big-screen television, and a computer.

- 1) Luis, Michael, and Nadia each won a different prize.
- 2) Michael did not win the computer.

Which of the following pieces of additional information makes it possible to determine who won each prize?

- A. Michael won the free trip.
- B. Luis won the television.
- C. Luis won the computer.
- D. Nadia won the computer.
- E. Michael won the television.

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**14.** Five students used the telephone in the gym office at separate times on Wednesday.

- 1) Steve used it earlier than Raymond.
- 2) Elise used it earlier than Raymond, but later than Ahmed.
- 3) Tiffany used it last.

Who used the telephone first?

- F.** Steve
  - G.** Elise
  - H.** Ahmed
  - J.** Either Elise or Ahmed, but it is not possible to determine which one.
  - K.** Either Ahmed or Steve, but it is not possible to determine which one.
- 

**15.** Five horses entered the stable, one at a time.

- 1) Silver entered before Rainbow.
- 2) Ebony entered before Rainbow, but after Ace.
- 3) Thunder entered before Silver, but after Ebony.

Which horse entered fourth?

- A.** Silver
  - B.** Rainbow
  - C.** Ebony
  - D.** Thunder
  - E.** Cannot be determined from the information given.
- 

**16.** When Soon Bae listens to music, she also dances. Whenever she dances, she also sings.

Based only on the information above, which of the following is a valid conclusion?

- F.** When Soon Bae sings, then she is dancing.
- G.** Soon Bae sings only when she is dancing.
- H.** When Soon Bae listens to music, then she is also singing.
- J.** If Soon Bae is not listening to music, then she is not dancing.
- K.** If Soon Bae is not dancing, then she is not singing.

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Questions 17 and 18 refer to the following information.

In the code below, (1) each letter always represents the same word, (2) each word is represented by only one letter, and (3) in any given sentence, the letters may or may not be presented in the same order as the words.

L            S    Q    M    T    means  
"Sherbet is cold and sweet."

T            Q    V    N    R    means  
"Chili is spicy and hot."

Q            X    W    T    L    means  
"Lemonade is cold and tart."

P            T            M    V    means  
"Hot chocolate is sweet."

**17.** Which letter represents the word "and"?

- A.** T
- B.** L
- C.** M
- D.** Q
- E.** Cannot be determined from the information given.

**18.** Which word is represented by the letter V?

- F.** chili
- G.** spicy
- H.** hot
- J.** sweet
- K.** Cannot be determined from the information given.

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**19.** In a cartoon, four trolls stood in a line. Their names were Banto, Gretchen, Snowflake, and Holly. One had green eyes, another had purple ears, another had red teeth, and another had white hair.

- 1) The troll with red teeth was directly in front of Snowflake, who had white hair.
- 2) Banto, who did not have green eyes, was behind Gretchen.
- 3) Gretchen had purple ears.
- 4) Snowflake was behind Holly.

If the troll with green eyes stood behind Gretchen, then what was Gretchen's position?

- A.** first
  - B.** second
  - C.** third
  - D.** fourth
  - E.** Cannot be determined from the information given.
- 

**20.** Most people in the Skydiving Club are not afraid of heights. Everyone in the Skydiving Club makes three parachute jumps a month.

Based only on the information above, which of the following statements **must** be true?

- F.** Skydivers are less afraid of heights than are non-skydivers.
- G.** A person must make three parachute jumps a month in order to join the Skydiving Club.
- H.** Some people who are afraid of heights make three parachute jumps a month.
- J.** Most people who are not afraid of heights are in the Skydiving Club.
- K.** Every skydiver makes at least one parachute jump a month.

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# READING

## QUESTIONS 21-50

**DIRECTIONS:** Read each passage below and answer the questions following it. Base your answers on information contained only in the passage. You may reread a passage if you need to. Mark the best answer for each question.

If you have ever watched someone fall on the ice, you've seen slipperiness at work. But have you wondered what makes ice slippery, or why skates or skis glide across  
5 ice so easily? The answer might seem 5 obvious: ice is smooth. Yet smoothness in itself does not explain slipperiness. Imagine, for example, skating on a smooth surface of glass or sheet metal.

10 Surprisingly, scientists do not fully under- 10 stand why ice is slippery. Past explanations of slipperiness have focused on friction and pressure. According to the friction theory, a skate blade rubs across the ice, causing  
15 friction. The friction produces heat, 15 melting the ice and creating a slippery, microscopically thin layer of water for the skate to glide on. The friction theory, however, cannot explain why ice is slippery  
20 even when someone stands completely 20 motionless, creating no friction.

The pressure theory claims that pressure from a skate blade melts the ice surface, creating a slippery layer of water. The  
25 water refreezes when the pressure is lifted. 25 Science textbooks typically cite this explanation, but many scientists disagree, claiming that the pressure effect is not great enough to melt the ice. Nor can the  
30 pressure theory explain why someone wear- 30 ing flat-bottomed shoes—which have a greater surface area than skate blades and thus exert less pressure per square inch—can glide across the ice or even go  
35 sprawling. 35

During the 1990s, another theory found acceptance: the thin top layer of ice is liquid, or “liquid-like,” regardless of friction

or pressure. This notion was first proposed  
40 more than 150 years ago by physicist 40 Michael Faraday. Faraday's simple experiment illustrates this property: two ice cubes held against each other will fuse together. This happens, Faraday explained, because  
45 liquid on the cubes' surfaces froze solid 45 when the surfaces made contact.

Faraday's hypothesis was overlooked, in part because scientists did not have the means to detect molecular structures.  
50 However, technological advances during 50 recent decades allow scientists to measure the thin layer on the surface of the ice. For example, in 1996, a chemist at Lawrence Berkeley Laboratory shot electrons at an  
55 ice surface and recorded how they 55 rebounded. The data suggested that the ice surface remained “liquid-like,” even at temperatures far below freezing. Scientists speculate that water molecules on the ice  
60 surface are always in motion because there 60 is nothing above them to hold them in place. The vibration creates a slippery layer of molecules. According to this interpretation of the Lawrence Berkeley  
65 Laboratory experiments, the molecules 65 move only up and down; if they also moved side to side, they would constitute a true liquid. Thus it could be said that people are skating on wildly vibrating molecules!

70 The phenomenon of a slippery liquid-like 70 surface is not limited to ice, although ice is the most common example. Lead crystals and even diamond crystals, made of carbon, also show this property under certain tem-  
75 perature and pressure conditions. 75

21. Which of the following best tells what this passage is about?
- A. theories about how people learn to skate
  - B. how ice changes from a solid to a liquid
  - C. answers to the question of what makes ice slippery
  - D. the discoveries of Michael Faraday
  - E. the processes of freezing and melting
22. What is the most likely reason that the author mentioned lead and diamond crystals in the last paragraph?
- F. to point out that solids other than ice have slippery surfaces
  - G. to suggest that ice, lead, and diamonds are composed of the same materials
  - H. to cast doubt on Faraday's theory of slipperiness
  - J. to suggest that scientists shoot electrons at lead and diamond surfaces
  - K. to suggest new uses for slippery substances
23. According to Faraday, why do two ice cubes fuse when held together?
- A. Friction causes the ice to melt and refreeze.
  - B. The warmer ice cube melts the colder ice cube.
  - C. The liquid layers on their surfaces freeze.
  - D. The vibrations of the molecules on their surfaces increase.
  - E. Their surface areas are perfectly smooth.
24. What is the most likely reason that the author mentioned the 1996 experiment at Lawrence Berkeley Laboratory?
- F. to provide evidence about the surface of ice
  - G. to illustrate the weaknesses of scientific technology
  - H. to show how Faraday tested his theory
  - J. to suggest that the ice surface was solid, not liquid
  - K. to explain why ice cubes freeze together
25. According to researchers at the Lawrence Berkeley Laboratory, why is the surface of ice "liquid-like" rather than "liquid"?
- A. because electrons rebound from the ice surface
  - B. because the molecules vibrate only up and down
  - C. because the ice surface is wet
  - D. because the ice surface is slipperier than a liquid surface
  - E. because the ice surface is frozen solid
26. According to the passage, which of the following undermines the friction theory of slipperiness?
- F. a person wearing flat-bottomed shoes gliding across the ice
  - G. two ice cubes fused together
  - H. electrons bouncing off an ice surface
  - J. a person trying to skate on a sheet of glass or sheet metal
  - K. a person slipping while standing immobile on ice

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When you eat an orange, your perception of its flavor comes from the combination of its aroma and its taste. Taste buds, the sensory receptors on the tongue, convey information to the brain about chemicals in food while the food dissolves in saliva. The sense of smell comes into play when the olfactory nerve in the nasal passages senses even very low concentrations of food chemicals in gaseous form. The sense of smell has a larger role in tasting flavors than most people realize—that is, until they have a stuffy nose and nothing tastes good.

If taste and smell depend on our detection of food chemicals, one might expect that chemists would be able to duplicate the flavors of foods. In fact, a surprising number of popular food flavors can now be reproduced in the laboratory, and even more are on the way. Orange, perhaps the most popular flavor worldwide, has been reproduced successfully. So have some national favorites, including cashew (Latin America), paprika (Hungary), and fruit-flavored “Jamaica” (Mexico). Synthetic flavors are not limited to flavoring food; they are also added to mouthwashes, toothpaste, beverages, and other consumer products.

Only a small proportion of the chemical components occurring naturally in foods actually contribute to their flavor. To identify these critical components, scientists use a gas chromatograph to separate a food into its basic chemical constituents. Flavor experts, called flavorists, then attempt to isolate those chemicals that are essential to the distinctive flavor of a food. Mechanical techniques have been developed to capture the aromas of food as it is being prepared—such as bread while it bakes—and distill the essential chemicals from these essences. If successful, flavorists use their highly developed senses of taste and smell to attempt to produce acceptable flavorings that are chemically identical to, but purer than, flavors that are naturally present in unprocessed food.

Although American consumers claim to want “natural” flavors in their food, taste tests demonstrate that they often prefer their synthetically produced counterparts. Artificial flavors tend to be stronger and less subtle than natural flavors. For example, many Americans prefer a soft drink created with artificial flavors, such as orange soda, over an “all-natural” soda flavored with real oranges, which may taste weak in comparison. In fact, some flavorists worry that consumers will develop such a strong taste for artificial flavors that natural flavorings, usually more expensive than their artificial counterparts, will become scarce.

Researchers have not always been successful in their efforts to duplicate natural flavors. Some popular flavors, such as coffee, strawberry, and chocolate, have proven virtually impossible to reproduce. The difficulty in creating a flavor like chocolate, experts say, is its complexity—a mysterious combination of sweet and bitter that excites the taste buds in an unusual and satisfying way.

27. Which of the following best tells what this passage is about?
- A. how the sense of smell affects taste
  - B. the science of how taste buds work
  - C. the analysis and creation of flavors
  - D. why some flavors cannot be reproduced
  - E. the search for the perfect aroma
28. What is the principal goal of the scientific research described in the third paragraph?
- F. to predict consumer taste preferences
  - G. to develop artificial foods with strong flavors
  - H. to monitor the use of artificial food additives
  - J. to produce synthetic equivalents to natural food flavors
  - K. to invent entirely new flavors

- 29.** Which of the following is the most likely reason that no good synthetic strawberry flavoring exists?
- A.** People prefer the taste of oranges to strawberries.
  - B.** The taste of strawberries is more complicated than most other flavors.
  - C.** The gas chromatograph has not yet been used to analyze strawberries.
  - D.** Most people prefer artificial strawberry flavor to a natural flavor.
  - E.** Fruit flavors cannot be duplicated successfully.
- 30.** Which of the following can be concluded about collecting aromas during food preparation?
- F.** The flavors of odorless foods can now be duplicated.
  - G.** Artificial flavors do not make food taste better.
  - H.** Certain chemical components of a food's flavor are present in its odor.
  - J.** Uncooked food is more flavorful than cooked food.
  - K.** The flavor of a food is always improved by cooking it.
- 31.** What is the most likely reason that the author mentioned orange soda in the fourth paragraph?
- A.** to give an example of a well-liked flavor that has no natural counterpart
  - B.** to explain why artificial orange flavor has not yet been produced
  - C.** to describe how the aroma of oranges can be used to help reproduce its flavor
  - D.** to demonstrate that consumers sometimes prefer flavor substitutes to the natural flavors they mimic
  - E.** to give an example of a flavor you cannot taste without the sense of smell
- 32.** According to the passage, some flavorists are concerned by the fact that
- F.** artificial flavors are more expensive to produce than natural flavors.
  - G.** artificial flavors are not as healthy as natural flavors.
  - H.** many people prefer bland food to tasty food.
  - J.** every natural flavor has been duplicated.
  - K.** people may come to strongly prefer artificial flavors over natural flavors.

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Mary Cassatt defied tradition, family, and public opinion to become one of the most celebrated artists of the United States. Born in 1845, the daughter of a wealthy Pittsburgh banker, Cassatt spent several years of her childhood with her family in Europe. As she grew older, she gave up a life of ease to choose a path that at the time was almost impossible for a woman to follow. In 1861, while many of her friends were entering the social world of the upper classes, Cassatt was beginning her studies at the Pennsylvania Academy of Fine Arts. After four years, however, she felt stifled by the rigid curriculum. Against her father's wishes, she decided to return to Europe to study painting.

Cassatt spent several years, mainly in France and Italy, immersing herself in the works of great European painters of the past. Finally, in 1872, she settled in Paris permanently. There, Cassatt came to admire the work of the French Impressionists, a group of "outsiders" that included Degas, Monet, and Renoir. Unlike mainstream artists who produced the dark, polished, and detailed paintings favored by traditionalists and critics, these artistic revolutionaries applied pigment to the canvas in small dabs of pure color to achieve an illusion of light. Works painted in this manner presented not photograph-like detail but a softer focus that conveyed a highly personalized impression.

This new movement inspired Cassatt. Discarding the traditional European style, she adopted the luminous tones of the impressionists. Particularly interested in the human figure, Cassatt began creating pastels of groups of women—on outings in the park, having tea, and so forth. In 1879, Edgar Degas invited her to exhibit with the impressionists, and her paintings were included in four of their next five shows. Cassatt and Degas admired each other's work and a loyal friendship developed. It was Degas who first suggested the mother-child theme that became the hallmark of Cassatt's later work.

Throughout her years in Europe, Cassatt kept in touch with her wealthy friends in the United States, introducing them to impressionist art. Many of the excellent collections of impressionist paintings in this country are to a great extent the result of her influence. As a woman and as an American, Cassatt stood virtually alone among the impressionist painters. Since her death in 1926, the work of the "Impressionist from Pennsylvania" has been avidly sought by collectors.

33. Which of the following best tells what this passage is about?
- A. the barriers faced by women artists
  - B. the mother-child theme in Cassatt's work
  - C. why Cassatt is considered an early feminist
  - D. Cassatt's development as an artist
  - E. a brief history of impressionism
34. Why did Cassatt leave the Pennsylvania Academy of Fine Arts?
- F. Her father wanted her to study in Europe.
  - G. She felt the program there limited her creativity.
  - H. She did not want to enter Pittsburgh society.
  - J. She wanted to study with the French Impressionists.
  - K. She wished to rejoin her family.
35. What prompted Cassatt to begin using the mother-child theme in her work?
- A. It was an appropriate subject for a beginning artist.
  - B. It was a favorite theme of great European painters of past centuries.
  - C. It was suggested to her by another artist.
  - D. It was a common theme in the late nineteenth century.
  - E. It was favored by the critics.

- 36.** Which of the following best describes Cassatt as a young woman, before 1865?
- F.** interested in fashion and social standing
  - G.** an independent thinker
  - H.** friend to many French Impressionists
  - J.** a painter in the impressionist style
  - K.** a successful artist in her own right
- 37.** How was Cassatt unusual among impressionist painters?
- A.** Her painting style created the illusion of light.
  - B.** She was befriended by Degas.
  - C.** She managed to remain in the artistic mainstream of her day.
  - D.** Her paintings have gained in value and popularity.
  - E.** She was an American woman.
- 38.** In what way does the writer suggest that Cassatt influenced art collections in the United States?
- F.** She was an avid art collector in her own right.
  - G.** She preferred to paint pastels of women and children.
  - H.** She showed impressionist art to her wealthy American friends.
  - J.** She settled in Paris permanently.
  - K.** She exhibited regularly with the impressionists.

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The African country of Zimbabwe took its name from the Shona word meaning “stone enclosures” or “venerated houses.” In fact, dozens of stone ruins are today scattered throughout Zimbabwe and other areas in southeastern Africa. One of these ruins, known as “Great Zimbabwe,” was once a fabled city that inspired tales that circulated throughout Europe. Where was this remarkable city, and who had built it? For centuries the mystery occupied the minds of explorers and treasure-seekers.

The first reports to Europeans of Great Zimbabwe were spread a thousand years ago by Arab traders sailing between the Middle East and the east coast of Africa. They told of the fabulous wealth of a mysterious stone city in the African interior. In their tales, that city became associated with their understanding of Middle Eastern history—with the Queen of Sheba, King Solomon, and his legendary gold mines, long since lost to the world. By the sixteenth century, Portuguese explorers regularly visited East Africa, searching for “King Solomon’s gold,” but they never found Great Zimbabwe. In 1552, a Portuguese historian, João de Barros, recorded a story told by the Arabs about a city with a “square fortress of masonry within and without, built of stones of marvelous size, and there appears to be no mortar joining them.”

In fact, Great Zimbabwe **was** a marvel. In one area, a massive wall, over thirty feet high and twenty feet thick, created a great enclosure. Another area contained a fortress-like series of walls, corridors, and steps built into the bluff above. Throughout the city, each stone was precisely fitted to the others without the use of mortar.

In the 1870s, a German geologist, Karl Mauch, was the first European to see Great Zimbabwe, by then in ruins. Mauch realized that he had “rediscovered” the fabled city from de Barros’s story. He jumped to the conclusion that Great Zimbabwe had been built by the Queen of

Sheba. British authorities sent a British journalist, Richard Hall, to Great Zimbabwe to investigate Mauch’s report. Archaeology was still in its infancy, and Hall, convinced that the structures had been built by ancient people from the Middle East, dug up and discarded archaeological deposits that would have revealed much about the true history of Great Zimbabwe. Later European excavations destroyed even more valuable evidence.

In the twentieth century, after excavating areas that had not been disturbed, David Randall-MacIver, a Scottish Egyptologist, and Gertrude Caton-Thompson, an English archaeologist, concluded that the ruins were unmistakably African in origin. Great Zimbabwe was most likely built during the fourteenth or fifteenth century by the ancestors of the present-day Shona people. Recent carbon-14 dating supports their conclusion. Great Zimbabwe was once home to an estimated 20,000 people, the center of a great Shona kingdom. Wealthy Shona kings traded their ivory and gold in coastal towns for other goods, thus accounting for the discovery of beads and other foreign wares in the ruins.

One mystery of Great Zimbabwe had been solved. Another mystery remains: why was the settlement at Great Zimbabwe abandoned, leaving the magnificent stone architecture to fall into ruins?

39. Which of the following best tells what this passage is about?
- A. a brief history of the nation of Zimbabwe
  - B. inaccuracies in the recording of African history
  - C. a comparison of Great Zimbabwe with other African archaeological sites
  - D. the true story of the Great Zimbabwe ruins
  - E. how Karl Mauch discovered Great Zimbabwe

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40. With which of the following statements about Richard Hall's opinion regarding Great Zimbabwe would the author most likely agree?
- F. First impressions are generally accurate.
  - G. Preconceptions can cloud a person's judgment.
  - H. The history of a people can best be judged by looking at its present culture.
  - J. Advanced cultures developed first in the Middle East, then spread to the rest of the world.
  - K. Much of Middle Eastern culture was derived from the culture of the Shona people.
41. What was "one mystery of Great Zimbabwe" (line 77) that had been solved?
- A. why foreign wares were found in the ruins
  - B. why the settlement was abandoned
  - C. the source of the ivory and gold
  - D. why it was not discovered by Europeans until the 1870s
  - E. who had built it and when
42. Which of the following statements about the Shona people is best supported by the passage?
- F. They no longer exist as a distinct group.
  - G. They live along Africa's East Coast.
  - H. They are descendents of the people who built Great Zimbabwe.
  - J. They lived in the Middle East before settling in Africa.
  - K. They were once ruled by King Solomon and the Queen of Sheba.
43. Which of the following best illustrates the statement that "Archaeology was still in its infancy" (lines 51-52)?
- A. the stone buildings built without mortar
  - B. the abandonment of Great Zimbabwe
  - C. the conclusions of David Randall-MacIver and Gertrude Caton-Thompson
  - D. the discovery of beads and other foreign materials at Great Zimbabwe
  - E. the excavations conducted by Richard Hall
44. Which of the following best describes the relationship of Portuguese explorers to Great Zimbabwe?
- F. They searched for it but never found it.
  - G. They told Arab traders where to find it.
  - H. They found King Solomon's mines but didn't realize it.
  - J. They destroyed archaeological evidence about its history.
  - K. They were responsible for its abandonment.

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Anyone who has watched TV news coverage of a hurricane has seen how destructive wind energy can be. But the power of the wind can also be put to constructive use.

5 From sailboats to old-fashioned windmills 5  
to the high-tech, modern wind machines called turbines, people have devised ways to harness wind energy for thousands of years.

10 The first known attempt to use wind power 10  
was the sailboat. Ancient shipbuilders understood how to use forces like lift and momentum, even if they could not explain those forces scientifically. The principles behind sailing led to the development of the windmill. The first known windmills 15  
originated in Persia, an area that is now Iran, as early as A.D. 500. They were created to help with the demanding chores of grinding grain and pumping water. By the tenth 20  
century, windmills were used throughout central Asia; they were used in China as early as the thirteenth century.

25 In Europe, windmills came into widespread 25  
use during the twelfth century. As in other parts of the world, they were used for milling grain and pumping water. Windmills replaced the water wheel, which was turned by the movement of running water over paddles mounted around a wheel. The 30  
windmill was more adaptable and efficient than the water wheel and quickly became popular. For example, Holland, famous for its windmills, used the machines to pump seawater away from low-lying coastal 35  
bogs. This allowed the Dutch to reclaim large areas of land from the sea. Windmills eventually became sophisticated enough for use in a broad range of work, from sawmills and drainage pumping to processing goods 40  
such as dyes, tobacco, cocoa, and spices.

45 In the 1700s, as steam engines gained in 45  
popularity, the use of wind machines for many types of work declined. However, windmills still played an essential role in pumping water on farms throughout the American West and Midwest. Between 1850 and 1970, over six million small windmills were installed on American farms for water-

ing livestock and meeting other water needs. 50  
In many remote areas even today, livestock 50  
production would be impossible without the use of windmills to provide water.

55 Beginning in the late nineteenth century, 55  
windmills were adapted to generate electricity. During the 1930s and '40s, 55  
thin-bladed windmills provided electricity for hundreds of thousands of farms across the United States. By the 1950s, however, 60  
power lines connected almost every household in America to a central power source, 60  
such as a utility company. After that, there was little need for wind turbines until the energy crisis of the 1970s. At that time, 65  
interest in wind turbines was renewed due to rising energy costs and concern about 65  
the future availability of fossil fuels such as oil, coal, and natural gas. The last several decades have seen the development of "wind farms," clusters of wind turbines that 70  
generate electricity. Efficient, clean, and 70  
fairly inexpensive to operate, wind farms may prove to be as important in the future as earlier windmills were in the past.

45. Which of the following best tells what this passage is about?
- A. the destructive power of wind energy
  - B. the ways people have harnessed wind power throughout history
  - C. reasons for developing wind farms to generate electricity
  - D. how windmills are used in the United States
  - E. the use of the windmill in the present day
46. Where were the first known windmills built?
- F. Persia
  - G. North America
  - H. Europe
  - J. China
  - K. Holland

CONTINUE ON TO THE NEXT PAGE ►

47. Which of the following best expresses the author's opinion regarding the future use of wind energy?
- A. Wind farms will someday be the only source of electricity in the United States.
  - B. Wind farms will not be successful in providing large amounts of electricity.
  - C. Wind farming will eventually be replaced by new energy sources.
  - D. Wind farms will become an important source of electricity in the United States.
  - E. Wind farming will become more expensive as more consumers switch to using it.
48. The adaptation of old-fashioned water-pumping windmills into wind turbines that generate electricity illustrates
- F. that modern technology is no improvement over ancient technology.
  - G. the inability of people to generate a better idea.
  - H. how wind power has helped to reclaim land from the sea.
  - J. that water cannot be used to generate electricity.
  - K. the ability of people to think creatively.
49. Why were fewer American farms dependent on windmills for electrical power after the 1950s?
- A. Windmills were not used for any purpose after that time.
  - B. The energy crisis had prompted interest in other fuel sources.
  - C. The energy crisis had stopped the development of wind turbines.
  - D. A centralized power system had connected almost all American homes.
  - E. Wind farms had replaced the need for individual windmills.
50. According to the passage, how did windmills aid the growth of the country of Holland?
- F. Windmills helped Dutch shipbuilders use the forces of lift and momentum.
  - G. By pumping seawater out, the Dutch turned bogs into usable land.
  - H. Windmills made the country of Holland famous.
  - J. By pumping seawater, the Dutch flooded coastal bogs in order to improve ship travel.
  - K. In Holland, windmills led to the use of water wheels.

