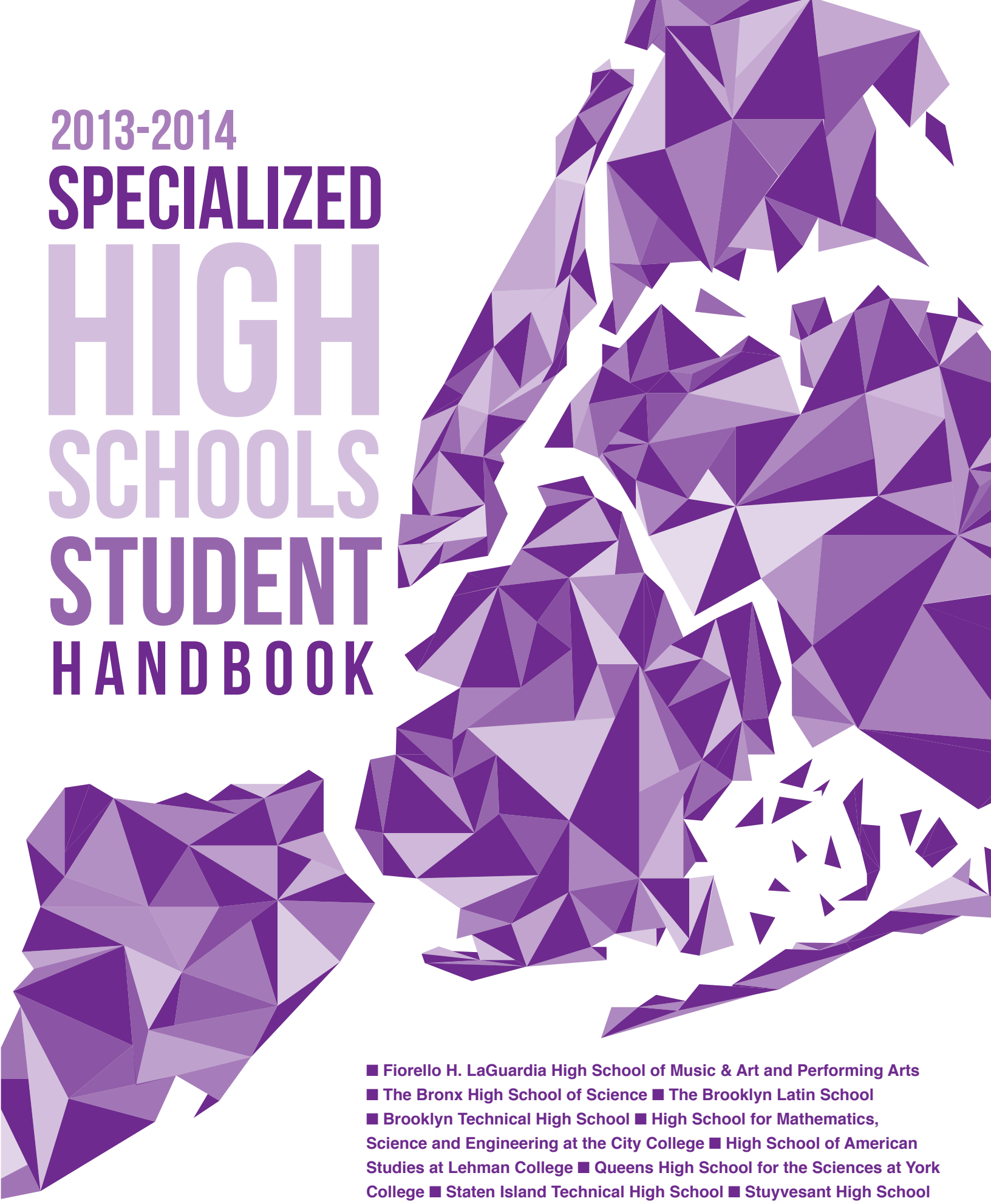
2013-2014

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

The 2013-2014 Specialized High Schools Student Handbook describes the programs and admissions procedures for the Specialized High Schools in New York City, which are:

- 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
- 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

These schools were established under New York State Law 2590 – Section G. Entrance into these schools is by examination except for Fiorello H. LaGuardia High School of Music & Art and Performing Arts (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.

In this handbook, you will find useful information about the Specialized High Schools, including programs in the schools, admission procedures, sample tests with test-taking tips, and a calendar of important dates. It is important to familiarize yourself with the information contained in this handbook.

The Specialized High Schools Student Handbook is a project of the New York City Department of Education, the Office of Assessment and the Division of Portfolio Planning.