CONTINUE ON TO THE NEXT PAGE ►

# PART 2 — MATHEMATICS

Suggested Time — 75 Minutes

50 QUESTIONS

## GENERAL INSTRUCTIONS

Solve each problem. Select the **best** answer from the choices given. Mark the letter of your answer on the answer sheet. You can do your figuring in the test booklet or on paper provided by the proctor. **DO NOT MAKE ANY MARKS ON YOUR ANSWER SHEET OTHER THAN FILLING IN YOUR ANSWER CHOICES.**

### IMPORTANT NOTES:

- (1) Formulas and definitions of mathematical terms and symbols are **not** provided.
- (2) Diagrams other than graphs are **not** necessarily drawn to scale. Do not assume any relationship in a diagram unless it is specifically stated or can be figured out from the information given.
- (3) Assume that a diagram is in one plane unless the problem specifically states that it is not.
- (4) Graphs are drawn to scale. Unless stated otherwise, you can assume relationships according to appearance. For example, (on a graph) lines that appear to be parallel can be assumed to be parallel; likewise for concurrent lines, straight lines, collinear points, right angles, etc.
- (5) Reduce all fractions to lowest terms.

51.  $100(2 + 0.1)^2 - 100 =$

- A. 101
- B. 141
- C. 200
- D. 301
- E. 341

52. If  $\frac{4}{5}$  of P is 48, what is  $\frac{3}{5}$  of P?

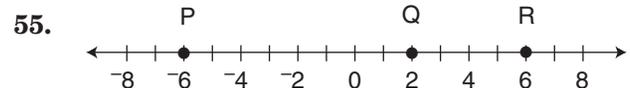
- F. 12
- G. 15
- H. 20
- J. 36
- K. 60

53. If  $\frac{a}{b} = 2$  and  $a = 8$ , what is the value of  $3b + a^2$ ?

- A. 28
- B. 70
- C. 76
- D. 88
- E. 112

54.  $3.99 \div 1.5 =$

- F. 0.266
- G. 0.267
- H. 2.0
- J. 2.66
- K. 2.67



How many units is it from the midpoint of  $\overline{PQ}$  to the midpoint of  $\overline{QR}$ ?

- A. 2
- B. 4
- C. 6
- D. 8
- E. 10

CONTINUE ON TO THE NEXT PAGE ►

56. Jack scored a mean of 15 points per game in his first 3 basketball games. In his 4th game, he scored 27 points. What was Jack's mean score for the 4 games?
- F. 15  
G. 16  
H. 17  
J. 18  
K. 21

57. If  $0.00102 = \frac{102}{N}$ , what is the value of  $N$ ?

- A. 10,000  
B. 100,000  
C. 1,000,000  
D. 100,000,000  
E. 1,000,000,000

58. Judy is  $n$  years older than Carmen and twice as old as Frances. If Frances is 15, how old is Carmen?

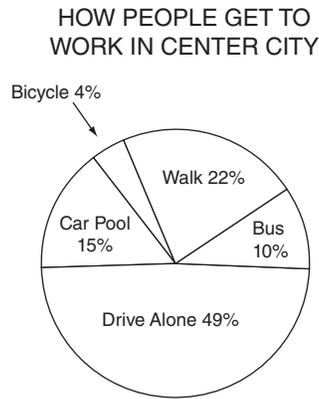
- F. 30  
G.  $15 + n$   
H.  $15 + 2n$   
J.  $15 - n$   
K.  $30 - n$

59.  $1 \text{ sind} = 5.6 \text{ ricks}$   
 $1 \text{ sind} = 12.88 \text{ dalts}$

Using the conversions above, how many dalts are equivalent to 1 rick?

- A. 0.43 dalts  
B. 2.3 dalts  
C. 7.28 dalts  
D. 18.48 dalts  
E. 72.128 dalts

60.

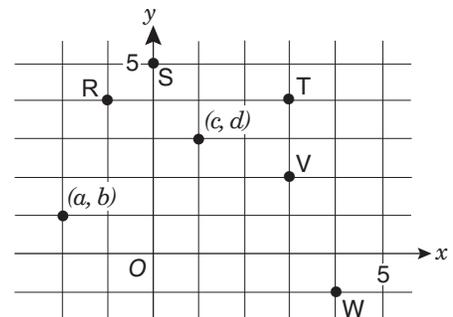


Total number of people working in Center City = 15,000

How many more people in Center City walk to work than ride their bicycles to work?

- F. 18  
G. 22  
H. 2,700  
J. 2,800  
K. 3,000

61.



The figure above is drawn to scale. Which point best shows the location of  $(c + a, d + b)$ ?

- A. R  
B. S  
C. T  
D. V  
E. W

62. On a scale drawing, a distance of 1 foot is represented by a segment 0.25 inch in length. How long must a segment on the scale drawing be to represent a 36-inch distance?

- F. 0.25 in.  
G. 0.75 in.  
H. 3 in.  
J. 9 in.  
K. 144 in.

63. What is the greatest common factor of 2,205 and 3,675?

- A. 147
- B. 245
- C. 441
- D. 735
- E. 1,225

64. The set P consists of all prime numbers greater than 6 and less than 36. What is the median of the numbers in P?

- F. 17
- G. 17.75
- H. 18
- J. 18.75
- K. 19

65. Ms. Grant's car gets between 20 and 22 miles per gallon, inclusive. The gasoline she uses costs between \$4.20 and \$4.50 per gallon, inclusive. What is the **greatest** amount Ms. Grant will spend on gasoline to drive her car 200 miles?

- A. \$37.27
- B. \$40.90
- C. \$42.00
- D. \$45.00
- E. \$99.00

66. A group of mountain climbers started the day at an elevation of 125 feet below sea level. At the end of the day, they camped at 5,348 feet above sea level. What was the climbers' elevation gain for the day?

- F. 5,223 ft
- G. 5,373 ft
- H. 5,377 ft
- J. 5,463 ft
- K. 5,473 ft

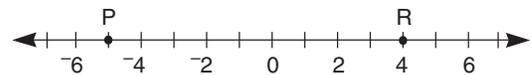
67. What is the solution to  $\frac{0.21}{0.33} = \frac{x}{1.10}$ ?

- A. 0.07
- B. 0.67
- C. 0.70
- D. 6.70
- E. 7.00

68. There are 45 eighth graders and 20 seventh graders in a school club. The president of this club wants 40% of the club's members to be seventh graders. How many **more** seventh graders must join the club in order to meet the president's wishes? (Assume that the number of eighth graders remains the same.)

- F. 6
- G. 7
- H. 8
- J. 10
- K. 27

69.



Point Q is to be placed on the number line one-third of the way from point R to point P. What number will be at the midpoint of segment  $\overline{PQ}$ ?

- A. 2
- B. 1
- C. 0
- D. -1
- E. -2

70. How many different two-digit numbers can be formed from the digits 7, 8, 9 if the numbers must be even and no digit can be repeated?

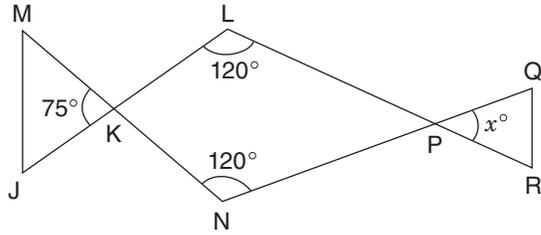
- F. 0
- G. 1
- H. 2
- J. 3
- K. 6

71. How many integers are between  $\frac{5}{2}$  and  $\frac{20}{3}$ ?

- A. 3
- B. 4
- C. 5
- D. 10
- E. 15

CONTINUE ON TO THE NEXT PAGE ►

72.



In the figure above,  $\overline{JKL}$ ,  $\overline{MKN}$ ,  $\overline{NPQ}$ , and  $\overline{LPR}$  are straight line segments. What is the value of  $x$ ?

- F. 25
- G. 45
- H. 50
- J. 60
- K. 75

73. A roofing contractor uses shingles at a rate of 3 bundles for each 96 square feet of roof covered. At this rate, how many bundles will he need to cover a roof that is 416 square feet?

- A. 5
- B. 12
- C. 13
- D. 14
- E. 15

74.

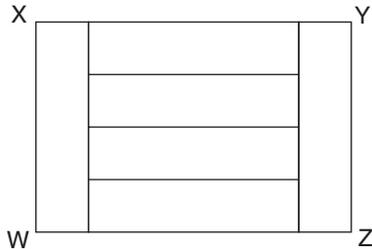


Figure WXYZ above is composed of 6 congruent rectangular panels. The area of figure WXYZ is 54 square centimeters. What is the perimeter of figure WXYZ in centimeters?

- F. 24 cm
- G. 30 cm
- H. 36 cm
- J. 45 cm
- K. 50 cm

75. Three gallons of gasoline are needed to drive 65 miles. At this rate, how many gallons are needed to drive  $m$  miles?

- A.  $\frac{3}{65}$  gal.
- B.  $\frac{3m}{65}$  gal.
- C.  $3m$  gal.
- D.  $\frac{65}{3}$  gal.
- E.  $\frac{65m}{3}$  gal.

76.

- 8:54 a.m.
- 9:12 a.m.
- 9:24 a.m.
- 10:24 a.m.
- 11:18 a.m.

Light A flashes every 12 minutes, and light B flashes every 18 minutes. The two lights flash at the same time at 8:00 a.m. At how many of the times listed above will they again both flash at the same time?

- F. 1
- G. 2
- H. 3
- J. 4
- K. 5

CONTINUE ON TO THE NEXT PAGE ►

77.

Regular Price . . . . .	\$2.49
Discount . . . . .	− \$0.60
Sale Price . . . . .	\$1.89
6% Tax . . . . .	\$0.15
Total . . . . .	\$2.04

Nikolai bought a packet of pens. His receipt is shown above. Assume that sales tax is rounded to the nearest cent. If the 6% sales tax had been computed on the sale price instead of on the regular price, how much lower would the tax have been?

- A. \$0.01
- B. \$0.02
- C. \$0.03
- D. \$0.04
- E. \$0.36

78.

PEOPLE PER VEHICLE AT CHECKPOINT

Number of People in the Vehicle	Percent of Vehicles
1	40%
2	35%
3	15%
4	7%
5 or more	3%

A researcher recorded the number of people in each vehicle that passed through a checkpoint. The table above shows the percent distribution for the 420 vehicles that passed the checkpoint yesterday morning. How many of the 420 vehicles contained **at least** 3 people?

- F. 42
- G. 63
- H. 105
- J. 315
- K. 378

79.

Jack and Roberto were assigned to guard a tower. Each was to watch for 5 hours, then rest 5 hours while the other watched. If Roberto began his first watch at 6:00 p.m., at what time will he begin his third watch?

- A. 11:00 p.m.
- B. 4:00 a.m.
- C. 9:00 a.m.
- D. 7:00 p.m.
- E. 2:00 p.m.

80.

If Crystal multiplies her age by 3 and then adds 2, she will get a number equal to her mother's age. If  $m$  is her mother's age, what is Crystal's age in terms of  $m$ ?

- F.  $-\frac{2}{3}m$
- G.  $\frac{m-2}{3}$
- H.  $3m+2$
- J.  $\frac{m}{3}-2$
- K.  $\frac{3}{m}-2$

81.



Points P and Q are points on the number line above, which is divided into equal sections. What is the value of PQ?

- A. -5
- B. 7
- C. 30
- D. 35
- E. 50

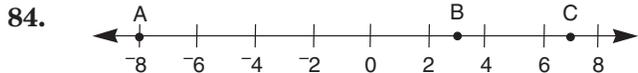
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82. RELATIONSHIP BETWEEN ROW A AND ROW B

Row A	1	2	3	4	5	6	7	8	9	10	11
Row B	1	1	2	2	3	3	4	4	5	5	6

The table above shows two rows of integers, Row A and Row B, and the relationship between them. Assume each row continues in the pattern shown. When the number 111 appears in Row A, what is the corresponding number that will appear in Row B?

- F. 55  
G. 56  
H. 57  
J. 59  
K. 66
83. A certain insect has a mass of 75 milligrams. What is the insect's mass in grams?
- A. 0.075 g  
B. 0.75 g  
C. 7.5 g  
D. 75 g  
E. 7,500 g



On the number line above, A is located at  $-8$ , B is located at  $3$ , and C is located at  $7$ . D (not shown) is the midpoint of  $\overline{AB}$ , and E (not shown) is the midpoint of  $\overline{BC}$ . What is the midpoint of  $\overline{DE}$ ?

- F.  $-1.5$   
G.  $1.25$   
H.  $1.75$   
J.  $2.25$   
K.  $7.5$
85. A video game originally priced at \$44.50 was on sale for 10% off. Julian received a 20% employee discount applied to the sale price. How much did Julian pay for the video game? (Assume that there is no tax.)
- A. \$31.15  
B. \$32.04  
C. \$35.60  
D. \$40.05  
E. \$43.61

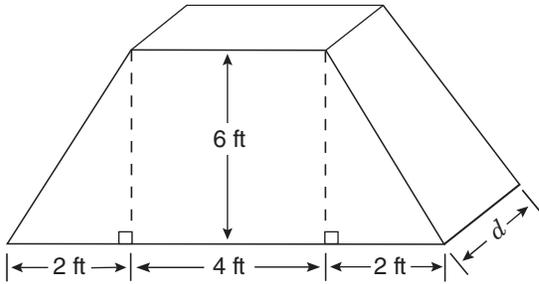
86. A box contains 11 marbles—7 red and 4 green. Five of these marbles are removed at random. If the probability of drawing a green marble is now 0.5, how many red marbles were removed from the box?
- F. 1  
G. 2  
H. 3  
J. 4  
K. 5

87. Ryan must read 150 pages for school tomorrow. It took him 30 minutes to read the first 20 of the assigned pages. At this rate, how much **additional** time will it take him to finish the reading?
- A.  $1\frac{2}{3}$  hr  
B.  $2\frac{1}{6}$  hr  
C.  $3\frac{1}{4}$  hr  
D.  $3\frac{3}{4}$  hr  
E.  $7\frac{1}{2}$  hr

88. In how many different ways can you make exactly \$0.75 using only nickels, dimes, and quarters, if you must have at least one of each coin?
- F. 2  
G. 4  
H. 6  
J. 7  
K. 12

89. A cylindrical oil drum can hold 4,320 liters when it is completely full. Currently, the drum is  $\frac{1}{3}$  full of oil. How many **kiloliters** (kL) of oil need to be added to fill the drum completely?
- A. 1.44 kL  
B. 2.88 kL  
C. 4.32 kL  
D. 14.40 kL  
E. 28.80 kL

90.



The end of a tent has a trapezoidal cross-section as shown above. What is the depth ( $d$ ) of the tent if its volume is 216 cubic feet?

- F.  $4\frac{1}{2}$  ft
- G. 6 ft
- H.  $6\frac{1}{2}$  ft
- J. 7 ft
- K. 8 ft

91. Ang has  $x$  dollars in his savings account, and Julia has  $y$  dollars in her savings account. Ang gives Julia  $\frac{1}{3}$  of the money in his savings account, which Julia deposits into her savings account. Julia then spends  $\frac{1}{4}$  of the total in her savings account. Express the amount of money Julia spent in terms of  $x$  and  $y$ .

- A.  $\frac{y}{4} + \frac{x}{12}$
- B.  $\frac{y}{4} + \frac{x}{3}$
- C.  $\frac{y}{4} + \frac{x}{7}$
- D.  $\frac{3y}{4} + \frac{x}{4}$
- E.  $\frac{3y}{4} + \frac{x}{3}$

92. Set R contains all integers from 10 to 125, inclusive, and Set T contains all integers from 82 to 174, inclusive. How many integers are included in R, but **not** in T?

- F. 23
- G. 48
- H. 49
- J. 71
- K. 72

93. If  $x$  can be any integer, what is the greatest possible value of the expression  $1 - x^2$ ?

- A.  $-1$
- B. 0
- C. 1
- D. 2
- E. Infinity

94. A recent survey asked students what pets they have. Based on the results, the following statements are all true:

- 23 students have dogs.
- 20 students have cats.
- 3 students have both dogs and cats.
- 5 students have no cats or dogs.

How many students were surveyed?

- F. 40
- G. 42
- H. 45
- J. 46
- K. 51

CONTINUE ON TO THE NEXT PAGE ►

95.

PRICES FOR AD SPACE

Space	Price
$\frac{1}{4}$ page	\$200
$\frac{1}{2}$ page	\$350
full page	\$600

The table above shows prices for newspaper advertising. A store purchased quarter pages, half pages, and full pages of space in equal numbers for a total of \$11,500. What is the total amount of page space the store purchased?

- A.  $1\frac{3}{4}$  pages
- B. 10 pages
- C.  $16\frac{1}{2}$  pages
- D.  $17\frac{1}{4}$  pages
- E.  $17\frac{1}{2}$  pages

96. A 90-gram mixture contains three items, X, Y, and Z. The ratio of the weights of X and Y is 4:9, and the ratio of the weights of Y and Z is 9:5. If all of item Z were removed, what would be the new weight of the mixture?

- F. 60 g
- G. 65 g
- H. 70 g
- J. 72 g
- K. 75 g

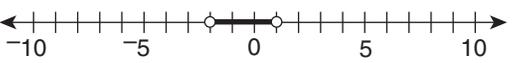
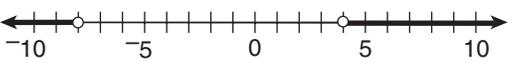
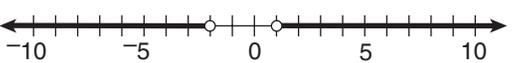
97.  $(2p + 8) - (5 + 3p) =$

- A.  $3 - p$
- B.  $p + 3$
- C.  $5p - 3$
- D.  $5p + 3$
- E.  $5p + 13$

98. A car travels at 4,400 feet per minute. If the radius of each tire on the car is one foot, how many revolutions does one of these tires make in a single minute? (Use the approximation  $\frac{22}{7}$  for  $\pi$ .)

- F. 700
- G. 1,925
- H. 13,828
- J. 15,400
- K. 27,657

99. Which number line below shows the solution to the inequality  $-4 < \frac{x}{2} < 2$ ?

- A. 
- B. 
- C. 
- D. 
- E. 

100. Nam worked on a job for 10 days. On each of the last 2 days, he worked 2 hours more than the mean number of hours he worked per day during the first 8 days. If he worked 69 hours in all, how many hours did he work during the last 2 days together?

- F. 8.5
- G. 10.5
- H. 13.0
- J. 15.0
- K. 17.0

THIS IS THE END OF THE TEST. IF TIME REMAINS, YOU MAY CHECK YOUR ANSWERS TO PART 2 AND PART 1. BE SURE THAT THERE ARE NO STRAY MARKS, PARTIALLY FILLED ANSWER CIRCLES, OR INCOMPLETE ERASURES ON YOUR ANSWER SHEET. ■

**SCRAMBLED PARAGRAPHS****Paragraph 1 (TUSRQ)**

The daily meals mentioned in the opening sentence are further described in T—a main course (a thick stew) and a starch. U continues the distinction between the main dish and the starch. The main dish is served on individual plates, while diners take the starch from a shared plate. S explains what the diners do with the starch—they scoop up a portion of the main dish. R says that the starch serves another purpose—to cool the spicy taste of the main dish. (Q).

**Paragraph 2 (UTRSQ)**

The two definitions of “bluegrass” given in the opening sentence are connected by U, which introduces bluegrass music and its founder, Bill Monroe. The description of Monroe’s traditional bluegrass sound, including its instruments, is in T. R mentions two instruments **not** in a bluegrass band. A bluegrass band that does not perform traditional music on traditional instruments is mentioned in S—“newgrass” music, a combination of the words “new” and “bluegrass.” “Newgrass” is **not** heard at traditional bluegrass festivals (Q).

**Paragraph 3 (TRUQS)**

Either R or T could follow the given sentence. Try both possibilities and compare the results. When R follows the opening sentence, it continues the discussion of volcanoes, including Kilauea. U follows R with its reference to “that volcano,” referring to Kilauea, and describes its activity. U also names Hawaii Volcanoes National Park. “In the same park” (in Q) logically follows that reference. Q also mentions a second volcano, Mauna Loa. S must follow Q because it refers to two volcanoes (“Both of these . . .”). The remaining sentence, T, ends the paragraph on an awkward note. The definition of the paragraph’s topic (volcanoes) appears after, not before, further discussion of the topic. RUQST is neither well-organized nor cohesive.

For comparison, place T after the given sentence. Now, the given sentence is followed with another reference to Vulcan, and the definition of a volcano appears early in the paragraph. The logic and flow of thought that formed RUQS remain the same. TRUQS creates a well-organized, cohesive paragraph, and it is the correct answer.

**Paragraph 4 (SURQT)**

The given sentence introduces macaws as large, beautiful birds. S is next, referring to an additional attribute of macaws, their intelligence, and claiming that some macaw behaviors are not well understood. U gives an

example of such behavior, eating clay in river mud. Why do they eat mud? Not to satisfy their hunger, according to R. Q follows with a theory to explain the behavior: macaws ingest the clay to counteract toxins found in the fruit seeds they have eaten. T provides further evidence to support the theory.

**Paragraph 5 (UTRQS)**

The given sentence introduces the topic, how an abandoned settlement called Nan Madol was built. U follows because it refers to the “structures” of Nan Madol and comments on the size of its stone columns. U also mentions that the local people told anthropologists about the construction of Nan Madol. The rest of the paragraph describes how the columns were quarried and transported to the building site. The “local people” in U connects to “the islanders” in T, which explains how the stone columns were formed. Next, R describes how the columns were split from the surrounding rock. Q explains how the columns were transported to the site, and S describes the placement of the columns in their present positions.

**LOGICAL REASONING**

**11. (C)** Draw a diagram with four spaces beside Quil, using the initials D, N, S, and T to represent the names of the planets. Needer is closest to Quil (Statement 1), so write “N” in the first space. The orbit of planet Sly is farthest from the orbit of Needer (Statement 3), so write “S” in the last space.

Quil                        N                    S  

We can stop here. The question asks for the planet that travels fastest, which is also the planet farthest from Quil. That planet is Sly (Option C).

**12. (J)** The problem says that either of two circumstances, snow or darkness, will prevent me from riding my bike. We do not know whether these are the only two circumstances, because the information given does not say so. Therefore, you can rule out Options F and G. Option H is not mentioned, and K incorrectly combines two pieces of information. J is correct. If I ride my bike, then it is not snowing; otherwise I cannot ride my bike. Nor is it dark; if it was, I cannot ride my bike.

**13. (B)** Draw a grid to illustrate who won each prize. An X indicates that a person did **not** receive a prize. According to Statement 2, Michael did not win the computer.

	Trip	Television	Computer
Luis			
Michael			X
Nadia			

**W**  
The question asks which option makes it possible to determine who won each prize, that is, to fill in the rest of the grid. For each option, mark the information on the grid. Are you able to determine who won each prize? If not, erase the marks and evaluate the next option. For example, mark the information for Option A, and fill in X's wherever you can.

	Trip	Television	Computer
Luis	X		
Michael	Yes	X	X
Nadia	X		

We can't figure out who won the television set and the computer, so option A cannot be correct. Only Option B allows us to determine who won each prize.

	Trip	Television	Computer
Luis	X	Yes	X
Michael	Yes	X	X
Nadia	X	X	Yes

**14. (K)** The first student cannot be Raymond, Elise, or Tiffany, because each of these students used the phone **after** someone else. The first caller must be either Ahmed or Steve, but there is not enough information to determine which one.

**15. (A)** Write "BEFORE" on the left side of your scrap paper and "AFTER" on the right side. Using the initial for each horse's name, list what each statement says about the order of the horses entering the stable. These positions are relative to each other. (The problem does not give any definite information about a horse's exact position.)

BEFORE	1.) SR	AFTER
	2.) AER	
	3.) ETS	

Now combine the information into one list: AETSR. Thus, the fourth horse was Silver (Option A).

**16. (H)** This question contains two conditional sentences. You can put them together like this: When Soon Bae listens to music, she is also dancing and singing.



The arrows indicate the direction of the condition. Notice that the arrows point in only one direction, ruling out Option F. Music might not be the only thing that causes Soon Bae to dance and sing. Other factors, beside music, might lead to dancing and singing. Thus Options G, J, and K are not valid. The only valid conclusion is Option H.

**17. and 18.** Read the directions carefully. The letters in a sentence may or may not appear in the same order as the words in that sentence. For example, in the first sentence, the first letter (L) may or may not represent the first word (sherbet). Remember that you need not find out what every letter represents in the code.

**17. (D)** The word "and" appears in the first, second, and third sentences of the code, but not in the fourth sentence. The letter that represents "and" must also appear in the first three sentences, but not in the fourth. The letter T (Option A) appears in all four sentences, so it cannot be correct. The letters L and M (Options B and C) each appear in only two sentences, so they are also incorrect. The letter Q appears in the first three sentences but not the fourth. No other letters meet this requirement, so Option D is correct.

**18. (H)** The letter V appears only in the second and fourth sentences. Find the word that also appears only in those sentences. Options F and G are incorrect because "chili" and "spicy" appear in the second sentence, but not the fourth. Option J, "sweet," appears in the first and fourth sentences, but not in the second sentence, so it can be ruled out. "Hot" is the only word that appears in both the second and fourth sentences, and it is the correct answer.

**19. (A)** This question requires you to match each troll with a colorful characteristic, and put the trolls in order. Start by matching the trolls and their characteristics. Draw a grid like the one below. According to Statement 1, Snowflake has white hair. According to Statement 3, Gretchen has purple ears. Statement 2 states that Banto did not have green eyes, so Holly must have green eyes. This leaves Banto with red teeth. Now every troll's characteristic is known.

Troll	Green Eyes	Purple Ears	Red Teeth	White Hair
Banto	no		yes	
Gretchen		yes		
Snowflake				yes
Holly	yes			

Now, put the trolls in order. From Statements 1 and 2, we conclude that Banto was in front of Snowflake and behind Gretchen. The question says that Holly (“green eyes”) was behind Gretchen. Thus, every troll is behind Gretchen, and Gretchen is first (Option A).

**20. (H)** Read each option to determine whether it **must** be true. Option F is ruled out because the question does not mention non-sky-divers. The question does not state the requirements for joining the Skydiving Club (Option G), only for maintaining membership. Option H is correct; some people who are afraid of heights belong to the Skydiving Club, and these people make three jumps a month. There is no support for Option J, and Option K applies to skydivers in general, not to members of the Skydiving Club.

## READING

### Ice

**21. (C)** The passage begins by asking why ice is slippery (lines 3-5) and reviews several theories of slipperiness: smoothness, friction, pressure, and Faraday’s theory. Option C, “answers to the question of what makes ice slippery,” summarizes the theme of the passage. Option A is not mentioned, and Options B, D, and E are details, not the main idea.

**22. (F)** Read the entire last paragraph. The writer says, “a slippery liquid-like surface is not limited to ice,” then mentions lead and diamond crystals. The most likely reason that the author mentions these crystals is to illustrate that solids other than ice have slippery surfaces, which is Option F. Option G cannot be correct because these crystals are not made of frozen water. The properties of lead and diamond crystals are not related to Faraday’s theory, ruling out Option H. Options J and K are not mentioned in the passage.

**23. (C)** Faraday’s experiment is described in the fourth paragraph. The liquid on the ice cubes’ surfaces froze solid when the surfaces made contact (lines 45-46). This information is restated in the correct answer, Option C.

Option A is incorrect because Faraday’s explanation does not include the concept of friction. Options B and D are not supported by the passage. The “smoothness” explanation of slipperiness (Option E) was ruled out in the first paragraph.

**24. (F)** The experiment at Lawrence Berkeley Laboratory is mentioned in lines 52-58. The data from this experiment suggested that the ice surface remained “liquid-like,” creating a slippery layer of molecules on the ice surface. This conclusion is best summarized by Option F. Option G is wrong because the experiment illustrated the power, not the weaknesses, of scientific technology. Option H is impossible: the experiment was conducted long after Faraday’s lifetime. Option J contradicts the scientists’ conclusion, and Option K refers to Faraday’s experiment, not the Lawrence Berkeley Lab experiment.

**25. (B)** The distinction between the two terms is made in lines 65-68. The surface of ice is liquid-like because the surface molecules move only up and down, which is Option B. Option A describes the result of the experiment, not the ice surface itself. Option C can be ruled out because “wet” and “liquid” are synonyms. Option D cannot be evaluated—we do not know from the passage which is slipperier. Option E contradicts the passage, which says that the molecules on the ice surface are in motion.

**26. (K)** The friction theory of slipperiness is explained in the second paragraph, which concluded that the theory cannot explain why ice is slippery for someone who stands motionless, creating no friction. Something that a theory cannot explain can be said to weaken, or undermine, the theory. Option K, “a person slipping while standing immobile on ice,” is the best answer. Option F undermines the pressure theory, not the friction theory, while Option J undermines the “smoothness” explanation. Options G and H neither support nor undermine the friction theory.

### Flavors

**27. (C)** The answer to this question must be broad enough to encompass the main points, but not overly broad. Options A and B are too broad—the passage mentions some scientific aspects of taste and smell, but it concentrates on the development of synthetic flavors. Option C successfully incorporates the main topics—the science of taste and smell, the duplication of many flavors, and the implications of synthetic flavors. Option D is mentioned only in the last paragraph. Option E is not mentioned at all.

**28. (J)** The third paragraph describes a technique for separating a food into its basic chemical constituents. Option J best summarizes the goal of this research. Options F, H, and K are not mentioned. Option G is incorrect because the researchers are developing artificial flavors, not artificial foods.

**29. (B)** Lines 65-67 state that some flavors, including strawberry, are nearly impossible to duplicate. The passage says that chocolate flavor cannot be duplicated because of its complexity. It is reasonable to infer that strawberry, like chocolate, is also more complex than other natural flavors. Option B restates this inference. Options A and D may be true, but they do not answer the question. Option C is unlikely, given that the use of a gas chromatograph to duplicate flavors seems to be a standard procedure. Option E is contradicted by lines 20-22.

**30. (H)** The collection of aromas during food preparation is described in the third paragraph. For this kind of question, be sure to read every option to identify the one best supported by the passage. Option F is ruled out; odorless foods by definition do not have aromas. Options G and J might or might not be true, but the information in the passage does not support them one way or the other. Option K cannot be concluded from the process as it is described. Option H is best. The odor of food as it is being prepared can be captured to synthesize the food's flavor.

**31. (D)** Orange soda is mentioned in lines 54-58, following a statement that some American consumers prefer synthetic flavors to natural flavors. Orange soda is mentioned as an example of this assertion, which is Option D. Orange is a natural flavor, ruling out Option A, and it has been successfully reproduced (lines 20-22), ruling out Option B. Orange soda is mentioned to compare natural and artificial flavors, not to describe how orange flavor is reproduced, eliminating Option C. Option E does not answer the question.

**32. (K)** Some flavorists are concerned (“worry”) that natural flavorings will become scarce because many consumers prefer synthetic flavors (lines 58-62). Option K expresses this concern. Artificial flavors are less expensive to produce than natural flavors (lines 60-62), contradicting Option F. Options G and H are not mentioned. Option J is contradicted by lines 63-64.

### Cassatt

**33. (D)** The correct answer must encompass the main points without being overly broad. Options A and B are details, not the main theme. Option E is too broad. The passage focuses on only one impressionist painter, Mary Cassatt. Option C looks attractive, and while Cassatt is depicted as an independent and confident woman, which might be considered traits of a feminist, that term is not used in the passage and requires an inference that is not supported by the passage. Option D is best. The phrase “development as an artist” includes Cassatt’s background, education, artistic style, subject matter, and influence on the art world.

**34. (G)** The answer to this question is found directly in the reading passage (lines 14-15). “Stifled” in this sense means repressed or held back. Option G restates this idea. Option F is not true, and Option H does not explain why she left her studies. Cassatt had not yet decided to study with French Impressionists (Option J), so that cannot be the reason. Option K is not mentioned.

**35. (C)** The mother-child theme in Cassatt’s work is discussed in lines 45-48. It was first suggested by Edgar Degas, a fellow artist, which is Option C. The other options are not mentioned in the passage.

**36. (G)** The question asks for a description of Cassatt before 1865. In 1865, she left the Pennsylvania Academy of Fine Arts to study in Europe. Option F cannot be correct; she was never interested in fashion and social standing. Options H, J, and K are descriptive of dates much later than 1865. Option G, “an independent thinker,” best describes the young woman who left the social world of the upper classes and returned to Europe against her father’s wishes.

**37. (E)** This question requires you to read all of the options and choose the best one. Option A was true of all impressionists, not just Cassatt. The passage provides no evidence that her friendship with Degas made her unusual (Option B). Option C is not true; by joining the impressionists (called “outsiders” in line 24), she left, not remained in, the artistic mainstream of her day. Option D is true of many artists, so it is not what made Cassatt unusual. Option E is best. Lines 55-57 state, “As a woman and as an American, Cassatt stood virtually alone among the impressionist painters.” In other words, she was unusual as a female American impressionist painter.

**38. (H)** Art collections in the United States are mentioned in the last paragraph. Cassatt introduced impressionist art from Europe to her wealthy American friends, thus influencing many of them to buy it. Option H best summarizes this idea. None of the other options explain how Cassatt influenced art collections in the United States.

### Great Zimbabwe

**39. (D)** You are asked to identify the general topic of the passage. Options B and E refer to only parts of the passage. Option C is not mentioned at all. Option A is too broad; most of the passage is about Great Zimbabwe, not the nation of Zimbabwe. Option D, “the true story of the Great Zimbabwe ruins,” is best.

**40. (G)** The basis for the correct answer is found in several places in the passage. First, find the section that mentions Richard Hall’s opinion. Lines 52-54 state that Hall was “convinced that the structures had been built by ancient people from the Middle East.” Later, Hall’s opinion was discredited by archaeologists who demonstrated that Great Zimbabwe was African in origin (lines 64-65). In other words, Hall’s opinion was inaccurate. All five options must be evaluated to find the option with which the passage’s author would most likely agree. Option F is not correct: Hall’s first impression was inaccurate. The author would not agree with Option H: the present culture of the Shona people is not illustrative of their past. The author does not take any stand on whether advanced cultures developed first in the Middle East, ruling out Option J, nor does the author claim that Middle Eastern culture was derived from Shona culture (Option K). The best answer is Option G. A preconception is an opinion formed in advance of actual knowledge, which perfectly describes Hall’s belief. Hall’s preconception had clouded his judgment.

**41. (E)** Read the entire last paragraph, which implies that discussion of “one mystery of Great Zimbabwe” has just been concluded, and the author is making a transition to another mystery. The previous paragraph showed that Great Zimbabwe was built by ancestors of the Shona people, not by people from the Middle East. Thus, the mystery that had been solved was who had built Great Zimbabwe and when (Option E). Option A is incorrect because the mystery comprised much more than the foreign wares discovered in the ruins. Option B, “why the settlement was abandoned,” has not been solved. The source of gold and ivory (Option C) and the reason that Europeans did not discover Great Zimbabwe until the 1870s (Option D) are not presented as mysteries.

**42. (H)** The Shona people are discussed in the fifth paragraph. Since the question is open-ended, we must evaluate each option to find the best answer. The Shona people still exist as a distinct group (line 68), ruling out Option F. Shona kings traded their goods in coastal towns (lines 72-74), implying that they lived in the African interior, not the coast, eliminating Option G. Lines 65-68 state that Great Zimbabwe was most likely built by ancestors of the present-day Shona people, which supports Option H. Options J and K confuse the histories of the Shona people and ancient Middle Eastern people. Option H is the best answer.

**43. (E)** This statement implies that the field of archaeology was new and immature in the 1870s. The statement is followed by descriptions of how early explorers, including Richard Hall, discarded valuable archaeological material. Thus, the “infancy” of archaeology is illustrated by Option E, “the excavations conducted by Richard Hall.” Options A and B are events in Shona history, not the history of archaeology, and Options C and D are references to more advanced stages of archaeology, not to its infancy.

**44. (F)** Each option should be evaluated in turn. Option F is correct; the Portuguese searched for Great Zimbabwe but never found it (lines 26-27). It is a good idea to read the remaining options to be sure that none of them is better than Option F. Options G, H, and K are incorrect because the Portuguese never found Great Zimbabwe or King Solomon’s mines. The destruction of archaeological evidence was committed by subsequent explorers, not the Portuguese, which rules out Option J. Option F is the best answer.

### Wind Energy

**45. (B)** Option A is mentioned only in the first paragraph, and it is not the main theme. Option B best summarizes the passage: it describes how wind energy has been used, from ancient sailboats to medieval windmills to modern turbines. Option C is a detail. Options D and E are important points, but neither is the main theme.

**46. (F)** The first known windmills originated in Persia (lines 15-17), which is Option F.

**47. (D)** The future use of wind energy is discussed in the last paragraph. Options A, C, and E are never mentioned. Option D best conveys the author’s optimism that wind farms—“efficient, clean, and fairly inexpensive to operate” (lines 70-71)—will be a major source of electricity in the future. Option B is contradicted by the passage.

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**48. (K)** You are asked which option best illustrates the development of wind energy. In the passage, the author followed the history of wind energy from old-fashioned water-pumping windmills (lines 17-19) to thin-bladed windmills (lines 55-58) to the development of wind farms (lines 67-70). Options F, G, and J are contradicted by the passage. Option H is only one example in the history of wind energy. Option K implies that the development from simpler into more complex machines illustrates human creativity, and it is the best answer.

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**49. (D)** The need for windmills on farms before the 1950s is discussed in lines 53-58. The next two sentences explain that the need decreased in the 1950s because most homes were connected to an electric utility and no longer depended on windmills for electrical power (Option D). Options A and C are contradicted by the passage. Option B incorrectly combines information in the passage, and Option E overlooks the fact that wind turbines are windmills, and thus did not replace windmills.

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**50. (G)** The country of Holland (lines 32-36) used windmills to pump seawater away from bogs and reclaim large areas of land (Option G). Dutch shipbuilding is not mentioned, ruling out Option F. Although Holland was famous for its windmills, their fame did not aid the country’s developments, eliminating Option H. Options J and K are contradicted by the passage.

$$\begin{aligned}
 51. \text{ (E)} \quad & 100(2 + 0.1)^2 - 100 \\
 & = 100(2.1)^2 - 100 \\
 & = 100(4.41) - 100 \\
 & = 441 - 100 \\
 & = 341
 \end{aligned}$$


---

$$\begin{aligned}
 52. \text{ (J)} \quad & \frac{4}{5}P = 48 \\
 & \frac{1}{5}P = \frac{48}{4} = 12 \\
 & \frac{3}{5}P = 12 \cdot 3 = 36
 \end{aligned}$$


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53. (C) First, use the given information to calculate the value of  $b$ :

$$\frac{a}{b} = 2 \quad \frac{8}{b} = 2 \quad 8 = 2b \quad 4 = b$$

Now, calculate  $3b + a^2$  by substituting  $a = 8$  and  $b = 4$ :

$$3(4) + (8)^2 = 12 + 64 = 76$$


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54. (J) Multiply the numerator and denominator by 100 to eliminate the decimals:

$$\begin{aligned}
 3.99 \div 1.5 & = \\
 \left(\frac{3.99}{1.5}\right)\left(\frac{100}{100}\right) & = \frac{399}{150} = \frac{133}{50} = \frac{266}{100} = 2.66
 \end{aligned}$$

Note: You could also solve this equation using long-division.

---

55. (C) To calculate the midpoint of a segment, add the values of the two endpoints and divide by 2:

$$\text{Midpoint of } \overline{PQ} = \frac{2 + (-6)}{2} = -2$$

$$\text{Midpoint of } \overline{QR} = \frac{6 + 2}{2} = 4$$

To find how many units from one midpoint to the other, subtract the midpoint values:

$$4 - (-2) = 6$$


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56. (J) Since Jack scored a mean of 15 points per game in each of the first 3 games, he must have earned a total of 45 points for the first three games by definition. Use that information to calculate the mean over the four games:

$$\frac{45 + 27}{4} = \frac{72}{4} = 18$$

$$\begin{aligned}
 57. \text{ (B)} \quad & 0.00102 = \frac{102}{N} \\
 & \frac{100,000}{100,000} \cdot (0.00102) = \frac{102}{N} \\
 & \frac{102}{100,000} = \frac{102}{N} \\
 & N = 100,000
 \end{aligned}$$


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58. (F) Since Frances' age (F) is given, use that information to find Judy's age (J):

$$J = 2F = 2 \cdot 15 = 30$$

So, Judy is 30 years old. Now, use that information to calculate Carmen's age (C):

$$\begin{aligned}
 C + n & = J \\
 C + n & = 30 \\
 C & = 30 - n
 \end{aligned}$$


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59. (B) Since 5.6 ricks and 12.88 dalts are both equal to 1 sind, then 5.6 ricks = 12.88 dalts. To calculate the number of dalts ( $d$ ) in 1 rick, set up a proportion:

$$\frac{5.6}{12.88} = \frac{1}{d}$$

$$5.6d = 12.88$$

$$d = 2.3$$


---

60. (H) According to the chart, 22% of people walk to work and 4% ride a bicycle. Subtract to find the percentage of how many more people walk than bicycle:

$$22\% - 4\% = 18\%$$

To find the exact number of people, multiply 18% (0.18) by the number of people working in Center City (15,000):

$$15,000 \cdot 0.18 = 2,700$$


---

61. (A) Since the figure is drawn to scale, use the values from the grid to solve:

$$(c, d) = (1, 3) \text{ and } (a, b) = (-2, 1)$$

$$\text{Then, } c + a = 1 + (-2) = -1, \text{ and}$$

$$d + b = 3 + 1 = 4.$$

The point  $(-1, 4)$  is point R on the graph.

- 62. (G)** The scale is 1 foot = 0.25 inch. Since the rest of the question is in inches, change the scale conversion into inches: 1 foot is equal to 12 inches, so 12 inches = 0.25 inch.

Next, set up a proportion, where  $x$  represents the scale inches for a distance of 36 inches:

$$\frac{12}{0.25} = \frac{36}{x}$$

$$12x = 36(0.25)$$

$$12x = 9$$

$$x = \frac{9}{12} = \frac{3}{4} = 0.75 \text{ in.}$$

- 63. (D)** First, find the prime factorization of each number:

$$2,205 = 3 \cdot 3 \cdot 5 \cdot 7 \cdot 7$$

$$3,675 = 3 \cdot 5 \cdot 5 \cdot 7 \cdot 7$$

Now, determine what each prime factorization has in common, and multiply those:

$$2,205 = 3 \cdot (3 \cdot 5 \cdot 7 \cdot 7) = 3 \cdot 735$$

$$3,675 = 5 \cdot (3 \cdot 5 \cdot 7 \cdot 7) = 5 \cdot 735$$

The greatest common factor is 735.

- 64. (H)** List in order the prime numbers between 6 and 36: 7, 11, 13, 17, 19, 23, 29, and 31. Since there are 8 numbers, find the middle two and calculate the mean to find the median of all the numbers. The middle two are 17 and 19.

$$\text{The mean is } \frac{17 + 19}{2} = 18.$$

- 65. (D)** The car gets between 20 and 22 miles per gallon. Ms. Grant would use the most gas if the car gets only 20 miles per gallon, so use this value. Then, use \$4.50 (the highest possible price per gallon) to determine the greatest amount of money she will spend:

$$200 \text{ miles} \div 20 \text{ miles per gallon} = 10 \text{ gallons of gas}$$

$$10 \text{ gallons} \cdot \$4.50 = \$45.00$$

- 66. (K)** The climbers started at 125 feet below sea level, which can be expressed as  $-125$ . They stopped at 5,348 feet above sea level, which is expressed as a positive number. The elevation gain for the day is  $5,348 - (-125) = 5,473$  feet.

- 67. (C)** To eliminate the decimals in this equation, multiply the numerators and denominators by 100:

$$\left(\frac{0.21}{0.33}\right)\left(\frac{100}{100}\right) = \left(\frac{x}{1.10}\right)\left(\frac{100}{100}\right)$$

$$\frac{21}{33} = \frac{100x}{110}$$

$$x = \left(\frac{110}{100}\right)\left(\frac{21}{33}\right) = \frac{70}{100} = 0.70$$

- 68. (J)** Let  $x$  be the number of seventh grade students that must join to meet the president's wishes. There are 65 students currently in the club. The percentage of seventh graders is calculated by dividing the number of seventh graders by the total number of students in the club. Using the president's desired percentage of 40% (0.40), the equation is:

$$\frac{20 + x}{65 + x} = 0.40$$

$$20 + x = (0.40)(65 + x)$$

$$20 + x = 26 + 0.40x$$

$$0.60x = 6$$

$$x = 10$$

- 69. (E)** First, find the length of  $\overline{PR}$ :  $4 - (-5) = 9$  units. Point Q is located  $\frac{1}{3}$  of the way from R to P, so calculate where that point would be:

$$9 \times \frac{1}{3} = 3 \text{ units}$$

So, point Q is located at  $4 - 3 = 1$ . Finally, calculate the midpoint of  $\overline{PQ}$ :

$$\text{Midpoint } PQ = \frac{-5 + 1}{2} = -2$$

- 70. (H)** The two-digit numbers must be even, so the only possible two-digit numbers must end in 8, since 8 is the only even digit given in the problem. Since the numbers cannot be repeated, the only possibilities for two-digit even numbers are 78 and 98. Thus, the answer is two possible two-digit numbers.

71. (B) First, change the improper fractions into mixed numbers:

$$\frac{5}{2} = 2\frac{1}{2} \quad \text{and} \quad \frac{20}{3} = 6\frac{2}{3}$$

The integers between these two values are 3, 4, 5, and 6. So, there are 4 integers between  $\frac{5}{2}$  and  $\frac{20}{3}$ .

72. (G) Angle LKN =  $75^\circ$  because vertical angles are congruent. The interior angles of quadrilateral KLPN sum to  $360^\circ$ . So, angle LPN =  $360 - (120 + 120 + 75) = 45^\circ$ . Angle LPN and angle QPR are vertical angles, so  $x = 45$ .

73. (C) Let  $x$  be the number of bundles needed for the roof's area of 416 square feet. Set up a proportion to find  $x$ :

$$\frac{x}{416} = \frac{3}{96} \qquad x = 416 \left( \frac{3}{96} \right) = 13$$

74. (G) All 6 of the smaller rectangles are congruent. Let the shorter side of one of these small rectangles be  $x$ . Based on the figure, the longer side is then  $4x$ , because the shorter side of four rectangles stacked together is the same length as the longer side of one rectangle. Using this information, you can now figure out the length and width of WXYZ:

$$\text{Width of WXYZ} = 4x$$

$$\text{Length of WXYZ} = x + 4x + x = 6x$$

Use the area of WXYZ to calculate  $x$ :

$$(4x)(6x) = 54$$

$$24x^2 = 54$$

$$x^2 = \frac{9}{4}$$

$$x = \frac{3}{2}$$

Now that  $x$  is known, use that to find the length and width of WXYZ:

$$\text{Width of WXYZ} = 4\left(\frac{3}{2}\right) = 6$$

$$\text{Length of WXYZ} = 6x = 6\left(\frac{3}{2}\right) = 9$$

$$\begin{aligned} \text{So, the perimeter of WXYZ} &= 2(6) + 2(9) \\ &= 12 + 18 = 30 \text{ cm} \end{aligned}$$

75. (D) Let  $x$  equal the number of gallons needed to drive  $m$  miles. Set up a proportion to solve for  $x$ :

$$\frac{x}{m} = \frac{3}{65} \qquad x = \frac{3m}{65}$$

76. (G) To find when the two flashes occur at the same time, find the least common multiple of 12 and 18, which is 36. Every 36 minutes, the lights flash at the same time. The first time is 8:00 a.m. The next 6 times would be 8:36, 9:12, 9:48, 10:24, 11:00, and 11:36. Only 2 of those times are listed (9:12 a.m. and 10:24 a.m.).

77. (D) First, find the amount of the tax charged on the sale price:

$$\$1.89 \cdot 0.06 = \$0.1134 = \$0.11 \text{ (rounded to the nearest cent)}$$

Then, subtract the original tax from the tax on the sale price calculated above:

$$\$0.15 - \$0.11 = \$0.04$$

78. (H) First, add the percentage of cars containing 3 people, 4 people, and 5 or more people:

$$15\% + 7\% + 3\% = 25\%$$

Thus, 25% of the cars contained **at least** 3 people, so use that to calculate the number of cars:

$$420 \times 25\% = 105 \text{ cars}$$

79. (E) Roberto began his first 5 hour watch at 6:00 p.m. Since he had 5 hours off before he began his second watch, the second watch began 10 hours after the first watch began. Thus, his third watch began 20 hours after his first watch began. 20 hours after 6:00 p.m. is 2:00 p.m. the next day.

80. (G) Let  $c$  be Crystal's age:

$$3c + 2 = m$$

$$3c = m - 2$$

$$c = \frac{m - 2}{3}$$

- 81. (D)** The line between  $-20$  and  $30$  is divided into 10 sections. Calculate the length of 1 section by finding the distance between  $-20$  and  $30$ , and dividing by the number of sections:

$$\frac{30 - (-20)}{10} = 5$$

So, the length of 1 section is 5 units and Point P is located at  $-5$ . To find the value of PQ, subtract the value of P from the value of Q:

$$30 - (-5) = 35$$

- 82. (G)** In row B, a number appears twice—first under an odd number in row A, and then under the next even number in row A. So, the number 112 in row A would have a corresponding number 56 in row B. The numbers 111 and 112 in row A would both have 56 under them in row B.