THE **SPECIALIZED** HIGH SCHOOLS

SECTION 1

There are nine Specialized High Schools in New York City. For eight of these schools, admission is based solely on the score attained on the Specialized High Schools Admissions Test (SHSAT). For Fiorello H. LaGuardia High School of Music & Art and Performing Arts (LaGuardia), acceptance is based on an audition and a review of a student's academic records.

Approximately 30,000 students took the SHSAT and 14,000 students applied to LaGuardia High School for September 2013 admission. More information about each Specialized High School can be found below:

THE BRONX HIGH SCHOOL OF SCIENCE

75 West 205th Street, Bronx, New York 10468
Phone: (718) 817-7700 • **Website:** www.bxscience.edu

The Bronx High School of Science is a world-renowned college preparatory school for students gifted in science and mathematics. The school provides an enriched and diverse program to prepare students to enter the country's top colleges and universities, and to become leaders in all academic fields including science, business, medicine, the law, and technology. The school offers a large variety of elective courses allowing students to explore areas of interest. All graduates attend college, and our goal from day one is to prepare students to attend the school of their dreams. The school boasts seven Nobel Laureates, more than any other high school and more than most countries. The school is the nation's all-time leader in the Westinghouse/Intel Science Talent Search, the leading science competition in the country.

The Bronx High School of Science offers every possible Advanced Placement course, except for German and many post-AP courses (second-year college courses). The school offers eight foreign languages, numerous electives in biology, chemistry, physics, mathematics, technology, and the humanities. Bronx Science has an orchestra, band, chorus, jazz ensembles, and computerized music for students interested in music. Please see our course guide on our website, www.bxscience.edu, for full descriptions.

Extracurricular activities include over 60 after-school clubs, 30 athletic teams, an internationally acclaimed Speech and Debate Team, Mock Trial, a world-class Robotics Team, two theatrical productions each year, SING, an award-winning yearbook, and scholarly journals. Check our website for more information about the school. As our alumni uniformly agree: "Bronx Science—The Effect is Transformational."

For September 2013 admission, 18,620 students listed Bronx Science as a choice on their application and 980 offers were made.

THE BROOKLYN LATIN SCHOOL

325 Bushwick Avenue, Brooklyn, New York 11206
Phone: (718) 366-0154 • **Website:** www.brooklynlatin.org

The Brooklyn Latin School (TBLS) offers a classical liberal arts curriculum with an emphasis on the classics and Latin language instruction. Instruction emphasizes a core knowledge of the liberal arts that students will use as the basis for further, more detailed exploration. All students are required to complete four years of Latin, history, mathematics, English, science, and at least two years of a world language. In humanities classes, students participate in Socratic Seminars and declamation (public speaking exercises). Non-humanities classes feature labs, math expositions, discussions, and problem sets. In all classes, students can expect a strong and continuing emphasis on structured writing and public speaking, as well as the overarching practice of analytical thinking that will ensure that all TBLS students are prepared for the challenges of college work.

The Brooklyn Latin School offers the prestigious International Baccalaureate (IB) Diploma Programme. Widely regarded around the world as the most rigorous and comprehensive course of study at the high school level, the IB Programme is a crucial aspect of the TBLS experience. Its emphasis on student-led inquiry, global perspectives and personal integrity conform perfectly with the ideals on which The Brooklyn Latin School was founded. In addition to rigorous class work, IB stresses independent thinking and community engagement. All students are expected to complete an extended essay, a lengthy independent essay on a subject of their choosing, the completion of which correlates closely to college-level research writing. 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. We believe that both of these requirements will help our students become well-rounded citizens of the world.

For September 2013 admission, 14,147 students listed The Brooklyn Latin School as a choice on their application and 526 offers were made.

BROOKLYN TECHNICAL HIGH SCHOOL

29 Fort Greene Place, Brooklyn, New York 11217
Phone: (718) 804-6400 • **Website:** www.bths.edu

Brooklyn Technical High School (Brooklyn Tech) is committed to providing an outstanding educational experience in the areas of engineering, the sciences, and computer science for its student body.

During the ninth and tenth grades, all students take an academic core and begin to explore the fields of engineering, science, and computers through hands-on experience in fully equipped laboratories, computer centers, shops, and theory classes. A select group of applicants may also choose to enroll in our Gateway to Medicine pre-medical program. Gateway is a four-year small learning community focused on careers in the medical professions.

For the eleventh and twelfth grades, Brooklyn Tech students choose one of the following major areas of concentration: Aerospace Engineering, Architecture, Bio-Medical Engineering, Biological Science, Chemistry, Civil Engineering, College Prep, Computer Science, Electro-Mechanical Engineering, Environmental Science, Industrial Design, Law & Society, Mathematics, Media & Graphic Arts, and Social Science.