- 83. (A)** One gram is equal to 1,000 milligrams, or 1 milligram is equal to  $\frac{1}{1,000}$  gram.

$$\text{Thus, } 75 \text{ milligrams} = \frac{75}{1,000} = 0.075 \text{ gram.}$$

- 84. (G)** First, calculate the midpoints of  $\overline{AB}$  and  $\overline{BC}$  to find the locations of D and E, respectively:

$$D = \frac{-8 + 3}{2} = -\frac{5}{2}$$

$$E = \frac{3 + 7}{2} = 5$$

Now, find the midpoint of  $\overline{DE}$ :

$$\frac{-\frac{5}{2} + 5}{2} = \frac{\frac{5}{2}}{2} = \frac{5}{4} = 1.25$$

- 85. (B)** First, find the sale price. 10% of \$44.50 is \$4.45, so the sale price is  $\$44.50 - \$4.45 = \$40.05$ . Next, find the price after Julian's employee discount.  $20\% \times \$40.05 = \$8.01$ , so the final price of the video game is  $\$40.05 - \$8.01 = \$32.04$ .

- 86. (J)** There were 11 marbles in the box. After 5 were removed, the total number of marbles in the box is now 6. The probability of drawing a green marble is now  $\frac{1}{2}$ , which is equivalent to  $\frac{3}{6}$ . Thus, 3 green marbles remain in the box.

Originally, there were 4 green marbles in the box, so only 1 green marble was removed. Since a total of 5 marbles were removed from the box, that means 4 of those marbles were red.

- 87. (C)** Ryan has 130 pages left to read ( $150 - 20$ ). He read 20 pages in 30 minutes, which means he read at a rate of 40 pages per 1 hour. To find out how much longer it will take him to finish the assignment, divide the total pages remaining by the number of pages he is able to read per hour:

$$\frac{130}{40} = 3\frac{1}{4} \text{ hours}$$

- 88. (H)** The question asks for the number of different ways to create \$0.75 using at least one of each coin. One of each coin (one quarter, one dime, one nickel) is  $\$0.25 + \$0.10 + \$0.05 = \$0.40$ . Thus, the first \$0.40 of any solution is already determined. Subtract \$0.40 from \$0.75 ( $\$0.75 - \$0.40 = \$0.35$ ), so the question becomes "how many different ways can you make \$0.35 using nickels, dimes, and quarters?" There are 6 ways to create \$0.35 using nickels, dimes and quarters:

7 nickels

5 nickels + 1 dime

3 nickels + 2 dimes

1 nickel + 3 dimes

1 quarter + 1 dime

1 quarter + 2 nickels

- 89. (B)** First, find the number of liters that need to be added:

$$\frac{2}{3} \cdot 4,320 = 2,880 \text{ liters}$$

Use the conversion 1 kiloliter = 1,000 liters to find the number of kiloliters:

$$\frac{2,880}{1,000} = 2.88 \text{ kL}$$

**90. (G)** Because the volume of the tent is calculated using the area of the cross-section  $\times$  depth ( $d$ ), you can also use this formula to find  $d$ .

The area of the cross-section is the sum of the areas of the two triangles and the rectangle.

The two triangles have the same base length (2 ft) and height (6 ft), so the area of one of the triangles is:

$$A = \frac{1}{2} \times 2 \times 6 = 6 \text{ sq ft}$$

The area of the center rectangle is:

$$A = 4 \times 6 = 24 \text{ sq ft}$$

So the total area of the cross-section is:

$$A = 6 + 6 + 24 = 36 \text{ sq ft}$$

Use that to calculate the depth of the tent:

$$V = 36d$$

$$216 = 36d$$

$$6 = d$$

**91. (A)** After Ang gives Julia  $\frac{1}{3}$  of his money (which can be expressed as  $\frac{1}{3}x$  or  $\frac{x}{3}$ ), Julia has  $y + \frac{x}{3}$  in her account. If she spends  $\frac{1}{4}$  of that amount, the expression is now:

$$\frac{1}{4} \left( y + \frac{x}{3} \right) = \frac{y}{4} + \frac{x}{12}$$

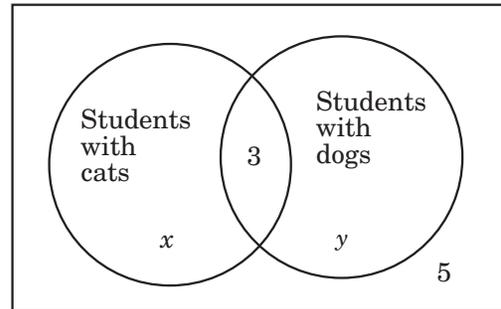
**92. (K)** The integers that are included in Set R but not in Set T are 10 through 81. (Note that 82 is included in Set T.) To calculate the number of integers between 10 and 81, inclusive, subtract the two endpoints and add 1. (One must be added because the endpoints are both counted in the total)  $81 - 10 + 1 = 72$

**93. (C)** To answer this question, assign several positive and negative values to  $x$  and determine what the value of the expression will be:

$x$	$1 - x^2$
-2	-3
-1	0
0	1
1	0
2	-3

The pattern shows the largest possible value of the expression is 1, which occurs when  $x = 0$ .

**94. (H)** This problem can be solved by creating a Venn diagram:



The circle on the left indicates the students with cats, and the circle on the right indicates students with dogs. The number outside both circles (5) is the number of students without cats or dogs. The number inside the intersection of the two circles (3) indicates the number of students who have both cats and dogs.

Calculate  $x$  and  $y$  using the given information: There are 20 students who have cats, and of those 20 students, 3 have cats and dogs. Thus,  $x = 20 - 3 = 17$ . There are 23 students who have dogs, and of those 23 students, 3 have cats and dogs. Thus,  $y = 23 - 3 = 20$ .

To find the total number of students surveyed, add the numbers in the diagram:

$$3 + 5 + x + y = 3 + 5 + 17 + 20 = 45$$

**95. (E)** The question says that an equal number ( $x$ ) of each type of space was purchased. To find the number of each type of space that was purchased, multiply the price per type by  $x$  and set it equal to the total amount spent:

$$200x + 350x + 600x = 11,500$$

$$1,150x = 11,500$$

$$x = 10$$

Thus, the store purchased 10 units of each type of space. To find the total **amount** of page space purchased, multiply each type of space by 10 and add:

$$\begin{aligned} & (10 \cdot \frac{1}{4} \text{ page}) + (10 \cdot \frac{1}{2} \text{ page}) + (10 \cdot 1 \text{ page}) \\ &= 2\frac{1}{2} + 5 + 10 = 17\frac{1}{2} \text{ pages} \end{aligned}$$

**96. (G)** The ratios of X:Y and Y:Z can be combined because Y has the same value in both ratios. So, X:Y:Z = 4:9:5. The proportion of X and Y in the mixture is  $\frac{4+9}{4+9+5} = \frac{13}{18}$ . Multiply the total weight of the mixture by the proportion to find the weight of the mixture after Z has been removed:  $90 \times \frac{13}{18} = 65$  g

---

**97. (A)**  $(2p + 8) - (5 + 3p) = 2p + 8 - 5 - 3p = 3 - p$

---

**98. (F)** One revolution is equal to the circumference of the tire:

$$C = 2r\pi = 2(1)\left(\frac{22}{7}\right) = \frac{44}{7} \text{ feet}$$

The car travels at 4,400 feet per minute. To calculate the number of revolutions, divide the speed by the circumference:

$$4,400 \div \frac{44}{7} = 4,400 \cdot \frac{7}{44} = 700 \text{ revolutions}$$


---

**99. (E)** First, multiply each term by 2 to eliminate the fraction:

$$-4(2) < x < 2(2)$$

$$-8 < x < 4$$

Therefore,  $x$  must be between  $-8$  and  $4$ , which is Option K.

**100. (K)** Let  $x$  = the mean number of hours Nam worked per day during the first 8 days.

Then,  $x + 2$  is the number of hours he worked on each of the last 2 days. Since he worked 69 total hours, set up the equation and solve for  $x$ :

$$8x + 2(x + 2) = 69$$

$$10x + 4 = 69$$

$$10x = 65$$

$$x = 6.5$$

Remember that  $x$  is the mean hours worked the first 8 days. The question asked for the number of hours Nam worked the **last** two days:

$$2(x + 2) = 2(6.5 + 2) = 2(8.5) = 17.0 \text{ hours}$$

**Answer Key for Sample Form A**

Paragraph 1 T U S R Q	11. C	21. C	31. D	41. E	51. E	61. A	71. B	81. D	91. A
Paragraph 2 U T R S Q	12. J	22. F	32. K	42. H	52. J	62. G	72. G	82. G	92. K
Paragraph 3 T R U Q S	13. B	23. C	33. D	43. E	53. C	63. D	73. C	83. A	93. C
Paragraph 4 S U R Q T	14. K	24. F	34. G	44. F	54. J	64. H	74. G	84. G	94. H
Paragraph 5 U T R Q S	15. A	25. B	35. C	45. B	55. C	65. D	75. D	85. B	95. E
	16. H	26. K	36. G	46. F	56. J	66. K	76. G	86. J	96. G
	17. D	27. C	37. E	47. D	57. B	67. C	77. D	87. C	97. A
	18. H	28. J	38. H	48. K	58. F	68. J	78. H	88. H	98. F
	19. A	29. B	39. D	49. D	59. B	69. E	79. E	89. B	99. E
	20. H	30. H	40. G	50. G	60. H	70. H	80. G	90. G	100. K



Student's First Name (please print) \_\_\_\_\_

Student's Last Name (please print) \_\_\_\_\_

**PART 1 VERBAL**

**SCRAMBLED PARAGRAPHS**

**Paragraph 1**

- The second sentence is    Q    R    S    T    U
- The third sentence is    Q    R    S    T    U
- The fourth sentence is    Q    R    S    T    U
- The fifth sentence is    Q    R    S    T    U
- The sixth sentence is    Q    R    S    T    U

**Paragraph 2**

- The second sentence is    Q    R    S    T    U
- The third sentence is    Q    R    S    T    U
- The fourth sentence is    Q    R    S    T    U
- The fifth sentence is    Q    R    S    T    U
- The sixth sentence is    Q    R    S    T    U

**Paragraph 3**

- The second sentence is    Q    R    S    T    U
- The third sentence is    Q    R    S    T    U
- The fourth sentence is    Q    R    S    T    U
- The fifth sentence is    Q    R    S    T    U
- The sixth sentence is    Q    R    S    T    U

**Paragraph 4**

- The second sentence is    Q    R    S    T    U
- The third sentence is    Q    R    S    T    U
- The fourth sentence is    Q    R    S    T    U
- The fifth sentence is    Q    R    S    T    U
- The sixth sentence is    Q    R    S    T    U

**Paragraph 5**

- The second sentence is    Q    R    S    T    U
- The third sentence is    Q    R    S    T    U
- The fourth sentence is    Q    R    S    T    U
- The fifth sentence is    Q    R    S    T    U
- The sixth sentence is    Q    R    S    T    U

**LOGICAL REASONING**

- |              |              |
|--------------|--------------|
| 11 A B C D E | 33 A B C D E |
| 12 F G H J K | 34 F G H J K |
| 13 A B C D E | 35 A B C D E |
| 14 F G H J K | 36 F G H J K |
| 15 A B C D E | 37 A B C D E |
|              | 38 F G H J K |
| 16 F G H J K |              |
| 17 A B C D E | 39 A B C D E |
| 18 F G H J K | 40 F G H J K |
| 19 A B C D E | 41 A B C D E |
| 20 F G H J K | 42 F G H J K |
|              | 43 A B C D E |
|              | 44 F G H J K |

**READING**

- |              |              |
|--------------|--------------|
| 21 A B C D E | 45 A B C D E |
| 22 F G H J K | 46 F G H J K |
| 23 A B C D E | 47 A B C D E |
| 24 F G H J K | 48 F G H J K |
| 25 A B C D E | 49 A B C D E |
| 26 F G H J K | 50 F G H J K |
|              |              |
| 27 A B C D E |              |
| 28 F G H J K |              |
| 29 A B C D E |              |
| 30 F G H J K |              |
| 31 A B C D E |              |
| 32 F G H J K |              |

**PART 2 MATHEMATICS**

**MATHEMATICS PROBLEMS**

- |              |              |              |               |
|--------------|--------------|--------------|---------------|
| 51 A B C D E | 66 F G H J K | 81 A B C D E | 96 F G H J K  |
| 52 F G H J K | 67 A B C D E | 82 F G H J K | 97 A B C D E  |
| 53 A B C D E | 68 F G H J K | 83 A B C D E | 98 F G H J K  |
| 54 F G H J K | 69 A B C D E | 84 F G H J K | 99 A B C D E  |
| 55 A B C D E | 70 F G H J K | 85 A B C D E | 100 F G H J K |
|              |              |              |               |
| 56 F G H J K | 71 A B C D E | 86 F G H J K |               |
| 57 A B C D E | 72 F G H J K | 87 A B C D E |               |
| 58 F G H J K | 73 A B C D E | 88 F G H J K |               |
| 59 A B C D E | 74 F G H J K | 89 A B C D E |               |
| 60 F G H J K | 75 A B C D E | 90 F G H J K |               |
|              |              |              |               |
| 61 A B C D E | 76 F G H J K | 91 A B C D E |               |
| 62 F G H J K | 77 A B C D E | 92 F G H J K |               |
| 63 A B C D E | 78 F G H J K | 93 A B C D E |               |
| 64 F G H J K | 79 A B C D E | 94 F G H J K |               |
| 65 A B C D E | 80 F G H J K | 95 A B C D E |               |

# SAMPLE TEST, FORM B

## PART 1 — VERBAL

*Suggested Time — 75 Minutes*

45 QUESTIONS

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### SCRAMBLED PARAGRAPHS

PARAGRAPHS 1-5

**DIRECTIONS:** In this section, arrange each group of sentences to create the best paragraph. The first sentence for each paragraph is given; the remaining five sentences are listed in random order. Choose the order for these five sentences that will create the **best** paragraph, one that is well-organized, logical, and grammatically correct. Each correctly ordered paragraph is worth **double** the value of a question in any other section of the test. No credit will be given for responses that are only partially correct.

To keep track of your sentence order, use the blanks to the left of the sentences. For example, write “2” next to the sentence you think follows the first sentence, write “3” next to the sentence you think follows “2,” and so on. You may change these numbers if you decide on a different order. When you are satisfied with your sentence order, mark your choices on your answer sheet.

---

#### Paragraph 1

What song is sung more often than any other song in the United States, with the exception of the national anthem?

- \_\_\_\_\_ **Q.** Surprisingly, neither the composer nor the lyricist had ever even been to a baseball park at the time the song was written in 1910.
- \_\_\_\_\_ **R.** The answer is “Take Me Out to the Ballgame,” probably the best-known song ever written about the sport traditionally called “America’s national pastime.”
- \_\_\_\_\_ **S.** Albert von Tilzer, the lyricist, eventually went to a ballgame in the 1920s.
- \_\_\_\_\_ **T.** Twenty years after Tilzer went, composer Jack Norworth saw the Brooklyn Dodgers defeat the Chicago Cubs in his first Major League game.
- \_\_\_\_\_ **U.** It is usually sung during the seventh-inning stretch of a baseball game.

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**Paragraph 2**

Most cowboys of North and South America lacked the necessary chemicals to soften animal hides into leather, so they often used rough, untreated hides, or rawhide, for their gear.

- \_\_\_\_\_ **Q.** The result was a soft, supple piece of leather for making reins, halters, straps, and other cowboy gear.
- \_\_\_\_\_ **R.** The strip was pulled through the slot repeatedly, with the stick held at a slight angle so that it took effort to draw the strip through.
- \_\_\_\_\_ **S.** They took a round piece of wood, such as a broom handle, cut a lengthwise slot through the middle of it, and filed the edges of the slot until they were smooth.
- \_\_\_\_\_ **T.** However, the gauchos, the cowboys of South America, created an effective method for softening strips of rawhide without the need for chemicals.
- \_\_\_\_\_ **U.** The gauchos then rubbed a rawhide strip with saddle soap and inserted one end into the slot.

---

**Paragraph 3**

In the 1880s, John Wesley Powell, an explorer of the Grand Canyon and director of the United States Geological Survey, led the development of the first topographical maps of the entire United States.

- \_\_\_\_\_ **Q.** This is because streams cut into the land, so contour lines will turn upstream, cross the waterway, and return downstream, creating a V shape, with the “V” pointing upstream.
- \_\_\_\_\_ **R.** Waterways, such as streams, are usually marked in blue on topo maps, but even if they were not, the presence of one could still be identified using contour lines.
- \_\_\_\_\_ **S.** Contour lines indicate the slope of the land as well.
- \_\_\_\_\_ **T.** If the lines are close together, the elevation is changing rapidly and the slope is steep, whereas widely spaced lines depict a gently sloping terrain.
- \_\_\_\_\_ **U.** Also called “topo maps,” these maps differ from others in using thin brown lines, called contour lines, to connect points of equal elevation.

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**Paragraph 4**

When contemporary Native American tribes meet for a powwow, one of the most popular ceremonies is the women’s jingle dress dance.

- \_\_\_\_\_ **Q.** During this type of dance, the dancers blend complicated footwork with a series of gentle hops, done in rhythm to a drumbeat.
- \_\_\_\_\_ **R.** In the past, it is believed, the dress worn by the jingle-dress dancer was adorned by shells.
- \_\_\_\_\_ **S.** These actions cause decorations sewn on the dancer’s dress to strike each other as she performs, creating a lovely jingling sound.
- \_\_\_\_\_ **T.** Besides being more readily available than shells, the lids are thought to create a softer, more subtle sound.
- \_\_\_\_\_ **U.** The modern jingle dress no longer has shells, but is decorated with rows of tin cones, made from the lids of snuff cans, rolled up and sewn onto the dress.

---

**Paragraph 5**

To the earliest European traders, Africa seemed to be loosely organized into tribal societies, without any great centers of wealth or learning.

- \_\_\_\_\_ **Q.** He described a thriving metropolis with great universities and dozens of private libraries.
- \_\_\_\_\_ **R.** Unfortunately, by the nineteenth century raids by neighboring tribes had made Timbuktu a shadow of its former self.
- \_\_\_\_\_ **S.** This impression began to change in the fifteenth century, as Europeans traveled inland into western Africa.
- \_\_\_\_\_ **T.** In 1470, an Italian merchant named Benedetto Dei traveled to Timbuktu and confirmed these stories.
- \_\_\_\_\_ **U.** The travelers told tales of an enormous city, known as Timbuktu, on the southern edge of the Sahara Desert, where the markets were crowded with goods and gold was bought and sold.

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# LOGICAL REASONING

## QUESTIONS 11-20

**DIRECTIONS:** Read the information given and choose the **best** answer to each question. Base your answer **only on the information given**.

In a logical reasoning test, certain words must be read with caution. For example, “The red house is **between** the yellow and blue houses” does not necessarily mean “The red house is **between and next to** the yellow and blue houses”; one or more other houses may separate the red house from the yellow house or from the blue house. This precaution also applies to words such as **above, below, before, after, ahead of, and behind**.

---

11. Three children—Raquel, Tiara, and Xing—each own one pet. The pets are a parrot, an iguana, and a hamster. Xing does not own the hamster.

Which of the following additional pieces of information is needed to determine who owns the iguana?

- A. Tiara owns the hamster.
- B. Raquel does not own the hamster.
- C. Raquel owns the parrot.
- D. Xing owns the parrot.
- E. Tiara does not own the hamster.

12. Some teachers went to the lecture on how not to be boring. None of the teachers left the lecture early.

Based only on the information above, which of the following statements **must** be true?

- F. If Miriam left the lecture early, then she is not a teacher.
- G. If François is not a teacher, he was not at the lecture.
- H. Lu-San went to the lecture, so she is a teacher.
- J. If Peter was not a teacher, then he left the lecture early.
- K. Tom did not go to the lecture, so he is not a teacher.

13. There are four towns in Jefferson County: Elmont, Richland, Lendle, and Mopley. Highway 14 is closed from Elmont to Richland because of flooding.

- 1) Lendle is between Elmont and Richland on Highway 14.
- 2) Mopley can be reached from Lendle, without going through Elmont or Richland.

Which of the following statements is a valid conclusion from the statements above?

- A. Mopley is not flooded.
- B. Either Elmont or Richland is flooded.
- C. Both Elmont and Richland are flooded.
- D. No one can drive to Lendle on Highway 14.
- E. Mopley cannot be reached directly from Elmont.

14. Sidney was in a contest with Alice, Huang, and Mariah to see whose airplane could fly highest.

- 1) Alice’s airplane flew higher than Huang’s airplane.
- 2) Mariah’s airplane did not fly as high as Alice’s airplane.

Based only on the information above, which of the following is a valid conclusion?

- F. Alice won the contest.
- G. Sidney’s airplane flew higher than Mariah’s.
- H. Mariah’s airplane flew higher than Huang’s.
- J. If Sidney finished second, Alice won.
- K. If Sidney finished second, Huang finished third.

---

**15.** At Midway School, each new student is paired with an older student partner. The new students are Bai, Gloria, Sandro, and Henry. The older student partners are Edgar, Paola, Rakim, and Whitney.

- 1) Sandro and Whitney are paired.
- 2) Bai is not paired with Rakim.
- 3) Edgar is not paired with Gloria or Bai.

Who is paired with Paola?

- A.** Bai
  - B.** Gloria
  - C.** Henry
  - D.** Edgar
  - E.** Rakim
- 

**16.** When Tomas wears his white shirt, he also wears a tie. When he wears a tie, he also wears his black shoes.

Based only on the information above, which of the following statements is a valid conclusion?

- F.** When Tomas wears his black shoes, then he is wearing his white shirt.
  - G.** Tomas wears his black shoes only when he is wearing a tie.
  - H.** When Tomas wears his white shirt, then he is also wearing his black shoes.
  - J.** If Tomas is not wearing his white shirt, then he is not wearing a tie.
  - K.** If Tomas is not wearing a tie, then he is not wearing his black shoes.
- 

**17.** Jack played three instruments in the orchestra. He played violin for two years, cello for three years, and bass for three years. He never played more than two instruments during the same year. The first year, Jack played only the violin.

What is the **least** number of years Jack could have played in the orchestra?

- A.** 4
  - B.** 5
  - C.** 6
  - D.** 7
  - E.** 8
- 

**18.** At the race track, four race car drivers stood side by side, their backs toward you. Each driver stood facing his or her race car.

- 1) The brown car was to the right of the orange car.
- 2) Jorge stood immediately to Anya's right.
- 3) Marquise, who was to Jorge's right, owned the white car.
- 4) Patrick did not own the silver car.
- 5) Anya owned the orange car.

Which race car driver stood at the far right?

- F.** Jorge
  - G.** Anya
  - H.** Marquise
  - J.** Patrick
  - K.** Cannot be determined from the information given.
- 

CONTINUE ON TO THE NEXT PAGE ►

Questions 19 and 20 refer to the following information.

In the code below, (1) each letter always represents the same word, (2) each word is represented by only one letter, and (3) in any given sentence, the position of a letter is **never** the same as that of the word it represents.

Q        H        P        Z                means  
“Are     we     late     again?”

X        S        P        G        Z        means  
“No,     we     are     early    today.”

H        Q        W        G        N        means  
“She     is     late     again    today.”

19. Which word is represented by the letter Z?

- A. are
- B. we
- C. late
- D. again
- E. Cannot be determined from the information given.

20. Which letter represents the word “again”?

- F. H
- G. N
- H. P
- J. Q
- K. Cannot be determined from the information given.

CONTINUE ON TO THE NEXT PAGE ►

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# READING

## QUESTIONS 21-50

**DIRECTIONS:** Read each passage below and answer the questions following it. Base your answers on information contained only in the passage. You may reread a passage if you need to. Mark the best answer for each question.

---

The eruption of the Philippine volcano Mount Pinatubo in June 1991 sent a huge cloud of gas and dust encircling the globe. The dust and ash from Mount Pinatubo was  
5 blamed for a two-year decrease in global temperature, changes in weather patterns, and damage to the ozone layer. The situation brings to mind a meteorological event that occurred 175 years earlier. At that  
10 time, harsh weather conditions plagued much of eastern North America, and, to a lesser extent, northern Europe.

April 1816 brought typical spring weather to upstate New York and New England;  
15 trees budded and farmers prepared to plow and plant. In May, however, the expected warm temperatures failed to arrive. Most people remained optimistic, waiting for the summer that was “just around the corner.” They waited in vain. June ushered  
20 in what modern meteorologists call “The Year Without a Summer.” During the first week of June, ten inches of snow fell on New England. Throughout the month, temperatures rarely rose above the 30s. Many  
25 farmers replanted crops several times, only to see them stunted or destroyed by sleet, hail, and icy winds. July and August brought little improvement. During most  
30 days the temperature stayed in the 40s. Farmers’ diaries document their daily struggles with near-freezing temperatures, failing crops, and dying farm animals. The few crops that managed to survive were  
35 killed by frost in mid-September. Winter came early in New England and was unusually severe. Even the South was affected; on July 4, the high temperature for Savannah, Georgia, was only 46 degrees!

40 Some religious leaders warned their congregations that the unusual weather meant that the end of the world was drawing near. Other leaders attributed the cool weather to unusual sunspot activity. The proliferation of the newly invented lightning rod was  
45 also blamed. Some people believed that lightning rods had interrupted the natural temperature balance of the earth, causing the cooler temperatures.

50 It was not until October that the first plausible explanation for “The Year Without a Summer” was suggested. A German astronomer, Friedrich Bessel, reported seeing thick clouds of dust in the upper atmosphere. He  
55 theorized that these dust particles screened portions of the earth from the warming rays of the sun. It was discovered that, in April 1815, Mount Tambora, an Indonesian volcano, had erupted with such force that  
60 it had sent an estimated 100 cubic miles of fine dust into the atmosphere. Witnesses to the eruption reported that the sky remained dark for two days. The dust then rose high into the stratosphere, where it encircled the  
65 world for several years to come.

Skeptics in 1816 doubted that a far-away volcano could steal their summer. However, most present-day researchers believe Bessel’s explanation to be generally correct,  
70 demonstrating the global nature of weather. The dust in the atmosphere eventually settled, and the spring of 1817 was back to normal.

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21. Which of the following best tells what this passage is about?
- A. why some religious leaders believed the end of the world was coming in 1816
  - B. a summer of strange weather and its probable cause
  - C. the importance of summer weather to agriculture in New England
  - D. two volcanic eruptions
  - E. a comparison of the weather of 1816 and 1991
22. What is the most likely reason farmers persisted in replanting their crops?
- F. They believed that the cold weather could not continue all summer long.
  - G. They were attempting to increase crop yields to higher levels than they had ever before achieved.
  - H. They thought that crops would be able to survive even though the weather remained cold.
  - J. The weather had warmed up by July.
  - K. They thought the June snowfalls would provide needed moisture.
23. Which of the following was probably true about the winter of 1816-1817?
- A. The government decided to establish a weather forecasting service.
  - B. Temperatures were warmer than usual for that time of year.
  - C. New Englanders faced shortages of fruits and vegetables.
  - D. Bessel's theory was completely discredited.
  - E. People quickly forgot about "The Year Without a Summer."
24. Which of the following is implied by the phrase "the global nature of weather" (line 70)?
- F. Meteorologists around the world need to stay in close contact.
  - G. Extreme weather conditions may stimulate volcanic eruptions in other parts of the world.
  - H. Natural disasters tend to occur in different parts of the world at the same time.
  - J. Conditions in one part of the world can affect weather in another part.
  - K. A single storm may cover the entire world.
25. Which of the following situations, if it had occurred, would lend further support to the conclusion that "The Year Without a Summer" was caused by the eruption of Mount Tambora?
- A. Volcanoes all over the world erupted at the same time as Mount Tambora.
  - B. Other parts of the world also experienced unusually cold weather in 1816.
  - C. Temperatures in Indonesia in 1816 were higher than average.
  - D. Subsequent summers in New England were warmer than average.
  - E. The eruption of Mount Pinatubo did not disturb weather patterns.
26. Which of the following best summarizes Bessel's theory?
- F. The cold weather would end when the winter of 1816-1817 began.
  - G. The cold summer of 1816 indicated that the world was about to end.
  - H. The eruptions of Mount Tambora and Mount Pinatubo affected global weather in the same way.
  - J. The eruption of Mount Pinatubo is responsible for numerous weather changes.
  - K. Dust particles in the air blocked the warmth of the sun.

Imagine living in a society where ordinary people could be punished for what they choose to read and write. For much of the twentieth century, such a closed society existed in Russia and the rest of the Soviet Union. The Soviet government tried to dominate its citizens' activities and ideas by controlling the information that they received. Government censors examined books, films, and newscasts and banned anything they considered objectionable. They censored criticism of the Soviet government, news from the outside world, and anything that complimented Soviet enemies.

The Soviet government's strict censorship made life tremendously difficult for writers. Most worried that they were being watched by the government's secret police. Despite the harsh laws, small groups of writers dodged state censorship through an underground, or secret, publishing network that produced works called *samizdat*. The name *samizdat* came from the Russian words for "self" and "publish." For many writers, *samizdat* offered the only outlet for their intellectual and creative expression. To produce *samizdat*, an author passed a typed or handwritten text to a second person, who made a handwritten or typed copy. The original was returned to the author, while the copies were passed to other members of the network. The works were unsigned or signed with false names.

At first, *samizdat* focused mainly on literature, such as poetry and novels. By the late 1950s, *samizdat* circles were distributing political material, such as letters to the government, political essays, and trial transcripts. By the mid-1960s, the *samizdat* network produced sophisticated political news, debate, and analysis.

The great Russian novelist Boris Pasternak had his work published as *samizdat*. Like other writers, he feared that an appearance of disloyalty to the Soviet state would bring a knock at his door in the middle of the night. His classic novel, *Doctor Zhivago*,

was smuggled out of the Soviet Union for publication in Western countries in 1956; in Russia, it appeared only as *samizdat*. Pasternak won the Nobel Prize in Literature in 1958, but the government forced him to refuse the prize. Soviet authorities also blocked publication of the work of Anna Akhmatova, one of Russia's greatest poets. Her work was banned until 1952 because censors felt she did not sufficiently praise the Soviet government. Akhmatova was kept out of public life and the official Writers' Union. She composed her poetry in private, and her works were available only as *samizdat*.

Through the 1960s and '70s, Russian writers used *samizdat* networks to circulate banned or politically risky material. By the late 1980s, computers became available in scientific research facilities, and underground writers began using the computers to store and circulate texts. Censorship was officially abolished in 1989, shortly before the breakup of the Soviet Union, leading to a publishing boom. Works by previously banned authors were published, and the *samizdat* networks quickly faded into history.

27. Which of the following best tells what this passage is about?
- A. two Russian authors, Boris Pasternak and Anna Akhmatova
  - B. the poetry published in the Soviet Union during the twentieth century
  - C. the role of a free press in a free society
  - D. censorship in the Soviet Union and the underground system that arose in response
  - E. the reasons for banning authors who criticized the Soviet government

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28. Which of the following is most likely an example of material circulated in the earliest phase of samizdat?
- F. a letter protesting a writer's imprisonment
  - G. a true account of life in the secret police
  - H. a short story
  - J. a list of political prisoners
  - K. an article from a foreign newspaper
29. The phrase "a knock at his door in the middle of the night" (lines 47-48) most likely refers to a visit by
- A. Boris Pasternak.
  - B. the secret police.
  - C. a member of the Nobel Prize committee.
  - D. a participant in the samizdat network.
  - E. a political exile.
30. According to the passage, how did the use of computers influence samizdat publishing?
- F. The content of samizdat materials became exclusively technical.
  - G. Scientific research was published through samizdat networks.
  - H. Computers made it possible to smuggle *Doctor Zhivago* out of the country.
  - J. Computers made the distribution of samizdat material more efficient.
  - K. Computers made identification of samizdat authors easier for the secret police.
31. What is the most likely reason that samizdat materials were unsigned or signed with false names?
- A. to allow the materials to be smuggled outside the Soviet Union
  - B. to protect the writer from punishment
  - C. to shield the identities of members of the secret police
  - D. to undermine the trustworthiness of the materials
  - E. to prevent the materials from being copied
32. After 1989, "samizdat networks quickly faded" (lines 75-76) for which of the following reasons?
- F. The networks were no longer necessary after censorship was abolished.
  - G. The works produced by the networks could not compete with works published in Western countries.
  - H. Samizdat was successfully banned by government censors.
  - J. The networks were replaced by the use of computers.
  - K. Opposition to the government went deeper underground than before.

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Most movies about spies and undercover agents feature fascinating special equipment. Many of these gadgets exist only in the imaginations of script writers, but others are actually used in espionage activities. One device with a surprisingly long and colorful history, both in and out of the cloak-and-dagger world, is the concealed camera.

In the late nineteenth century, “detective cameras” were popular with amateur photographers who wanted to take snapshots of unsuspecting people on the street. The camera was usually carried in plain view. Its disguise was simple: it was a plain box resembling a large and rather heavy parcel or a piece of luggage, with no external lens or controls. When people caught on to the deception, though, designers began hiding cameras in other objects, ranging from hats and books to purses and pocket watches. One concealed camera even looked like an ordinary camera, but had mirrors that allowed users to take photographs at a right angle to the direction of whatever the photographer seemed to be viewing.

Although most early spy cameras were meant to be used on the ground, cameras have been hidden in the sky almost from the beginning of photography. In World War I, both sides realized the strategic value of taking aerial photographs of enemy territory from the newly invented airplane. To spy more discreetly, without the use of airplanes, the Germans attached cameras to homing pigeons and sent them over French army positions. Timers were set to trigger the cameras when the pigeons were expected to be flying over their targets. That particular attempt proved impractical, but the idea behind it did not: aerial photography became a staple of World War II.

In the mid-twentieth century, a new era of spying with cameras began under the Cold War. This was a period of worldwide tension and competition between the Communist world, led by the Soviet Union, and the Western world, represented by the United States and its allies. The conflict was

expressed through propaganda, arms races, and especially espionage. During the Cold War, both sides competed to develop new technologies to use photography in spying. Sophisticated concealed cameras were put in matchboxes, pens, rings, cigarette lighters, makeup cases, guns, and even hidden in clothing, with the lens concealed in a button. Almost any object that could be carried without attracting attention was probably made into a camera and carried by an undercover agent. Cameras were also hidden in furniture and office machines such as copiers, which took photos of every document that was copied. The development of the long-range telephoto lens even allowed spies to take clear photos from a distance, such as across the street from an embassy.

Today, space has proven to be the ultimate location for hidden cameras, as satellite-mounted cameras can produce highly detailed photographs of objects anywhere on earth.

33. Which of the following best tells what this passage is about?
- A. the role of hidden cameras in national security
  - B. the problems associated with hidden cameras
  - C. the mechanics of the “detective camera”
  - D. historical information about the concealed camera
  - E. how cameras are mounted in satellites
34. According to the passage, “detective cameras” were popular with
- F. spies.
  - G. airplane pilots.
  - H. the German army.
  - J. professional photographers.
  - K. amateur photographers.

- 35.** What was the original purpose of the early detective cameras?
- A.** to resemble an ordinary object such as a box
  - B.** to take pictures at a right angle
  - C.** to use in espionage activities by secret agents
  - D.** to take pictures without the subjects' knowledge
  - E.** to be carried by homing pigeons for surveillance
- 36.** The camera with mirrors (lines 21-25) allowed the photographer to
- F.** conceal the camera in a hat or pocket watch.
  - G.** take a picture with no external lens or controls.
  - H.** take aerial photographs.
  - J.** take a picture of one scene while appearing to take a picture of another.
  - K.** determine whether other photographers were using detective cameras.
- 37.** Photographers stopped using the box-type "detective camera" because
- A.** people were no longer deceived by them.
  - B.** the cameras could not be used with external lenses.
  - C.** they wanted to avoid being mistaken for secret agents.
  - D.** professional photographers refused to use them.
  - E.** espionage was conducted during the war.
- 38.** What was the "idea" referred to in line 40?
- F.** taking photographs without permission
  - G.** taking photographs from above
  - H.** locating military targets
  - J.** using cameras in wartime
  - K.** attaching cameras to homing pigeons

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Archaeologists first succeeded in using tree-ring dating while excavating ancient Pueblo Indian villages in the southwestern United States during the 1920s. At that time, no one knew when the villages had been occupied, or for how long, but the logs used in the buildings provided a clue. Scientists had long known that trees add a new growth ring to their circumferences during each growing season. Drought or early frost results in little growth and narrow rings. Good growing years result in wide rings. Archaeologists knew that by matching identical patterns of wide and narrow rings in sections of two different logs, they could determine which log was older. For example, a log with a certain pattern of rings near its outside edge would indicate a specific series of good and bad growing seasons. This log would have been cut down before a log of comparable size that shows the identical pattern near its center.

But how could these ring patterns help determine the actual dates for the abandoned Pueblo villages? Archaeologists had already used the ring patterns of trees with overlapping lifetimes to establish a tree-ring chronology for the southwestern United States that went back to A.D. 1260. That work had been done in a Hopi village called Oraibi. Oraibi had been continuously inhabited since before the arrival of the first Spanish explorers in 1540.

That same team of archaeologists also developed a relative, or “floating,” chronology for the abandoned Pueblo villages by matching up the ring patterns of the various logs used in the buildings. With this “floating” chronology, the archaeologists could tell which logs were older and which were more recent. None could be precisely dated, since no log had a pattern of tree rings that matched any part of the established chronology. It was clear from this evidence, however, that the buildings must have been constructed before A.D. 1260.

Finally, continued excavations turned up a “key” beam. The outer ring pattern of the

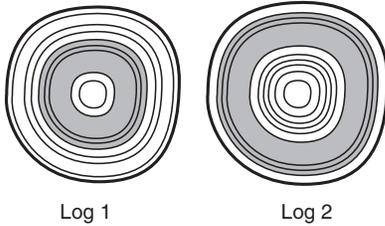
key beam overlapped the earliest rings in the established chronology. Furthermore, its inner ring pattern matched the pattern formed by the most recent rings of the “floating” chronology. Thus, the chronology for the abandoned Pueblo villages could be known with certainty. Counting backward from the present, the archaeologists estimated that the villages had been occupied between A.D. 900 and A.D. 1300.

The tree rings also suggested **why** the villages had been abandoned. The rings for the years A.D. 1276 to 1299 were very thin, indicating a severe drought that lasted for 23 years. Most likely the villagers had left their homes to search for a more hospitable climate.

39. Which of the following best tells what this passage is about?
- A. how variations in weather conditions affect tree growth
  - B. recent breakthroughs in understanding Indian cultures
  - C. why the Pueblo villages were abandoned
  - D. how tree-ring dating can establish the age of archaeological findings
  - E. why tree-ring dating is the best method for determining dates
40. What was the importance of the “key” beam described in the fourth paragraph?
- F. It proved that trees of the same age would have identical tree-ring patterns.
  - G. It helped to disprove earlier theories regarding the abandonment of the villages.
  - H. It helped archaeologists to determine why the villages had been built at that time.
  - J. It explained why the Pueblo buildings had been constructed at that location.
  - K. It connected the “floating” chronology to the established chronology.

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41.



In the diagrams above, an identical ring pattern on logs from two trees has been shaded. Which of the following conclusions about these logs is best supported by the information in the passage?

- A. Log 1 was cut before log 2.
  - B. Log 2 was cut before log 1.
  - C. The two trees responded differently to the same growing seasons.
  - D. The tree from which Log 1 was cut was the faster-growing tree.
  - E. The tree from which Log 2 was cut was the faster-growing tree.
42. For which of the following would tree-ring dating be **most** useful?
- F. identifying the kinds of trees used to build the ancient Pueblo buildings
  - G. tracking the historical sequence of weather cycles in a region
  - H. investigating the reasons that Indians lived in specific areas
  - J. determining the length of the growing season in different areas of the world
  - K. determining how people built their villages

43. Why did the archaeologists conclude that the buildings in the abandoned Pueblo villages “must have been constructed before A.D. 1260” (lines 45-46)?

- A. The logs in those buildings did not share any ring patterns with the established chronology, which went back to that year.
  - B. The logs in those buildings had ring patterns in common with the logs used in Oraibi.
  - C. The villages were still inhabited when the Spanish explorers found them.
  - D. The villages were already abandoned when the Spanish explorers found them.
  - E. The people in those villages had moved to Oraibi.
44. According to the passage, what is the most likely reason that the Pueblo villages had been abandoned?
- F. The villages were destroyed by warfare between the Pueblo and Hopi people.
  - G. There were no more trees to build with.
  - H. A long drought prompted people to leave the area.
  - J. The villages had grown too large for their locations.
  - K. The villagers fled to escape the Spanish explorers.

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Almost one hundred fifty years ago, Charles Darwin, the famous British naturalist, proposed a startling new theory about the cause of human emotions. Facial expressions, he argued, are more than the visible signs of an emotion; to some extent they actually cause the emotion. For example, a person's smile reflects a feeling of happiness, but it also helps to produce that feeling. The theory that facial expressions contributed to emotions was controversial and, at the time, impossible to prove. Eventually it lost favor, and for more than a century people's facial expressions were assumed to be the result, not the cause, of their feelings.

Theories change, however. Within the last few decades, psychologists have been investigating the notion that we can put smiles in our hearts by first putting them on our faces. In a research study, volunteers were asked to say words that placed their facial muscles into either smiles or frowns. The purpose of the task was not explained. After the experiment, the volunteers who said words like "cheese" were measurably happier than those who said words like "few."

To explain these results, the researchers theorized that there is a relationship between facial expressions and the temperature of the blood entering the brain. According to their theory, the muscle contractions produced by a facial expression raise or lower the temperature of the blood that flows through the person's face. The change in temperature is slight—less than one degree Celsius. The blood vessels in the face connect to the carotid artery, which leads to the hypothalamus, an area of the brain believed to regulate emotions. The researchers theorized that warmer blood, which is associated with frowning or scowling, leads to feelings of unhappiness. A smile, which is created by a different set of muscles, lowers the blood temperature and tends to produce a feeling of happiness.

In another study, volunteers were told exactly which facial muscles to contract. For example, volunteers were told, "Raise your eyebrows, open your eyes wide, tuck in your chin, and let your mouth relax" (the facial expression associated with fear). The volunteers were not told which emotion they were mimicking. As they produced the muscular movements of a particular emotional expression, they tended to experience that emotion. For example, while making a fearful expression, they reported feeling more fear than anger, sadness, or disgust.

Acceptance of the research relating emotions to facial expressions, especially the blood temperature theory, is far from universal. However, some psychologists hope that the phenomenon may be useful in treating mild depression. They do agree, though, that facial expressions are not the most important causes of emotion. Encouraging people to smile while they are mourning, for example, would do little to lessen their grief.

45. Which of the following best tells what this passage is about?
- A. the theory that facial expressions may contribute to emotions
  - B. the role of the hypothalamus in experiencing emotions
  - C. the use of facial expressions in a variety of scientific research
  - D. the range of emotions felt by volunteers in experiments
  - E. the potential uses of facial expressions in treating mild depression

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46. In the research study described in the second paragraph, after volunteers said words that placed their facial muscles into smiles, what did the researchers do?
- F. cooled down the blood entering the volunteers' brains
  - G. asked the volunteers to say words like "few"
  - H. explained the purpose of the study to the volunteers
  - J. placed the volunteers' facial muscles into frowns
  - K. determined how happy the volunteers felt
47. Why was Darwin's theory not accepted during his lifetime?
- A. Scientists could not think of a way to test his theory.
  - B. Most scientists mistakenly believed that emotions were caused by thoughts.
  - C. Scientists did not understand the function of the hypothalamus.
  - D. Scientists did not study emotions until the twentieth century.
  - E. Accurate measurement of blood temperature was not possible.
48. According to the theory described in lines 33-36, what effect might saying a word such as "cheese" have on a person?
- F. It makes a person's face appear to frown.
  - G. It relaxes the blood vessels leading to the carotid artery.
  - H. It may cool the blood flowing to the hypothalamus.
  - J. It produces the facial expression associated with fear.
  - K. It does not affect the speaker's mood.
49. What is the notion referred to in line 19?
- A. Smiling can make people feel happy.
  - B. People who feel happy tend to smile.
  - C. Psychologists can conduct research on emotions.
  - D. Theories change over time.
  - E. Certain words cause the speaker to smile or frown.
50. What do researchers believe about the hypothalamus?
- F. It prevents mild depression.
  - G. It manages emotions.
  - H. It regulates the temperature of blood.
  - J. It causes negative emotions, such as fear, rather than positive emotions.
  - K. It regulates the flow of blood to the brain.

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# PART 2 — MATHEMATICS

*Suggested Time — 75 Minutes*

50 QUESTIONS

## GENERAL INSTRUCTIONS

Solve each problem. Select the **best** answer from the choices given. Mark the letter of your answer on the answer sheet. You can do your figuring in the test booklet or on paper provided by the proctor. **DO NOT MAKE ANY MARKS ON YOUR ANSWER SHEET OTHER THAN FILLING IN YOUR ANSWER CHOICES.**

### IMPORTANT NOTES:

- (1) Formulas and definitions of mathematical terms and symbols are **not** provided.
- (2) Diagrams other than graphs are **not** necessarily drawn to scale. Do not assume any relationship in a diagram unless it is specifically stated or can be figured out from the information given.
- (3) Assume that a diagram is in one plane unless the problem specifically states that it is not.
- (4) Graphs are drawn to scale. Unless stated otherwise, you can assume relationships according to appearance. For example, (on a graph) lines that appear to be parallel can be assumed to be parallel; likewise for concurrent lines, straight lines, collinear points, right angles, etc.
- (5) Reduce all fractions to lowest terms.

51.  $\frac{4.5}{0.1} \times 0.22 =$

- A. 0.99
- B. 1.99
- C. 9.9
- D. 99
- E. 990

52. Carlos is picking colored pencils from a large bin that contains only 480 red pencils, 240 green pencils, and 160 blue pencils. Without looking, Carlos pulls out 22 pencils. If the pencils were distributed randomly in the bin, how many pencils of each color is it most likely that he picked?

- F. 8 red, 7 green, 7 blue
- G. 10 red, 7 green, 5 blue
- H. 10 red, 8 green, 4 blue
- J. 11 red, 6 green, 5 blue
- K. 12 red, 6 green, 4 blue

53. What time will it be 46 hours after 9:30 p.m. on Friday?

- A. 7:30 p.m. Saturday
- B. 7:30 a.m. Sunday
- C. 6:30 p.m. Sunday
- D. 7:30 p.m. Sunday
- E. 9:30 p.m. Sunday

54. Each child in a certain class is required to have school supplies of 1 notebook and 2 pencils. One notebook costs \$1.09 and one pencil costs \$0.59. With \$15, what is the maximum number of children that can be provided with the required supplies? (Assume no tax.)

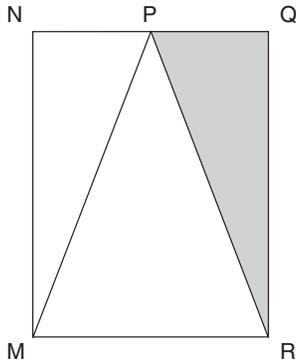
- F. 6
- G. 7
- H. 8
- J. 9
- K. 12

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55. How many positive integers satisfy the inequality  $x + 7 < 23$ ?

- A. 15
- B. 16
- C. 17
- D. 29
- E. 30

56.



In the figure above, the base of  $\triangle MPR$  is a side of rectangle  $MNQR$ , and point  $P$  is the midpoint of  $\overline{NQ}$ . If the area of the shaded region is 24 square centimeters, what is the area of the region that is **not** shaded?

- F. 24 sq cm
- G. 48 sq cm
- H. 64 sq cm
- J. 72 sq cm
- K. 96 sq cm

57. If  $x$  and  $y$  are positive integers such that  $0.75 = \frac{x}{y}$ , what is the **least** possible value for  $x$ ?

- A. 1
- B. 3
- C. 4
- D. 25
- E. 75

58.  $\frac{(-51)^2}{17^3} =$

- F.  $-2$
- G.  $-\frac{1}{17}$
- H.  $\frac{9}{17}$
- J.  $\frac{16}{17}$
- K. 2

59.

SONGS PLAYED DURING ONE HOUR

Number of Songs	Number of Radio Stations
14	8
15	4
16	4
17	5
18	9

The table above shows the number of songs played during a specific hour by 30 different radio stations. What is the mean number of songs played during that hour by these stations?

- A. 6
- B. 8
- C. 16.1
- D. 16.5
- E. 18

60.  $|190 - 210| + |19 - 21| + x = 100$

In the equation above, what is the value of  $x$ ?

- F. 78
- G. 88
- H. 100
- J. 122
- K. 123

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61. 1 dollar = 7 lorgs  
1 dollar = 0.5 dalts
- Kwamme has 140 lorgs and 16 dalts. If he exchanges the lorgs and dalts for dollars according to the rates above, how many dollars will he receive? (Assume there are no exchange fees.)
- A. \$28  
B. \$52  
C. \$182  
D. \$282  
E. \$988

62. DISTRIBUTION OF EYE AND HAIR COLOR FOR 64 CHILDREN

		Eye Color		
		Brown	Blue	Total
Hair Color	Blond	11	18	29
	Black	15	20	35

- The table above shows the distribution of eye color and hair color for 64 children. How many of these children have blond hair or brown eyes, but **not both**?
- F. 22  
G. 33  
H. 44  
J. 53  
K. 55

63.