While specializing in these areas, students continue their academic core. It is important to note that Brooklyn Tech students meet the requirements to enter any field of study on the college level, regardless of their major. However, they are particularly well prepared in their major area of concentration.

For September 2013 admission, 21,719 students listed Brooklyn Tech as a choice on their application and 1,861 offers were made.

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

The High School for Math, Science and Engineering at the City College of New York (HSMSE) combines a rigorous program in science, technology, engineering, and mathematics with an ambitious humanities curriculum. Our goal is to infuse social, technological and analytical skills in order to facilitate the development of the next generation of leaders in society. Our collaborative approach to education fosters a supportive community which raises the performance level of each individual. In our labs and classrooms, students learn by doing. Skilled and committed faculty teach with rigor and with passion for their subjects. Housed in a dedicated building on The City College of New York campus, HSMSE gives students an early taste of college life as they eat in the college cafeteria and study in the college library. Newly built science and engineering labs offer up-to-date equipment, and all classrooms have internet access and computers or laptop carts.

Students are drawn from all five boroughs of NYC and hail from diverse ethnic backgrounds. When students graduate, they are prepared for college and for life beyond by HSMSE's in-depth approach to learning. New York State Regents exams, while required, are viewed as minimal competencies which our students are expected to master. Our curriculum exceeds the state standards in every way. Most HSMSE courses are taught at the advanced, Advanced Placement and college level, and some courses earn college credit from The City College of New York. Students select one of three concentrations at the end of 10th grade, taking advanced coursework in either Advanced Engineering, Biomedical Research (Mt. Sinai) or Mathematics in eleventh and twelfth grade. All students take four year of math and science. HSMSE also offers a variety of elective classes and academic teams across departments. The school day is from 8:00 am to 3:35 pm.

For September 2013 admission, 17,647 students listed High School for Mathematics, Science and Engineering at the City College of New York as a choice on their application and 216 offers were made.

HIGH SCHOOL OF AMERICAN STUDIES AT LEHMAN COLLEGE

2925 Goulden Avenue, Bronx, New York 10468
Phone: (718) 329-2144 • **Website:** www.hsas-lehman.org

The High School of American Studies at Lehman College emphasizes the study of American History and offers students an academic program that is both well-rounded and challenging. Our goal is to prepare students for admission to highly competitive colleges and for a wide range of careers in politics, law, journalism, business, science, mathematics, and the arts.

All students engage in a three-year chronological study of American History. Our goal is to make history come alive through the use of primary source documents, films, biographies, literature, and creative teaching techniques. Supported by the Gilder-Lehrman Institute, students gain firsthand knowledge of the key events in American History through trips to sites and cities of historic importance and through participation in special seminars with guest speakers. We also offer honors-level, Advanced Placement, and elective courses in mathematics, science, constitutional and criminal law, literature, foreign languages, history, and the arts.

A special component of our program focuses on the development of college-level research skills and methodologies; therefore, students are supported by school and college faculty in the process of pursuing individualized research projects. Through our collaboration with Lehman College, students have access to its campus library and athletic facilities and may take credit-bearing college classes and seminars in their junior and senior years. After school, students may participate in a wide variety of extracurricular activities and PSAL sports. In all of our endeavors, we seek to encourage in our students a love for learning and an inquisitive spirit.

For September 2013 admission, 15,596 students listed High School of American Studies at Lehman College as a choice on their application and 162 offers were made.

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

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

In addition to the New York State standard high school curriculum, the school offers a wide range of elective courses in all subjects. A number of Advanced Placement courses, including English Language and Composition, English Literature, U.S. History, World History, Spanish Language, French Language, Music Theory, Calculus AB, Calculus BC, Biology, Chemistry, Physics B, and Environmental Science, are available to those who qualify. Students also have the opportunity to enroll in College Now courses, such as Political Science, Sociology, Computer Music, Computer Programming, Chinese, and Latin. Course offerings may vary from year to year.

Since the school is located on the campus of York College, students enjoy the state-of-the-art facilities such as the library, gymnasium, pool, theater, and cafeteria/food court throughout their high school career.

For September 2013 admission, 15,748 students listed Queens High School for the Sciences at York College as a choice on their application and 160 offers were made.

STATEN ISLAND TECHNICAL HIGH SCHOOL

485 Clawson Street, Staten Island, New York 10306
Phone: (718) 667-5725 • **Website:** www.siths.org
Email: gpo@SITHS.org

Staten Island Technical High School's (Staten Island Tech) instructional program is sustained by a broad range of data-driven, standards-based curricula, and evidenced by student performance levels on Advanced Placement and other comparable high-level examinations in mathematics, science, computers, engineering, humanities, and the performing arts.