Item	Quantity Purchased	Price Per Item
Rain Coat	1	\$102.00
Slacks	2	\$60.00
Shirt	2	\$35.00

- One state has a 6% sales tax on clothing items priced at \$75 or higher, and no sales tax on clothing items priced under \$75. What is the total tax on the items in the table above?
- A. \$6.12  
B. \$6.72  
C. \$13.32  
D. \$17.00  
E. \$203.12

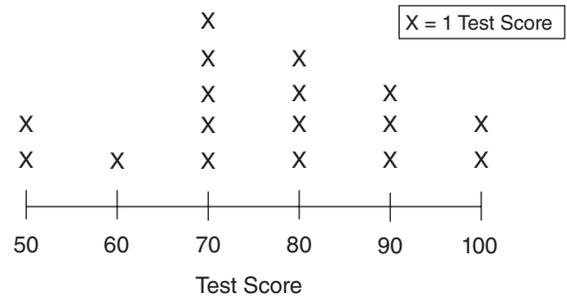
64.

$$\begin{array}{r}
 -2 \\
 4 \\
 -6 \\
 8 \\
 \cdot \\
 \cdot \\
 \cdot \\
 -22 \\
 + 24
 \end{array}$$

- If the missing terms in the problem above were filled in according to the pattern, what would be the sum of all the terms?
- F. -6  
G. 2  
H. 6  
J. 10  
K. 12

65. A pitcher contained 32 ounces of orange juice and 12 ounces of grapefruit juice. More grapefruit juice was added to the pitcher until grapefruit juice represented  $\frac{1}{3}$  of the pitcher's contents. How many ounces of grapefruit juice were added?
- A. 2 oz  
B. 4 oz  
C. 8 oz  
D. 16 oz  
E. 44 oz

66. TEST SCORES FOR 17 STUDENTS



- According to the figure above, what was the median score for the test?
- F. 70  
G. 75  
H.  $76\frac{8}{17}$   
J. 80  
K. 90

67. The fuel mix for a small engine contains only 2 ingredients: gasoline and oil. If the mix requires 5 ounces of gasoline for every 6 ounces of oil, how many ounces of gasoline are needed to make 33 ounces of fuel mix?

A. 3  
B. 6  
C. 15  
D.  $27\frac{1}{2}$   
E. 165

68. Which of the following shows the fractions  $\frac{11}{3}$ ,  $\frac{25}{7}$ , and  $\frac{18}{5}$  in order from least to greatest?

F.  $\frac{25}{7}$ ,  $\frac{18}{5}$ ,  $\frac{11}{3}$   
G.  $\frac{25}{7}$ ,  $\frac{11}{3}$ ,  $\frac{18}{5}$   
H.  $\frac{18}{5}$ ,  $\frac{11}{3}$ ,  $\frac{25}{7}$   
J.  $\frac{18}{5}$ ,  $\frac{25}{7}$ ,  $\frac{11}{3}$   
K.  $\frac{11}{3}$ ,  $\frac{18}{5}$ ,  $\frac{25}{7}$

69. A prom dress originally priced at \$450 is on sale for  $\frac{1}{3}$  off the original price. In addition, Alia has a coupon for 10% off the discounted price. If there is a 6% sales tax on the final price of the dress, what would Alia's total cost be?

A. \$111.30  
B. \$143.10  
C. \$270.30  
D. \$286.20  
E. \$297.00

70.  $4\frac{1}{2}$  ft,  $5\frac{3}{4}$  ft,  $4\frac{3}{4}$  ft,  $6\frac{1}{4}$  ft,  $5\frac{5}{8}$  ft

Jordan has 5 trees with the heights shown above. He plans to plant the trees in a row with the tallest tree in the middle, the next 2 shorter trees on either side, and the 2 shortest trees on either end of the row. How many different ways of ordering the 5 trees follow Jordan's plan?

F. 1  
G. 2  
H. 4  
J. 6  
K. 30

71. In the set of consecutive integers from 12 to 30, inclusive, there are 4 integers that are multiples of both 2 and 3. How many integers in the set are multiples of **neither** 2 nor 3?

A. 2  
B. 5  
C. 6  
D. 13  
E. 15

72. What is the prime factorization of 714?

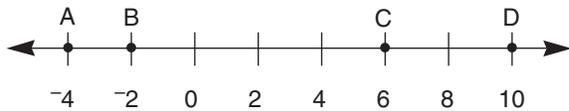
F.  $2 \cdot 357$   
G.  $2 \cdot 3 \cdot 119$   
H.  $2 \cdot 7 \cdot 51$   
J.  $6 \cdot 7 \cdot 17$   
K.  $2 \cdot 3 \cdot 7 \cdot 17$

73. If R, S, and T are integers and  $R + S$  and  $T - S$  are both odd numbers, which of the following must be an **even** number?

A.  $R + T$   
B.  $S + T$   
C. R  
D. S  
E. T

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74.



On the number line above, point E (not shown) is the midpoint of  $\overline{AC}$  and point F (not shown) is the midpoint of  $\overline{BD}$ . What is the length of  $\overline{EF}$ ?

- F. 1 unit
- G. 2 units
- H. 2.5 units
- J. 3 units
- K. 11 units

75. The regular price of a 12-ounce bag of candy is \$2.90. Lily has a coupon for 30% off one of these bags. What is the price per ounce (to the nearest cent) that Lily will pay if she uses the coupon?

- A. \$0.07
- B. \$0.15
- C. \$0.17
- D. \$0.22
- E. \$0.24

76. For what value of  $z$  is  $z - \frac{1}{3}z = 12$ ?

- F. -18
- G. 4
- H. 8
- J. 12
- K. 18

77. On a particular vehicle, the front tire makes three revolutions for every one revolution the back tire makes. How many times larger is the radius of the back tire than the radius of the front tire?

- A.  $\frac{1}{3}$
- B. 3
- C.  $\frac{3}{2}\pi$
- D.  $3\pi$
- E. 9

78. If  $r = 3q + 2$  and  $q = \frac{1}{3^n}$  for  $n = 1, 2,$  or  $3,$  what is the **least** possible value of  $r$ ?

- F. 1
- G.  $2\frac{1}{9}$
- H.  $2\frac{1}{3}$
- J. 3
- K. 5

79.  $|(-6) - (-5) + 4| - |3 - 11| =$

- A. -7
- B. -5
- C. -1
- D. 1
- E. 11

80. To paint a room, Suzanne uses blue and white paint in the ratio of blue:white = 8:3. What was the **total** number of gallons of paint used if she used 6 gallons of blue paint?

- F.  $2\frac{1}{4}$  gal.
- G.  $8\frac{1}{4}$  gal.
- H. 9 gal.
- J. 16 gal.
- K. 22 gal.

81. Which sum below can be expressed as a non-repeating decimal?

- A.  $\frac{1}{2} + \frac{1}{6}$
- B.  $\frac{1}{3} + \frac{1}{4}$
- C.  $\frac{1}{3} + \frac{1}{5}$
- D.  $\frac{1}{4} + \frac{1}{5}$
- E.  $\frac{1}{4} + \frac{1}{6}$

---

**82.** There are 1,000 cubic centimeters in 1 liter and 1,000 cubic millimeters in 1 milliliter. How many cubic millimeters are there in 1,000 cubic centimeters?

- F.** 1,000
  - G.** 10,000
  - H.** 100,000
  - J.** 1,000,000
  - K.** 1,000,000,000
- 

**83.** A radio station plays Samantha's favorite song 6 times each day at random times between 8:00 a.m. and 5:00 p.m. The song is 5 minutes long. If Samantha turns on the radio at a random time between 8:00 a.m. and 5:00 p.m., what is the probability that her favorite song will be playing at that time?

- A.**  $\frac{1}{30}$
  - B.**  $\frac{1}{18}$
  - C.**  $\frac{1}{6}$
  - D.**  $\frac{1}{5}$
  - E.**  $\frac{1}{3}$
- 

**84.** On the first leg of its trip, a plane flew the 900 miles from New York City to Atlanta in 2 hours. On the second leg, it flew the 1,400 miles from Atlanta to Albuquerque in  $2\frac{1}{2}$  hours. How much greater was the plane's mean speed, in miles per hour, on the second leg than on the first?

- F.** 110 mph
  - G.** 150 mph
  - H.** 200 mph
  - J.** 250 mph
  - K.** 500 mph
- 

---

**85.** A water tank is  $\frac{1}{3}$  full; then, 21 gallons of water are added to the tank, making it  $\frac{4}{5}$  full. How many gallons of water could the tank hold if it were completely full?

- A.** 35 gal.
  - B.** 45 gal.
  - C.** 56 gal.
  - D.** 84 gal.
  - E.** 105 gal.
- 

**86.** Today, Tom is  $\frac{1}{4}$  of Jordan's age. In 2 years, Tom will be  $\frac{1}{3}$  of Jordan's age. How old is Jordan today?

- F.** 4 yr
  - G.** 6 yr
  - H.** 12 yr
  - J.** 16 yr
  - K.** 22 yr
- 

**87.** Let  $N = -(|-3| - |-8| + |-4|)$ . What is the value of  $-|N|$ ?

- A.** -9
  - B.** -4
  - C.** -1
  - D.** 1
  - E.** 9
- 

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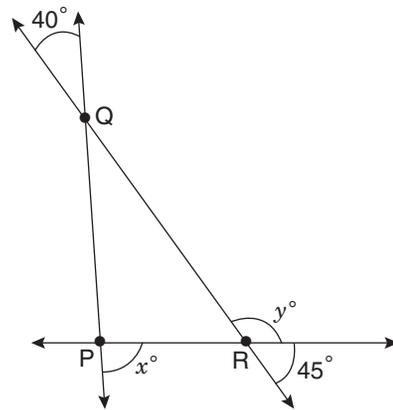
88. Joe began to increase the speed of his car at 2:00 p.m. Since that time, the speed of Joe's car has been steadily increasing by  $1\frac{1}{2}$  miles per hour for each half minute that has passed. If the car is now traveling  $65\frac{1}{2}$  miles per hour, for how many minutes has the car been exceeding the speed limit of 55 miles per hour?
- F.  $3\frac{1}{3}$  min  
 G.  $3\frac{1}{2}$  min  
 H.  $4\frac{1}{2}$  min  
 J. 5 min  
 K. 7 min

89. How many positive two-digit numbers are evenly divisible by 4?
- A. 22  
 B. 23  
 C. 24  
 D. 25  
 E. 26

90. If  $x$ ,  $y$ , and  $z$  are numbers such that  $xy + xz = 100$ , what is the value of  $\frac{x}{5}(3y + 3z) + 10$ ?
- F.  $60 + 2x$   
 G. 62  
 H. 70  
 J. 130  
 K.  $130 + 2x$

91. A steel container is shaped like a cube 10 feet on each side. This container is being filled with water at a rate of 7 cubic feet per minute. At the same time, water is leaking from the bottom of the container at a rate of 2 cubic feet per minute. If the container is exactly half-filled at 9:00 a.m., at what time will the container begin to overflow?
- A. 9:55 a.m.  
 B. 10:00 a.m.  
 C. 10:11 a.m.  
 D. 10:40 a.m.  
 E. 12:20 p.m.

92.

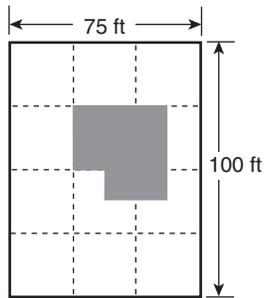


The figure above shows three intersecting straight lines. What is the value of  $y - x$ ?

- F. 40  
 G. 50  
 H. 85  
 J. 95  
 K. 135
93. Each week, Arnold has fixed expenses of \$1,250 at his furniture shop. It costs Arnold \$150 to make a chair in his shop, and he sells each chair for \$275. What is Arnold's **profit** if he makes and sells 25 chairs in 1 week?
- A. \$1,875  
 B. \$2,500  
 C. \$3,125  
 D. \$3,750  
 E. \$4,375

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94.



The drawing above represents a rectangular lot containing a building, indicated by the shaded region. The dashed lines divide the lot into twelve equal-sized squares. If the unshaded portion of the lot is to be paved, about how many square feet will be paved?

- F. 4,000 sq ft
- G. 5,000 sq ft
- H. 6,000 sq ft
- J. 7,000 sq ft
- K. 8,000 sq ft

95. In a restaurant, the mean annual salary of the 4 chefs is \$68,000, and the mean annual salary of the 8 waiters is \$47,000. What is the mean annual salary of all 12 employees?

- A. \$47,000
- B. \$54,000
- C. \$55,500
- D. \$57,500
- E. \$61,000

96. One week the price of gasoline dropped by \$0.05 per gallon. Madison's car travels 27 miles each way to work, and her car travels 30 miles on each gallon of gasoline. What were her total savings, to the nearest cent, over the 5-day work week?

- F. \$0.23
- G. \$0.25
- H. \$0.30
- J. \$0.45
- K. \$0.50

97. Marta and Kim are sisters. Five years ago, Kim's age was twice as great as Marta's age. If Marta is now  $m$  years old, which expression represents Kim's age now?

- A.  $2m + 5$
- B.  $2m$
- C.  $2(m - 5)$
- D.  $2(m + 5) - 5$
- E.  $2(m - 5) + 5$

98. {1, 2, 3, 4, 5, 6}

Company X wants to assign each employee a 3-digit ID number formed from digits in the set shown above. No digit may appear more than once in an ID number, and no two employees may be assigned the same ID number. What is the greatest total number of possible different ID numbers?

- F. 20
- G. 120
- H. 180
- J. 216
- E. 720

99. A rectangular floor is 12 feet wide and 16 feet long. It must be covered with square tiles that are 8 inches on each side. Assume there is no space between adjacent tiles. If the tiles cost \$8 each, how much will it cost to buy the tiles needed to cover the floor?

- A. \$24
- B. \$64
- C. \$192
- D. \$2,304
- E. \$3,456

100. What is the greatest prime factor of 5,355?

- F. 17
- G. 51
- H. 119
- J. 131
- K. 153

THIS IS THE END OF THE TEST. IF TIME REMAINS, YOU MAY CHECK YOUR ANSWERS TO PART 2 AND PART 1. BE SURE THAT THERE ARE NO STRAY MARKS, PARTIALLY FILLED ANSWER CIRCLES, OR INCOMPLETE ERASURES ON YOUR ANSWER SHEET. ■

EXPLANATIONS OF CORRECT ANSWERS

**SCRAMBLED PARAGRAPHS**

**Paragraph 1 (RUQST)**

The first sentence in each paragraph is the given sentence. In this paragraph, the given sentence is a question, and R contains the answer—the song “Take Me Out to the Ballgame.” The choice of the next sentence is more difficult. At first glance, it appears to be Q, which refers to the composer and lyricist of the song. S continues that train of thought by stating when the lyricist first attended a ballgame, and T logically follows by referring to the composer, who attended a ballgame 20 years later. The resulting four-sentence paragraph (RQST) is logically correct, but the remaining sentence, U, cannot follow T. The subject of U (“it”) does not have a referent in T. Thus, U must appear earlier in the paragraph. U says that “it” is sung, so the pronoun must refer to a song. The only song title is in R. U must follow R to form paragraph RUQST, because that is the only order that has a logical place for U. This is an example of a paragraph that is solved by viewing it as a coherent whole, more than the connections between individual sentences.

**Paragraph 2 (TSURQ)**

The opening sentence states a problem: cowboys used rawhide for their gear because they did not have chemicals to soften it. One effective way to soften leather was created by the gauchos of South America (T). The remaining three sentences describe how they did it. S begins with “They,” referring to the gauchos in T, and describes cutting a slot into a piece of wood. The next step (U) was to insert a leather strip into the slot. R continues the process—pulling the strip repeatedly through the slot. (Notice that U, which refers to inserting the strip into the slot, must precede R, which occurs after the strip has been inserted.) The result is a soft, supple piece of leather (Q).

**Paragraph 3 (USTRQ)**

The opening sentence is about topographical maps. U explains how they differ from other maps and defines the term “contour line.” S supplies another function of contour lines—to indicate the slope of the land. T explains in more detail how contour lines indicate slope. The last two sentences are about the depiction of streams and other waterways. R says that blue lines represent waterways. Q explains how the course of a waterway can be revealed by V-shaped contour lines.

**Paragraph 4 (QSRUT)**

According to the given sentence, the jingle dress dance is popular at Native American events. Q is next, describing the steps of the dance, which cause the decorations on the dress to jingle (S). Sentence R describes what made the

dresses “jingle” in the past—shells striking each other. “The modern jingle-dress” in U contrasts past and present dresses, explaining that nowadays shells have been replaced by the lids of metal cans. T contrasts the sounds of the lids and shells.

**Paragraph 5 (SUTQR)**

The given sentence states what early European traders thought about Africa, setting the reader up for a contrasting statement. S fills that role, stating that later European travelers to Africa changed their impressions. The reason for that change is given in U—their visits to Timbuktu. The best sentence to follow U is T. Both U and T take place in the fifteenth century, and “these stories” in T refers to the travelers’ tales in U. T also names a specific explorer, Benedetto Dei. Q begins with the pronoun “he,” which refers to Dei. Only R is left, and it provides a good conclusion, both chronologically (ending with the nineteenth century) and in terms of content (the rise and fall of Timbuktu).

SUQTR might seem correct, but it contains a grammatical problem. The “he” in Q has no referent in U. Another popular choice, SUTRQ, is incorrect because the sequence RQ does not make sense. R describes the decline of Timbuktu, while Q describes it as a thriving metropolis.

**LOGICAL REASONING**

**11. (C)** Draw a grid to show who owned each pet. An X indicates that the person does **not** own the pet. We are told that Xing does **not** own the hamster.

	Parrot	Iguana	Hamster
Raquel			
Tiara			
Xing			X

The question asks which option makes it possible to determine who owns the iguana. For each option, mark the information on the grid and figure out whether you are able to identify the owner of the iguana. If you can’t figure it out, erase the marks and try the next option. For example, mark the information for Option A, writing “yes” to indicate that Tiara owned the hamster, and filling in X’s wherever you can.

**Option A**

	Parrot	Iguana	Hamster
Raquel			X
Tiara	X	X	yes
Xing			X

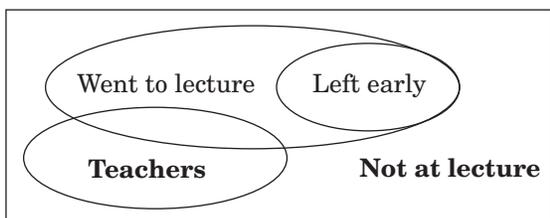
EXPLANATIONS OF CORRECT ANSWERS

Option A does not allow us to figure out who owns the iguana—it could be either Raquel or Xing—so it cannot be correct. Only Option C allows us to determine the iguana's owner. If Raquel owns the parrot and Xing does not own the hamster, then Xing must own the iguana.

**Option C**

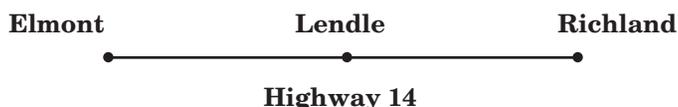
	Parrot	Iguana	Hamster
Raquel	yes	X	X
Tiara	X	X	yes
Xing	X	yes	X

12. (F) Draw a diagram to illustrate the relationship among the groups mentioned in the question: teachers, people who went to the lecture, and people who went to the lecture and left early.



Options G, H, J, and K **might** be true, but not necessarily. Only Option F **must** be true, because none of the teachers left the lecture early.

13. (D) According to statement 1, the towns of Elmont, Lendle, and Richland are connected by Highway 14. Draw a diagram to show this relationship.



We know that Highway 14 is closed from Elmont to Richland. This stretch of highway includes the town of Lendle.

Statement 2 says that the town of Mopley is connected to Lendle, but does not specify *how* it is connected. Mopley could be connected to Lendle by another road (not named), or it could be somewhere on Highway 14.

Not enough information is provided to determine whether Mopley is flooded, or whether Mopley can be reached directly from Elmont, ruling out A and E. Highway 14 connecting Elmont and Richland is flooded, but we cannot determine whether the towns themselves are flooded, ruling out B and C. Only Option D is valid. Highway 14

between Elmont and Richland is closed because of flooding, so no one can drive to Lendle on Highway 14. (Notice that the location of Mopley isn't relevant to the correct answer.)

14. (J) Neither condition places a contestant in a definite position. Rather, they give information about contestants relative to each other. From this information you can infer the following:

HIGHEST	
Statement 1	Statement 2
???	???
Alice	Alice
???	???
Huang	Mariah
???	???

The question marks are placeholders for other contestants. (The diagram shows placeholders for 5 contestants because there is no information to determine anyone's exact position. However, there are only 4 contestants: Alice, Sidney, Huang, and Mariah.) Notice that no information is given about Sidney's airplane. For a question like this, in which all of the information is relative, it is best to evaluate each option and determine which **must** be true. Options F, G, H, and K **might** be true, but not enough information is given to conclude they **must** be true. Only Option J **must** be true. If Sidney finished second, then Sidney finished ahead of Huang and Mariah, and Alice won. Even though Huang and Mariah's exact positions are unknown, the question can still be answered correctly.

15. (A) The question gives the names of four new students and four older student partners. Your task is to match them up correctly. Draw a table to show the four student pairs. Condition 1 says that Sandro and Whitney are paired. Edgar, an older student, is not paired with Gloria or Bai (Condition 3), so he must be paired with Henry.

<b>New students</b>	Bai	Gloria	Sandro	Henry
<b>Older student partners</b>			Whitney	Edgar

Bai is not paired with Rakim (Condition 2), so Rakim must be paired with Gloria, leaving Bai paired with Paola, which is Option A. To answer this question correctly, you must keep track of which students are new and which are older. Otherwise, you might incorrectly pair Paola with Rakim (Option E)

EXPLANATIONS OF CORRECT ANSWERS

**16. (H)** This question contains two conditional statements. You can put the two sentences together: When Tomas is wearing a white shirt, he is also wearing a tie and black shoes. Thus, Option H must be true.

$$W \rightarrow T \rightarrow B$$

The first sentence only tells us what will happen *when* Tomas wears his white shirt. It says nothing about what will happen when Tomas does **not** wear his white shirt. Therefore, it is incorrect to conclude that when Tomas wears a tie he is also wearing a white shirt. Likewise, the second sentence tells us only what will happen *when* Tomas wears a tie. It doesn't tell us what will happen when Tomas does **not** wear a tie. We cannot conclude that whenever Tomas wears his black shoes he is also wearing a tie.

**17. (B)** Draw a diagram like the one below. Eight years are shown because eight is the largest option. The question states that Jack played only the violin the first year. Under Year 1, put an X to represent Jack's instrument during the first year. The question does not state the order in which Jack played each instrument. Since he started with the violin, and played violin for two years, add an X under the second year as well.

Year	1	2	3	4	5	6	7	8
Violin	X	X						
Cello								
Bass								

Jack played the cello and the bass for three years each, and he never played more than two instruments during the same year. One possibility is that he played the cello during years, 2, 3, and 4, as marked below. Jack could not have started playing the bass until year 3. After "Bass," place an X under years 3, 4, and 5.

Year	1	2	3	4	5	6	7	8
Violin	X	X						
Cello		X	X	X				
Bass			X	X	X			

This is one possible arrangement, and it requires five years. All other possibilities require at least five years. Option B is correct.

**18. (K)** This question asks you to match each driver with a car color and put the drivers in order. Because the question asks for the driver at the far right, start with the information about the drivers. According to Statements 2 and 3, Marquise stands to the right of both Anya and Jorge.

There is no information about Patrick's position. He could be in one of several possible positions. Based only on this information, there are several possible orders (using the first initial of each driver).

$$A_{JMP} \quad A_{JPM} \quad P_{AJM}$$

Maybe the colors of the cars will help to solve the problem. Patrick did not drive the white car (Statement 3), the silver car (Statement 4), or the orange car (Statement 5). Therefore, Patrick must drive the brown car. The brown car was to the right of the orange car (Statement 1), but that leaves two possible orders of cars, with an initial standing for each color.

$$O_{SBW} \quad O_{SWB}$$

Thus, we cannot determine who stands at the far right, Patrick (the brown car) or Marquise (the white car), so the answer cannot be determined (Option K).

*19. and 20. These directions differ from the directions for the code in Sample Form A. They state that the position of a letter is **never** the same as that of the word it represents. For example, in the first sentence, Q cannot represent "Are" because they are both first in their sentences. To answer these questions, you need not find out what every letter represents.*

**19. (A)** The letter Z appears in the first and second sentences, but not the third, so the word that it represents must also appear in the first and second sentences, but not the third. "Late" (Option C) is incorrect because it does not appear in the second sentence. "Again" (Option D) is ruled out because the letter and word are in the same position in the first sentence. The remaining words—"are" and "we"—appear in the first and second sentences, and neither word shares the same position as the letter Z. Must we then conclude that the correct answer is "cannot be determined from the information given"? Not necessarily. The letter P is also common to both sentences, but P cannot represent "are" because P and "are" share the same position in the second sentence. Thus P must represent "we," leaving Z to represent "are," which is Option A.

**20. (K)** The word "again" appears only in the first and third sentences, as do the letters Q and H. There is no way to determine which letter represents "again," so the answer is Option K.

**READING****No Summer**

**21. (B)** The correct answer must incorporate all of the important elements of the reading passage, yet it must not be overly broad. Options A and E are details, and Option D, while important, is not the main theme. Option C might look attractive, but the passage is about much more than agriculture in New England. Option B best incorporates the description of the strange summer of 1816 and its possible cause.

**22. (F)** The correct answer requires you to make an inference based on information provided in the second paragraph. Lines 15-16 state that farmers “prepared to plow and plant;” they “expected warm temperatures” (lines 16-17) and were “optimistic” (line 18). Thus, the correct inference is that the farmers expected the weather to be normal and expected their crops to grow, which leads to Option F. Options H and K are incorrect because the snow and cold weather actually worsened growing conditions. The replanted crops were stunted or destroyed (line 27), ruling out Option G. Option J is not true; by July, the weather showed little improvement (lines 28-29).

**23. (C)** The winter of 1816-1817 followed the meager harvest of the summer of 1816. With many crops stunted or destroyed (lines 27-28), one would expect food shortages the following winter, which is Option C. Option A is not mentioned. Options B, D, and E are contradicted by information in the passage.

**24. (J)** Reread the fourth and fifth paragraphs to understand the phrase “the global nature of weather.” They explain how conditions in one part of the world (Indonesia) affected weather in another part of the world (New England), which is Option J. None of the other options are supported by the passage.

**25. (B)** To answer this question, assume that the “year of no summer” was indeed caused by the eruption of Mount Tambora and the lingering dust in the atmosphere. Based on the information in the passage, what else might you expect to have happened? Option B seems possible; dust from the volcanic eruption might have blocked the sunlight and lowered temperatures in other areas of the world. Options A, C, D, and E are not supported by the passage.

**26. (K)** Bessel’s theory is summarized in lines 54-57, and Option K restates his theory. Option F is contradicted by lines 35-37, and Option G summarizes the belief of “some religious leaders” (line 40), not Bessel. Options H and J were not part of Bessel’s theory. The eruption of Mount Pinatubo occurred long after Bessel’s lifetime, so he could not have known about it.

**Samizdat**

**27. (D)** Option A mentions two important samizdat writers, but they are mentioned only in passing in the fourth paragraph and are not the main topic. Option B refers to all poetry published in the Soviet Union, not limited to samizdat poetry, so it is too broad. Option C is incorrect because the Soviet Union had neither a free press nor a free society (lines 6-9). Option D is a good summary of the passage, describing Soviet censorship and the samizdat response. Option E is a detail mentioned only briefly in the first paragraph.

**28. (H)** The earliest phase of samizdat is described in lines 35-36: “At first, samizdat focused mainly on literature, such as poetry and novels.” Only Option H, a short story, fits into this category. None of the other options are representative of the earliest phase of samizdat, though they might be examples of later stages.

**29. (B)** To answer this question, you must read more than the sentence containing the phrase “a knock at his door in the middle of the night” (lines 47-48). The fourth paragraph says that Pasternak feared that he would appear disloyal to the Soviet state. What did he fear? Lines 18-19 state, “Most worried that they were being watched by the government’s secret police.” The correct answer is most likely that Pasternak feared a visit by the secret police, which is Option B. The other options are mentioned in the passage but are not objects of fear, as the secret police were.

**30. (J)** The correct answer must be in the last paragraph, the only paragraph to mention computers (lines 66-70). The passage does not specify the content of the texts stored on computers, so Options F and G can be ruled out. *Doctor Zhivago* was smuggled out by samizdat, not by computer, which eliminates Option H. Option J is the best answer, since storing and circulating texts via computers is more efficient than typing or hand-copying samizdat texts. Option K is not mentioned.

**31. (B)** The answer to this question is not stated directly in the passage but can be inferred from lines 16-19. Unsigned documents protected samizdat writers from capture and punishment, which is Option B. Options A and E are not likely reasons—the materials were in fact smuggled outside the Soviet Union and copied over and over. Option C might look attractive, but the samizdat documents were unsigned to protect the identities of the writers, not of the secret police. Since all samizdat documents were unsigned, that was not a factor in judging their trustworthiness (Option D).

**32. (F)** The answer is found in lines 71-75. The correct answer, Option F, makes the connection between the abolishment of censorship and subsequent freedom of the press, which eliminated the need for samizdat. The passage does not support Options G or K, and it contradicts Option H. Option J is not the reason that samizdat networks ended.

### Camera

**33. (D)** Options A, B, and C are mentioned in passing, but they are not the themes of the passage. Option E is mentioned only in the last paragraph. Option D best describes what the passage is about—early versions of the concealed camera, examples of its uses, and its role in spy craft.

**34. (K)** The answer, Option K, is found in lines 9-11. Despite the name of the camera, amateur photographers, not detectives, used this camera.

**35. (D)** The correct answer, Option D, is found in lines 9-12. Early detective cameras resembled boxes (Option A), but that was not their purpose. Options B, C, and E refer to other kinds of cameras, not early detective cameras.

**36. (J)** According to lines 21-25, the camera with mirrors allowed the photographer to aim the camera in one direction while photographing something in another direction (Option J). Options F and G refer to early detective cameras, not the camera with mirrors, which resembled an ordinary camera. Option H describes a different use for cameras, as presented in the third paragraph. Option K is not mentioned.

**37. (A)** The correct answer is found in lines 17-19. Option A restates the idea that people were no longer deceived by detective cameras. None of the other options is supported by the passage.

**38. (G)** Reread the third paragraph to understand the “idea” in line 40. The attempt to use pigeons to photograph the enemy’s army position was impractical, but the “idea behind it”—taking photographs from overhead, without detection—was practical, which is Option G. The passage gives the example of satellite-mounted cameras to illustrate its practicality. Options F and J were true for photography in general, not to “the idea” in line 40. Option H describes a use for aerial photography, not the “idea.” Option K refers to the impractical attempt, not to the idea behind it.

### Pueblo

**39. (D)** Option A cannot be the theme because only the first paragraph discusses how weather conditions affect tree growth. Option B is too broad to be the theme of the passage, which focuses on Pueblo and Hopi villages. The reason for the abandonment of the Pueblo villages (Option C) is mentioned only in the last paragraph, so it is not the theme. Option D, “how tree-ring dating can establish the age of archaeological findings,” offers a good summary of the entire passage, which explains the science of tree-ring dating, followed by several examples. Option E cannot be correct. The passage does not mention other dating methods, nor does it claim that tree-ring dating is the best method for determining dates.

**40. (K)** This question requires you to understand the established chronology (line 50) and “floating” chronology (line 53) and to draw an inference about the “key” beam, based on information in the passage. Option F is true, but can be proved without a “key” beam. The passage does not mention Options G, H, and J. Option K is correct. The “key” beam, with its overlapping ring patterns of the established and “floating” chronologies, allowed archaeologists to connect the two chronologies.

**41. (B)** The trees in the question share an identical pattern of a very wide band followed by two narrow bands, showing that both trees were alive during that three-year period, although they were planted and cut at different times. Options A and B can be evaluated by assigning arbitrary years to the three shaded rings—for example, 10, 11, and 12. (It does not matter what numbers you choose, as long as they are used consistently.) Counting out from the shaded rings, Log 1 was cut in the year 16, while Log 2 was cut in the year 13. Thus, Log 2 was cut before Log 1 (Option B). Option C contradicts the reasoning behind tree-ring dating and cannot be correct. There is no way to determine which log came from the faster-growing tree, ruling out Options D and E.

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**42. (G)** This question requires you to choose the correct answer based on information that is not directly stated. Evaluate each option to determine whether tree-ring dating would be useful for that purpose. The passage gives no information about the kinds of trees, so Option F is not correct. Lines 10-12 support the correct answer that “tracking the historical sequence of weather cycles in a region” (Option G) is both possible and useful using tree-ring dating. Lines 62-65 also support Option G. Read the remaining options to make sure that Option G is the best answer. Options H and K cannot be answered by tree-ring dating. Comparing growing seasons around the world is not possible (Option J), since only one part of the world, the southwestern United States, is discussed with relation to tree-ring dating.

**43. (A)** We must refer to several parts of the passage to answer the question. The second paragraph states that archaeologists had established a continuous tree-ring chronology going back to A.D. 1260, based on ring patterns of trees with overlapping lifetimes (the “established” chronology). The third paragraph, where the quotation appears, describes the development of a “floating” chronology that did not overlap the established chronology. The fact that they did not overlap implies that the years of the floating chronology preceded the years of the established chronology, which is Option A. Option B cannot be true because the logs used in Oraibi went as far back as A.D. 1260, but no further. The remaining options do not explain the archaeologists’ conclusion.

**44. (H)** The abandonment of the Pueblo villages is mentioned in lines 24-25 and line 36, but only in the context of determining when the villages were occupied. The reason for their abandonment is not brought up until the last paragraph, where the author suggests that the villagers left their homes to find a more hospitable climate (lines 63-65). This is restated in Option H, the correct answer. Options F, G, J, and K might sound reasonable, but there is no evidence in the passage to support them.

### Smiles

**45. (A)** Options B and D are important details, not the main theme. Option C is too broad. The passage is about testing only one theory on the relationship between emotions and facial expressions, not about the use of facial expressions in any type of research. Option A is best. It is broad enough to encompass Darwin’s theory and more modern theories, and it correctly identifies the issue, the causation of emotions. Option E is a detail mentioned only in the last paragraph.

**46. (K)** After volunteers said the required words, researchers assessed how happy the volunteers felt (lines 25-28), which is Option K. Option F is related to the theory, but was never carried out. Option G is ruled out because volunteers who smiled were not in the group that said words like “few” (lines 25-28). Option H is contradicted by lines 23-24. The volunteers, not the researchers, placed their own facial muscles into smiles or frowns (lines 21-23), eliminating Option J.

**47. (A)** In the first paragraph, Darwin’s theory is described as controversial and impossible to prove, and it thus never gained acceptance (lines 10-12). Option A best summarizes this idea. Options B and D are contradicted by the passage. Options C and E don’t answer the question.

**48. (H)** Volunteers who said words such as “cheese” were measurably happier than volunteers who said other words (lines 25-28), implying that the act of smiling leads to feelings of happiness. According to the theory in lines 33-36, a smile may lower the temperature of the blood flowing to the hypothalamus (lines 44-47), which is Option H. Options F, J, and K are contradicted by the passage. Option G is not mentioned.

**49. (A)** The notion of a smile in one’s heart (lines 19-20) signifies a feeling of happiness. Consciously smiling can produce a smile in one’s heart, which is Option A. None of the other options correspond to this “notion.”

**50. (G)** The hypothalamus is an area of the brain believed to regulate emotions (lines 40-41). Regulating and managing emotions are the same process, and thus Option G is the best answer. None of the other options is supported by the passage. Option H may seem attractive, but the passage theorizes that the act of smiling, not the hypothalamus, changes the temperature of blood.

51. (E)  $\frac{4.5}{0.1} \times 0.22 = 45 \times 0.22 = 9.9$

52. (K) First, find the ratio of red to green to blue pencils: 480:240:160 = 6:3:2

Since  $6 + 3 + 2 = 11$ , multiply each value by 2 (because  $2 \times 11 = 22$ ) to get the number of each color pencil in a set of 22 randomly chosen pencils: 12 red, 6 green, 4 blue

53. (D) The quickest solution is to first “round up” from 46 hours to 48 hours, because 48 hours is 2 full days. Thus, 48 hours after 9:30 p.m. on Friday would be 9:30 p.m. on Sunday. Since the question asks for 46 hours, subtract 2 hours from 9:30 p.m. Sunday to get 7:30 p.m. Sunday.

54. (F) The cost for one child’s supplies is:

$$\$1.09 + 2(\$0.59) = \$2.27$$

Divide the total money available (\$15) by the cost for one child’s supplies (\$2.27) to get the number of children that can be provided with the supplies:  $\$15 \div \$2.27 = 6.6\dots$

You do not need to complete the division, because the number of children must be a whole number. Six children can be provided with the complete requirement of supplies.

55. (A) First, simplify the inequality:

$$x + 7 < 23$$

$$x < 16$$

The positive integers that satisfy the inequality are 1, 2, 3, ..., 14, 15. (We cannot include 16 because  $x$  must be **less than** 16.) 15 positive integers satisfy this inequality.

56. (J) The area of triangle MPR is equal to half the area of rectangle MNQP. So, the area of MPR is also equal to the area of triangles MNP + RPQ. Point P is the midpoint of side  $\overline{NQ}$ , so triangle MNP is equal in area to triangle RQP. Thus, triangle MPR = 2(RQP). The area of the unshaded region is the sum of the areas of triangles MPR and MNP.

$$MNP = RQP = 24 \text{ sq cm}$$

$$MPQ = 2(RQP) = 48 \text{ sq cm}$$

Thus, the area of the unshaded region is  $24 + 48 = 72 \text{ sq cm}$

57. (B) Write 0.75 as a fraction in lowest terms to find the least value of  $x$ :  $0.75 = \frac{75}{100} = \frac{3}{4}$   
So, the least possible positive integer value of  $x = 3$ .

58. (H)  $\frac{(-51)(-51)}{17 \cdot 17 \cdot 17} = \frac{(-3)(-3)}{17} = \frac{9}{17}$

59. (C) To find the average, multiply each number of songs by the number of radio stations. Then add those products and divide by the total number of radio stations:

$$\frac{(14 \cdot 8) + (15 \cdot 4) + (16 \cdot 4) + (17 \cdot 5) + (18 \cdot 9)}{30}$$

$$= \frac{112 + 60 + 64 + 85 + 162}{30}$$

$$= 16.1$$

60. (F)  $|190 - 210| + |19 - 21| + x = 100$   
 $|-20| + |-2| + x = 100$   
 $20 + 2 + x = 100$   
 $x = 78$

61. (B) Use proportions to make the conversions:

Lorgs to dollars

$$\frac{140}{x} = \frac{7}{1} \quad 7x = 140 \quad x = \$20$$

Dalts to dollars

$$\frac{16}{x} = \frac{0.5}{1} \quad 0.5x = 16 \quad x = \$32$$

$$\text{Total dollars} = 20 + 32 = \$52$$

62. (G) The question asks for the number of children with blond hair or brown eyes, but **not both**. According to the chart, 18 children have blond hair and *blue* eyes, and 15 children have brown eyes and *black* hair.  $18 + 15 = 33$  children with blond hair or brown eyes, but not both.

63. (A) The only item on the chart that is priced above \$75 is the rain coat. Only one rain coat was purchased. Calculate the sales tax on the price of that rain coat:  
 $\$102 \times 0.06 = \$6.12$

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**64. (K)** The values in the problem can be grouped into 3 terms that each contain a positive and negative value:  $(-2, 4)$ ,  $(-6, 8)$ ,  $(-22, 24)$ . Arrange the terms into 2 rows to determine the pattern and find the missing terms:

$$\begin{array}{cccc} -2 & -6 & \dots & -22 \\ 4 & 8 & \dots & 24 \end{array}$$

The values in the top row are decreasing by 4, while the values in the bottom row are increasing by 4. Fill in the remaining values:

$$\begin{array}{cccccc} -2 & -6 & -10 & -14 & -18 & -22 \\ 4 & 8 & 12 & 16 & 20 & 24 \end{array}$$

To find the sum, combine the terms as follows:

$$(-2 + 4) + (-6 + 8) + (-10 + 12) + \dots + (-22 + 24)$$

Note that each pair of parentheses sums to 2. Count the number of pairs of parentheses (6) and multiply to find the final answer:

$$2 + 2 + 2 + \dots + 2 = 6(2) = 12$$

**65. (B)** The pitcher originally contained 44 ounces of juice  $(32 + 12)$ . If  $x$  ounces of grapefruit juice is added, the pitcher now contains  $44 + x$  ounces of juice.  $12 + x$  ounces of that is grapefruit juice, which makes up  $\frac{1}{3}$  of the entire juice mix. Use that information to set up a proportion to solve for  $x$ :

$$\frac{12 + x}{44 + x} = \frac{1}{3}$$

$$3(12 + x) = 44 + x$$

$$36 + 3x = 44 + x$$

$$2x = 8$$

$$x = 4 \text{ ounces}$$

**66. (J)** To find the median, first count the number of tests (Xs) in the figure, which is 17. The median is the middle value. The middle value of 17 is 9. Counting from the left, find the ninth X in the figure to determine the median score (80).

**67. (C)** If the ratio is 5 ounces of gasoline to 6 ounces of oil, then gasoline makes up  $\frac{5}{11}$  of the fuel mix. Use a proportion to calculate the number of ounces of gasoline ( $x$ ) in 33 ounces of mix:

$$\frac{x}{33} = \frac{5}{11} \qquad x = 15 \text{ ounce}$$

**68. (F)** It may be easier to see the order of the fractions by changing them to mixed numbers or decimals:

$$\frac{11}{3} = 3\frac{2}{3} = 3.666\dots$$

$$\frac{25}{7} = 3\frac{4}{7} = 3.57\dots$$

$$\frac{18}{5} = 3\frac{3}{5} = 3.6$$

The smallest fraction is  $\frac{25}{7}$ , followed by  $\frac{18}{5}$ , and finally  $\frac{11}{3}$ .

**69. (D)** First, find the sale price of the dress. If it is on sale for  $\frac{1}{3}$  off the original price, the sale price is  $\frac{2}{3}$  of the original price:  $\$450 \times \frac{2}{3} = \$300$

Alia has a 10% discount on the sale price. 10% of \$300 is \$30, so the discounted price will be:

$$\$300 - \$30 = \$270$$

Next, calculate the sales tax on the discounted price:  $\$270 \times 0.06 = \$16.20$

So, the total cost that Alia pays for the dress is:

$$\$270 + \$16.20 = \$286.20$$

**70. (H)** The tallest tree (T) goes in the middle, so there is only 1 possible location for that tree. The next two tallest trees (call them  $a$  and  $b$ ) go on either side of the tallest tree, so there are 2 possible options ( $aTb$  and  $bTa$ ). The final two trees ( $c$  and  $d$ ) go on either side of the set ( $caTbd$ ,  $daTbc$ ,  $cbTad$ ,  $dbTac$ ). So, there are 4 different ways to arrange the trees.

You could also use the counting principle to solve this:  $1 \times 2 \times 2 = 4$

**71. (C)** The question asks for integers that are **not** divisible by 2 or 3. Since all even numbers are divisible by 2, begin by listing the odd integers in this set:

$$13, 15, 17, 19, 21, 23, 25, 27, 29$$

Then, eliminate those integers that are multiples of 3. The remaining integers are:

$$13, 17, 19, 23, 25, 29$$

The answer is 6.

**72. (K)** Since 714 is even, factor out a 2:  
 $714 = 2 \cdot 357$ . The sum of the digits of 357 is 15, so we know 357 is a multiple of 3:  
 $714 = 2 \cdot 3 \cdot 119$   
 Finally, 119 is divisible by 7, so  
 $714 = 2 \cdot 3 \cdot 7 \cdot 17$

**73. (A)** Since  $R + S$  is odd, then one of the two variables ( $R$  or  $S$ ) must be odd and the other must be even. Similarly, since  $T - S$  is odd, one of the two variables must be odd and the other must be even. Since  $S$  is common to both expressions, if  $S$  is odd, then  $R$  and  $T$  are both even; and if  $S$  is even, both  $R$  and  $T$  are odd. It is not possible to determine which of the two possibilities is true, so Options C, D, and E can be eliminated as the correct answer.

Option B ( $S + T$ ) can be eliminated because if  $T - S$  is odd, then  $S + T$  is also odd.

Option A ( $R + T$ ) is the only possible answer. If  $R$  and  $T$  are both odd, then  $R + T$  is even. If  $R$  and  $T$  are both even, then  $R + T$  is even.

**74. (J)** Calculate the locations of points E and F on the number line using the midpoint formula:  
 Point E = (point A + point C)  $\div$  2 =  $\frac{-4 + 6}{2} = 1$   
 Point F = (point B + point D)  $\div$  2 =  $\frac{-2 + 10}{2} = 4$   
 Now calculate the length of  $\overline{EF}$ :  $4 - 1 = 3$  units

**75. (C)** Lily has a coupon for 30% off, which means she will pay 70% of the regular price ( $100\% - 30\% = 70\%$ ). Lily will pay  $\$2.90 \cdot 70\% = \$2.03$  for this bag of candy.  
 To calculate the price per ounce, divide the final price Lily pays by the number of ounces in the bag:  
 $\$2.03 \div 12 = \$0.16917$ , which rounds to \$0.17

**76. (K)**  $z - \frac{1}{3}z = 12$   
 $\frac{2}{3}z = 12$   
 $z = \frac{36}{2} = 18$

**77. (B)** The formula for the circumference of a circle is  $C = 2r\pi$ . Let  $f$  be the radius of the front tire and  $b$  equal the radius of the back tire. Then the circumference of the front tire would be  $2f\pi$  and the circumference of the back tire would be  $2b\pi$ .

Since it takes the front tire 3 revolutions for every 1 revolution of the back tire, the circumference of the back tire must be three times the circumference of the front tire:

$$2b\pi = 3(2f\pi)$$

$$b = 3f$$

Thus, the radius of the back tire ( $b$ ) is 3 times larger than the radius of the front tire ( $f$ ).

**78. (G)** First, calculate the three possible values of  $q$ :

$$\text{If } n = 1, \text{ then } q = \frac{1}{3^1} = \frac{1}{3}.$$

$$\text{If } n = 2, \text{ then } q = \frac{1}{3^2} = \frac{1}{9}.$$

$$\text{If } n = 3, \text{ then } q = \frac{1}{3^3} = \frac{1}{27}.$$

The least value of  $r$  will occur when  $q$  is the smallest ( $q = \frac{1}{27}$ ). So, the least possible value of  $r$  is:  $r = 3(\frac{1}{27}) + 2 = \frac{1}{9} + 2 = 2\frac{1}{9}$

**79. (B)**  $|(-6) - (-5) + 4| - |3 - 11| =$   
 $|3| - |-8| = 3 - 8 = -5$

**80. (G)** Create a proportion to calculate the total number of gallons of paint used:

$$\frac{\text{Gallons of blue}}{\text{total gallons}} = \frac{8}{8 + 3} = \frac{6}{x}$$

$$8x = 6(11)$$

$$x = 8\frac{1}{4} \text{ gallons}$$

**81. (D)** Of the fractions listed in the options ( $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$ , and  $\frac{1}{6}$ ),  $\frac{1}{3}$  and  $\frac{1}{6}$  are the only fractions that can be written as repeating decimals. Adding a non-repeating decimal to a repeating decimal will result in a

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repeating decimal. Thus, the correct answer must contain two non-repeating decimals, which is option D:  $\frac{1}{4} + \frac{1}{5}$

**82. (J)** 1 L = 1,000 mL

$$1 \text{ L} = (1,000)(1,000) \text{ cu mm} = 1,000,000 \text{ cu mm}$$

**83. (B)** If the song is 5 minutes long, then it could be played up to  $60 \div 5 = 12$  times per hour. There are 9 hours between 8:00 a.m. and 5:00 p.m. So, the song could be played up to  $12 \times 9 = 108$  possible times between the given hours. Since the song is played 6 times per day, the probability of Samantha hearing the song is  $\frac{6}{108} = \frac{1}{18}$ .

**84. (F)** To find the speed of the plane, divide the miles travelled by the number of hours:

$$\text{First leg: } 900 \text{ miles} \div 2 \text{ hours} = 450 \text{ mph}$$

$$\text{Second leg: } 1,400 \text{ miles} \div 2\frac{1}{2} \text{ hours} = 560 \text{ mph}$$

The question asks how much greater the speed was in the second leg than in the first, so subtract:  $560 - 450 = 110$  mph

**85. (B)** Let  $x$  be the number of gallons of water the tank holds when completely full. Use the information in the first sentence to set up the equation:

$$\frac{4}{5}x = \frac{1}{3}x + 21$$

$$\frac{12}{15}x - \frac{5}{15}x = 21$$

$$7x = 15 \cdot 21$$

$$x = 45 \text{ gallons}$$

**86. (J)** First, set up an equation to express Tom's age (T) and Jordan's age (J) today:

$$T = \frac{1}{4}J$$

Two years from now, Tom's age will be  $T + 2$  and Jordan's age will be  $J + 2$ . Use that information and the information from the second sentence in the question to set up an equation about the relationship between Tom's age and Jordan's age in two years:

$$T + 2 = \frac{1}{3}(J + 2)$$

Simplify the above equation for T:

$$T = \frac{1}{3}(J + 2) - 2$$

Now, set the two equations equal to each other and solve for J:

$$\frac{1}{4}J = \frac{1}{3}(J + 2) - 2$$

$$\frac{1}{4}J = \frac{1}{3}J - \frac{4}{3}$$

Multiply both sides of the equation by the common denominator (12):

$$12\left(\frac{1}{4}J\right) = 12\left(\frac{1}{3}J - \frac{4}{3}\right)$$

$$3J = 4J - 16$$

$$J = 16$$

**87. (C)** First, simplify N:  $N = -(3 - 8 + 4) = -(-1) = 1$   
Then, find  $-|N|$ :  $-|N| = -|1| = -1$

**88. (G)** First, find the amount by which Joe is currently exceeding the speed limit of 55 miles per hour:

$$65\frac{1}{2} - 55 = 10\frac{1}{2} \text{ mph}$$

He increased his speed at a rate of  $1\frac{1}{2}$  mph each half-minute, or 3 mph every minute.

To determine how many minutes he has been exceeding the speed limit, divide:

$$10\frac{1}{2} \div 3 = \frac{7}{2} = 3\frac{1}{2} \text{ minutes}$$

**89. (A)** The question asks for the number of positive two-digit numbers evenly divisible by 4. The smallest such number is 12 ( $4 \times 3$ ), and the largest is 96 ( $4 \times 24$ ). Thus, the two-digit numbers evenly divisible by 4 are  $4 \times 3$ ,  $4 \times 4$ ,  $4 \times 5$ , and so on up to  $4 \times 24$ .

To find how many such numbers there are, subtract the lowest value from the greatest value:  $24 - 3 = 21$ .

However, since each endpoint is included ( $4 \times 3$  and  $4 \times 24$ ), add 1 to that value to get the exact count of the numbers:  $21 + 1 = 22$

- 90. (H)** The left side of the given equation ( $xy + xz = 100$ ) must be rearranged to look like  $\frac{x}{5}(3y + 3z) + 10$  to get the answer.

First, factor out the  $x$ :  $x(y + z) = 100$

Next, multiply both sides of the equation by 3:  
 $3x(y + z) = 3(100)$        $x(3y + 3z) = 300$

Then, divide both sides by 5:

$$\frac{1}{5}x(3y + 3z) = \frac{300}{5} \quad \frac{x}{5}(3y + 3z) = 60$$

Finally, add 10 to both sides:

$$\frac{x}{5}(3y + 3z) + 10 = 70$$

Now that the left side looks like the expression in the question, the answer is the number on the right side (70).

- 91. (D)** The volume of the container is  $10 \times 10 \times 10 = 1,000$  cubic feet. Since it is already half full at 9:00 a.m., it will begin to overflow after 500 cubic feet of water is added to it.

7 cubic feet of water are being added per minute, but 2 cubic feet of water leak out per minute. That means  $7 - 2 = 5$  cubic feet of water are being added to the tank each minute.

$$500 \text{ cubic feet} \div 5 \text{ cubic feet per minute} = 100 \text{ minutes}$$

100 minutes is equal to 1 hour 40 minutes.  
1 hour 40 minutes after 9:00 a.m. is 10:40 a.m.

- 92. (G)** Angle PQR and the marked  $40^\circ$  angle are vertical angles and thus are congruent, so angle PQR is  $40^\circ$ . Similarly, angle QRP is  $45^\circ$  because it is a vertical angle with the one marked  $45^\circ$ . Given those two angles, calculate the third angle of triangle PQR (angle RPQ):

$$40 + 45 + \text{RPQ} = 180$$

$$\text{RPQ} = 95$$

Angle RPQ and angle  $x$  are supplementary, which means they sum to 180, so  
 $x = 180 - 95 = 85$ .

Similarly, angle  $y$  and angle QRP are supplementary, so  $y = 180 - 45 = 135$ .

Thus, the value of  $y - x = 135 - 85 = 50$

- 93. (A)** Each chair costs Arnold \$150 to make, and he sells the chair for \$275. His profit is found by subtracting the cost from the price:

$$\$275 - \$150 = \$125 \text{ per chair}$$

If Arnold makes and sells 25 chairs in a week, his initial profit is  $25 \cdot \$125 = \$3,125$ . However, Arnold has additional fixed expenses of \$1,250 per week, so this cost must also be subtracted. Thus, his final profit is:

$$\$3,125 - \$1,250 = \$1,875$$

- 94. (H)** First, calculate the area of the entire lot:

$$75 \times 100 = 7,500 \text{ sq ft}$$

There are 12 equal-sized squares, so each square is equal to  $7,500 \div 12 = 625$  sq ft.

From the figure, it appears the building (shaded region) covers 1 full square, 1 half-square, and 2 quarter-squares, for a total of 2 full squares ( $1 + \frac{1}{2} + 2(\frac{1}{4}) = 2$ ). Two full squares are equal to  $625 + 625 = 1,250$  sq ft.

To find the area that is **not** shaded, subtract the area of the building from the area of the entire lot:  $7,500 - 1,250 = 6,250$  sq ft, which rounds to 6,000 sq ft.

Remember that the question asks you to find out about **how** many square feet and not **exactly how many square feet**.

- 95. (B)** To find the mean salary for all 12 employees, find the sum for each group. Thus, 4 people earned a total of \$272,000 and 8 people earned a total of \$376,000. Use the mean formula:

$$272,000 + 376,000 = \frac{648,000}{12} = \$54,000$$

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**96. (J)** Madison’s car travels 27 miles one way to work, so it travels a total of 54 miles per day. In 5 days, it travels  $5 \times 54 = 270$  miles. Her car travels 30 miles on each gallon of gas, so it uses  $\frac{270}{30} = 9$  gallons of gas per week. To find the total savings, multiply the number of gallons by the savings per gallon:  
 $9 \text{ gallons} \cdot \$0.05 = \$0.45$

**97. (E)** Let  $m =$  Marta’s age now, and  $k =$  Kim’s age now. Then 5 years ago, Marta’s age was  $m - 5$ , and Kim’s age was  $k - 5$ . Using the information in the question, set up the equation to solve for  $k$ :  
 $k - 5 = 2(m - 5)$   
 $k = 2(m - 5) + 5$

**98. (G)** Using the counting principle, the first digit has 6 possible values (1 through 6). The second digit then has 5 possible values, and the third digit has 4 possible values. So the total number of possible different ID numbers is  $6 \times 5 \times 4 = 120$ .

**99. (E)** Since the floor measurement is in feet and the tile measurement is in inches, change inches into feet:

$$8 \text{ in.} = \frac{8}{12} = \frac{2}{3} \text{ ft}$$

The floor is 12 ft wide. To find the number of tiles needed along the width of the floor, divide the width by the size of a tile:

$$12 \text{ ft} \div \frac{2}{3} = 12 \cdot \frac{3}{2} = 18 \text{ tiles}$$

The floor is 16 ft long. Find the number of tiles needed along the length of the floor:

$$16 \text{ ft} \div \frac{2}{3} = 24 \text{ tiles}$$

To find the total number of tiles needed, multiply the number needed along the width by the number needed along the length:

$$18 \cdot 24 = 432 \text{ tiles}$$

To find the total cost, multiply the total tiles by the cost per tile:  $432 \text{ tiles} \cdot \$8 = \$3,456$

**100. (F)** First, find the prime factorization of 5,355:  
 $5,355 = 5 \cdot 1,071 = 5 \cdot 9 \cdot 119 = 3^2 \cdot 5 \cdot 7 \cdot 17$   
 The greatest prime factor is 17.

Answer Key for Sample Form B

Paragraph 1	11. C	20. K	29. B	38. G	47. A	56. J	65. B	74. J	83. B	92. G
R U Q S T	12. F	21. B	30. J	39. D	48. H	57. B	66. J	75. C	84. F	93. A
Paragraph 2	13. D	22. F	31. B	40. K	49. A	58. H	67. C	76. K	85. B	94. H
T S U R Q	14. J	23. C	32. F	41. B	50. G	59. C	68. F	77. B	86. J	95. B
Paragraph 3	15. A	24. J	33. D	42. G	51. E	60. F	69. D	78. G	87. C	96. J
U S T R Q	16. H	25. B	34. K	43. A	52. K	61. B	70. H	79. B	88. G	97. E
Paragraph 4	17. B	26. K	35. D	44. H	53. D	62. G	71. C	80. G	89. A	98. G
Q S R U T	18. K	27. D	36. J	45. A	54. F	63. A	72. K	81. D	90. H	99. E
Paragraph 5	19. A	28. H	37. A	46. K	55. A	64. K	73. A	82. J	91. D	100. F
S U T Q R										

# SAMPLE PROBLEMS FOR GRADE 9 MATHEMATICS

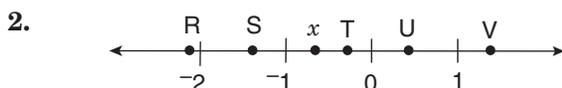
**DIRECTIONS:** This section provides sample mathematics problems for the Grade 9 test forms. These problems are based on material included in the New York City curriculum for Grade 8. (The Grade 8 problems on sample forms A and B cover mathematics material through Grade 7.) General directions for how to answer math questions are located on pages 50 and 88. There is no sample answer sheet for this section; mark your answers directly on this page or on a separate piece of paper.

1. STUDENTS OWNING PETS

Number of Pets Owned	Number of Students
0	5
1	7
2	3
3	4
4	0
5	1

There are 20 students in a class. The frequency table above shows the number of these students that own 0, 1, 2, 3, 4, or 5 pets. What is the mean number of pets owned per student in this class?

- A.  $1\frac{1}{2}$
- B. 3
- C.  $3\frac{1}{3}$
- D. 4
- E. 5



On the number line above, which letter could represent the location of  $x^2$ ?

- F. R
- G. S
- H. T
- J. U
- K. V

3. Define the operation  $\square$  as follows:

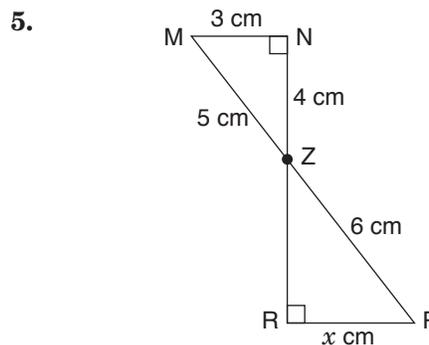
$$a \square \left(\frac{b}{c}\right) = \frac{a}{\left(\frac{b}{c}\right)}, \text{ where } b \text{ and } c \text{ are not zero.}$$

If  $2 \square \left(\frac{4}{x}\right) = \frac{3}{2}$ , what is the value of  $x$ ?

- A. 1
- B. 2
- C. 3
- D. 6
- E. 12

4. If  $(4^3)(8^2) = 2^x$ , what is the value of  $x$ ?

- F. 12
- G. 10
- H. 7
- J. 6
- K. 5



In the figure above, all lines are straight.  $\overline{MP}$  and  $\overline{RN}$  intersect at point  $Z$ . What is the value of  $x$ ?

- A. 3
- B.  $3\frac{3}{5}$
- C. 4
- D.  $4\frac{4}{5}$
- E. 5

6. Raul has two containers. One is a cylinder with an inner radius of 4 inches and an inner height of 8 inches. The other is a cube with inner height, width, and length each equal to 8 inches. The cylinder is filled with water and the cube is empty. If Raul pours the contents of the cylinder into the cube, how deep will the water be in the cube?

- F. 2 in.  
 G.  $\frac{2}{3}\pi$  in.  
 H. 4 in.  
 J.  $2\pi$  in.  
 K.  $4\pi$  in.

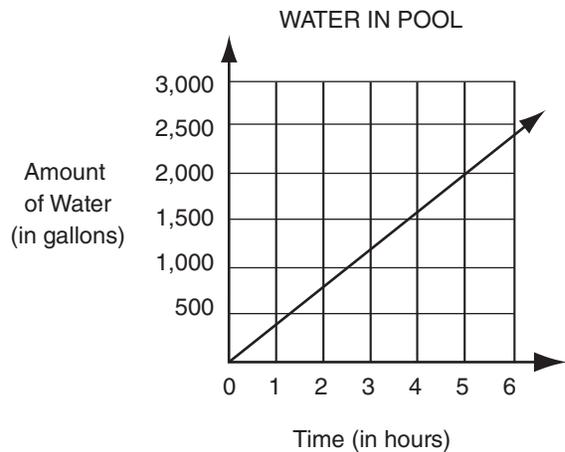
7. The translation of point P (3, 5) to P' (5, -3) is equivalent to rotating point P by which of the following clockwise rotations about the origin?

- A.  $45^\circ$   
 B.  $90^\circ$   
 C.  $135^\circ$   
 D.  $180^\circ$   
 E.  $225^\circ$

8. If  $(12.6 \times 10^{18}) - (1.1 \times 10^{17}) = k \times 10^{19}$ , what is the value of  $k$ ?

- F. 0.016  
 G. 1.150  
 H. 1.249  
 J. 11.500  
 K. 16.000

9.



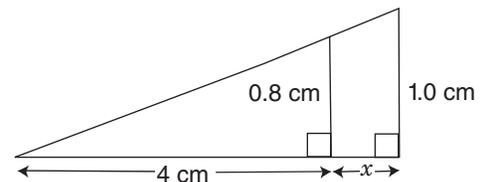
A swimming pool is being filled with water at a constant rate. The figure above is a portion of a graph that shows how the number of gallons of water in the pool changes over time. Starting with an empty pool, at the end of hour 5 there are 2,000 gallons in the pool. If the pool continues to fill at this rate, how much water will be in the pool at the end of hour 20? (Assume that the pool holds a total of 100,000 gallons.)

- A. 5,600 gal.  
 B. 6,000 gal.  
 C. 8,000 gal.  
 D. 40,000 gal.  
 E. 80,000 gal.

10. Let  $(x, y) \rightarrow (x + 10, y - 10)$ . Using that rule, if  $(n, r) \rightarrow (100, 100)$ , what is  $(n, r)$ ?

- F. (90, 90)  
 G. (90, 110)  
 H. (100, 100)  
 J. (110, 90)  
 K. (110, 110)

11.



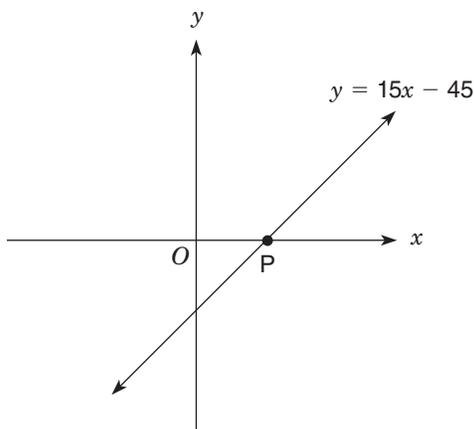
In the figure above, what is the value of  $x$ ?

- A. 1 cm  
 B. 1.2 cm  
 C. 3.2 cm  
 D. 4 cm  
 E. 5 cm

12. Straight line  $k$  passes through the point  $(-3, 4)$  with an  $x$ -intercept of 3. What is the equation of line  $k$ ?

- F.  $y = -\frac{3}{2}x + 3$   
 G.  $y = -\frac{2}{3}x - 3$   
 H.  $y = -\frac{2}{3}x + 2$   
 J.  $y = -\frac{1}{3}x + 3$   
 K.  $y = \frac{2}{3}x - 2$

13.



The line defined by the equation  $y = 15x - 45$  intercepts the  $x$ -axis at point P as shown above. What are the coordinates of point P?

- A.  $(45, 0)$   
 B.  $(3, 0)$   
 C.  $(-3, 0)$   
 D.  $(0, -3)$   
 E.  $(0, -45)$

14. Seven consecutive integers are arranged in increasing order. Their sum is  $7k$ . What is the value of the second integer in terms of  $k$ ?

- F.  $k - 6$   
 G.  $k - 2$   
 H.  $k$   
 J.  $k + 1$   
 K.  $7k - 6$

15.  $\frac{p}{q}, p + q, p - q, p^2 + q^2, \frac{p^2}{q^2}$

If  $p = q = \frac{1}{\sqrt{2}}$ , which one of the expressions above does **not** represent a rational number?

- A.  $\frac{p}{q}$   
 B.  $p + q$   
 C.  $p - q$   
 D.  $p^2 + q^2$   
 E.  $\frac{p^2}{q^2}$

16. A tiny robot sits on the point  $(1, -2)$  of the coordinate plane. At each flash of a blue light, it moves 4 units to the right and 5 units down. At each flash of a red light, it moves 1 unit to the left and 4 units up. If, at the end of 15 red flashes and  $n$  blue flashes, the robot is sitting on the line  $y = x$ , what is  $n$ ?

- F. 5  
 G. 8  
 H. 14  
 J. 15  
 K. 44

17.  $|x - 1| < 3$   
 $|x + 2| < 4$

How many integer values of  $x$  satisfy both inequalities shown above?

- A. 0  
 B. 1  
 C. 3  
 D. 4  
 E. 5

1. (A) First, determine the total number of pets that the students own by multiplying the number of pets owned by the number of students in each row of the table. Then add that column to get the total number of pets.

Number of Pets Owned	Number of Students	Number of Pets × Number of Students
0	5	0
1	7	7
2	3	6
3	4	12
4	0	0
5	1	5

Total: 30

Now, calculate the mean by dividing the total number of pets owned by the total number of students:

$$\frac{30}{20} = 1\frac{1}{2}$$

2. (J) Since  $x$  is a negative number between  $-1$  and  $0$ , assign a value to  $x$  in that range and calculate  $x^2$ . For example, let  $x = -\frac{2}{3}$ . Then  $x^2 = \frac{4}{9}$ , which roughly corresponds to point U.

3. (C)  $\frac{2}{(4/x)} = \frac{3}{2}$

$$2 \cdot \frac{x}{4} = \frac{3}{2}$$

$$2x = 6$$

$$x = 3$$

4. (F) Begin by finding a common base for each term. In this case, the common base is 2.

$$\begin{aligned} 4 &= 2^2 \\ 8 &= 2^3 \\ (4^3)(8^2) &= (2^2)^3(2^3)^2 \\ &= (2^6)(2^6) \\ &= 2^{12} \\ \text{So, } x &= 12. \end{aligned}$$

Alternatively, you could multiply the left side of the equation and then factor it:

$$\begin{aligned} (4^3)(8^2) &= (4 \times 4 \times 4)(8 \times 8) \\ &= (2 \times 2 \times 2 \times 2 \times 2 \times 2)(2 \times 2 \times 2 \times 2 \times 2 \times 2) \\ &= 2^{12} \end{aligned}$$

5. (B) Each triangle is a right triangle, and the angles formed at point Z are congruent because they are vertical angles. Thus, the two triangles are similar by definition. Set up the following proportion between similar sides to find  $x$ :

$$\frac{5}{3} = \frac{6}{x}$$

$$5x = 18$$

$$x = \frac{18}{5} = 3\frac{3}{5}$$

6. (J) First, calculate the volume of the cylinder:

$$V = \pi r^2 h = \pi(4)^2(8) = 128\pi \text{ cubic inches}$$

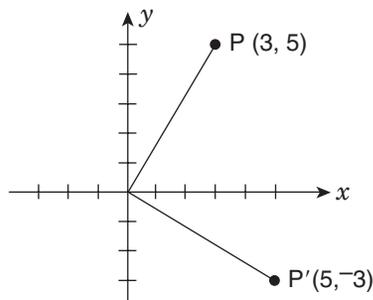
The volume of water in the cube will be the same as the volume of water in the full cylinder. Use the volume formula of a cube to calculate the depth ( $h$ ) of the water in the cube:

$$\begin{aligned} V &= lwh \\ 128\pi &= (8)(8)h \\ 128\pi &= 64h \\ 2\pi &= h \end{aligned}$$

- 7. (B)** If the coordinates of a point labeled R are  $(a, b)$ , then a  $90^\circ$  counterclockwise rotation about the origin would make the coordinates of point R'  $(-b, a)$ . A  $90^\circ$  clockwise rotation about the origin would make the coordinates of R'  $(b, -a)$ .

In the question, P is  $(3, 5)$  and P' is  $(5, -3)$ . Using the rule stated above, P' is the image after point P is rotated  $90^\circ$  clockwise.

Alternatively, it may help to make a sketch of this problem. Place the two points on the coordinate grid: Point P is in the first quadrant, and point P' is in the fourth quadrant. Draw a line from each point to the origin. The angle formed at the origin should resemble a right angle, which is option B ( $90^\circ$ ).



- 8. (H)** In order to add or subtract two numbers in scientific notation, the exponent on the 10 must be the same. Since the question asks for the value of  $k \times 10^{19}$ , change both terms into this same power of 10:

$$12.6 \times 10^{18} = (1.26 \times 10) \times 10^{18} = 1.26 \times 10^{19}$$

$$1.1 \times 10^{17} = (0.011 \times 10^2) \times 10^{17} = 0.011 \times 10^{19}$$

Now, perform the subtraction:

$$(1.26 \times 10^{19}) - (0.011 \times 10^{19})$$

$$= (1.26 - 0.011) \times 10^{19}$$

$$= 1.249 \times 10^{19}$$

Thus,  $k = 1.249$

- 9. (C)** At the beginning (hour 0), the pool is empty. After 5 hours, the pool holds 2,000 gallons. Thus, the rate of change (or slope of the line) is  $\frac{2,000 - 0}{5 - 0} = \frac{2,000}{5} = 400$  gallons per hour.

To find the number of gallons after 20 hours, multiply the rate by the number of hours:  
 $400 \times 20 = 8,000$  gallons.

- 10. (G)** Using the translation equation given in the question, set up two small equations to find  $n$  and  $r$ :

For  $n$ :

$$x + 10 = 100$$

$$x = 90$$

For  $r$ :

$$y - 10 = 100$$

$$y = 110$$

So,  $(n, r) = (90, 110)$

- 11. (A)** Because both triangles are right triangles that share a vertex, they are similar. To find  $x$ , set up a proportion using the two known sides of each triangle:

$$\frac{(4 + x)}{1.0} = \frac{4}{0.8}$$

$$0.8(4 + x) = 1.0(4)$$

$$4 + x = 5$$

$$x = 1$$

- 12. (H)** An  $x$ -intercept of 3 means the point  $(3, 0)$  is on line  $k$ . Using  $(3, 0)$  and  $(-3, 4)$ , calculate the slope ( $m$ ) of the line:

$$m = \frac{(4-0)}{(-3-3)} = \frac{4}{-6} = -\frac{2}{3}$$

The equation of line  $k$  must contain slope  $-\frac{2}{3}$ , so only Options G and H are potentially correct.

Next, find which of the two equations is true for the point  $(3, 0)$ . To solve, substitute 3 for  $x$  in each equation and find the one in which  $y = 0$ .

Option G:  $y = -\frac{2}{3}(3) - 3 = -2 - 3 = -5$

Option H:  $y = -\frac{2}{3}(3) + 2 = -2 + 2 = 0$

Option H is the correct answer.

- 13. (B)** Since P is on the  $x$ -axis, we know its  $y$ -value must equal 0. Use that in the equation to solve for  $x$ :

$$y = 15x - 45$$

$$0 = 15x - 45$$

$$45 = 15x$$

$$3 = x$$

So, the coordinates for P are (3, 0).

- 14. (G)** The question asks for the second integer, so let  $n$  be the second integer. Then, the sum of the 7 integers is:

$$(n - 1) + n + (n + 1) + (n + 2) + (n + 3) +$$

$$(n + 4) + (n + 5) = 7k$$

$$7n + 14 = 7k$$

$$7(n + 2) = 7k$$

$$n + 2 = k$$

$$n = k - 2$$

- 15. (B)** A rational number is a number that can be written as a fraction. Since  $p = q$ , then  $\frac{p}{q} = 1$ ,  $\frac{p^2}{q^2} = 1$ , and  $p - q = 0$ , all of which are rational. That leaves two expressions to test:

$$p + q = \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \frac{2}{\sqrt{2}}$$

(irrational because  $\sqrt{2}$  is irrational)

$$p^2 + q^2 = \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2 = \frac{1}{2} + \frac{1}{2} = 1 \text{ (rational)}$$

Thus,  $p + q$  is not a rational expression.

- 16. (G)** Since the number of red flashes is known (15), G calculate where the robot would be after the 15 red flashes. For each red flash,  $(x, y) \rightarrow (x - 1, y + 4)$ . So, after 15 red flashes:  $(1 - [1 \times 15], -2 + [4 \times 15]) = (-14, 58)$

Next, use the point  $(-14, 58)$  to calculate where the robot will be after  $n$  blue flashes. For each blue flash,  $(x, y) \rightarrow (x + 4, y - 5)$ . So, after  $n$  blue flashes:  $(-14 + 4n, 58 - 5n)$

The question states that the robot's final position is on the line  $y = x$ , which means the  $x$ - and  $y$ -coordinates will have the same value. To find  $n$ , set the two coordinates above as equal and solve for  $n$ :

$$-14 + 4n = 58 - 5n$$

$$9n = 72$$

$$n = 8$$

- 17. (C)** First, determine which integer values of  $x$  would make each inequality true:

$$|x - 1| < 3 \text{ can also be written as}$$

$$-3 < x - 1 < 3$$

Adding 1 to each term results in

$$-2 < x < 4$$

Since these are only "less than" and not "less than or equal to," the possible values of  $x$  for this inequality are  $-1, 0, 1, 2$ , and  $3$ .

Similarly,  $|x + 2| < 4$  can also be written as  $-4 < x + 2 < 4$

Subtracting 2 from each term results in

$$-2 < x < 2$$

The possible values of  $x$  in this inequality are  $-1, 0$ , and  $1$ .

The possible  $x$  values in common between the two inequalities are  $-1, 0$ , and  $1$ , so the answer is 3.

### Answer Key for Grade 9 Mathematics

1. A	7. B	13. B
2. J	8. H	14. G
3. C	9. C	15. B
4. F	10. G	16. G
5. B	11. A	17. C
6. J	12. H	