Staten Island Tech's physical plant includes updated science, engineering, and computer laboratories, a black-box theater, fully equipped sports and athletic facilities, and a state-of-the-art television production studio. Along with a highly engaging and demanding core curriculum, all students are scheduled for technical courses in Introduction to Robotics/Engineering Survey, Electronics, AutoCAD, and Television Studio Production. Students may participate in the school's Science Engineering Research Program (SERP), FIRST Robotics STEM programs, as well as selected internships.

The students at Staten Island Tech have the opportunity to take Advanced Placement courses in Biology, Chemistry, Physics, Psychology, Calculus, Statistics, English, and Social Studies. Elective courses are offered in Advanced AutoCAD, Forensics Science, Law, Robotics, Research, Television Studio Production, and FIRST Robotics. Students interested in the performing arts may participate in band, ensembles, dance, drama, SING, and musicals.

As part of the school's co-curricular and extended day programs, students have the opportunity to participate in a variety of activities, such as Student Government, National Honor Society, publications, performing arts programs, and PSAL teams, that foster the development of a well-rounded scholar athlete, and various accredited college courses offered on- and off-site.

For September 2013 admission, 14,096 students listed Staten Island Technical High School as a choice on their application and 361 offers were made.

STUYVESANT HIGH SCHOOL

345 Chambers Street, New York, New York 10282-1099
Phone: (212) 312-4800 • **Website:** stuy.enschool.org

Stuyvesant High School, founded in 1904, has been and continues to be committed to excellence in education. The school's enriched curriculum includes required courses for graduation and affords its students the opportunity to take advanced courses in mathematics and science, calculus, qualitative analysis, organic chemistry, and astronomy. In addition, a wide range of electives in other disciplines is available. The Technology Department course offerings include technology computer drafting, computer science, and robotics. Students interested in music may participate in symphonic band, symphony orchestra, jazz band, and various choral groups and ensembles.

Students have the opportunity to participate in independent research and to take college courses at New York University, Hunter College, and The City College of New York. Stuyvesant High School prides itself on the number of National Merit, National Achievement, National Hispanic Scholars, and Intel Science Talent Research recipients and finalists it has garnered every year. Stuyvesant High School is also proud of its extensive extracurricular program. There are 31 athletic teams, 20 major publications, and an active and elaborate system of student government, making it one of the most unique high schools in America.

For September 2013 admission, 22,675 students listed Stuyvesant High School as a choice on their application and 963 offers were made.

FIORELLO 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
Email: admissions@laguardiahs.net

The Fiorello H. LaGuardia High School of Music & Art and Performing Arts (LaGuardia High School) enjoys an international reputation as the first and foremost high school dedicated to nurturing students gifted in the arts. LaGuardia High School continues to be the model for schools for the arts throughout the world because the school provides a uniquely balanced educational experience that includes both demanding conservatory-style training and a challenging, comprehensive academic program. The conservatory programs include Dance, Drama, Instrumental and Vocal Music, Fine Arts, and Technical Theatre.

Students in the **Dance** program will study ballet and modern dance; supplementary courses include: dance history, choreography, theatre dance (tap and jazz), career management, and survival skills. In **Drama**, the focus is on theatre preparation through courses in acting, voice and diction, physical techniques, theatre history, and script analysis. **Instrumental Music** and **Vocal Music** courses include sight singing, diction, music theory, and music history. The Vocal Music Studio also includes performing opportunities in musical theatre, opera, choir, chamber music, and solo voice, and training in Italian, German, and French vocal literature. The Instrumental Music Studio courses include four symphonic orchestras, three concert bands, and two jazz bands, as well as electives in chamber music, conducting, and electronic music. In the **Fine Arts** program, drawing, watercolor, 3-D design, oil/acrylic painting, ceramics, photography, sculpture, illustration, advanced painting, and drawing are offered. In **Technical Theatre**, the focus is on practical theatre training in scenic carpentry, costume construction, drafting, sound properties, stage management, and design. Each year's program culminates in performances and exhibitions.

Each studio requires a substantial time commitment after school, including rehearsals and performances, as well as the practical application of technical theatre and gallery management techniques. Longer school days are expected during performance times, and students are required to be present and participatory during these extra hours.

Auditions will be held at the school. See pages 10-11 for audition information regarding LaGuardia High School.

For September 2013 admission, 1,080 students received one or more offers to the programs at LaGuardia High School from a pool of 13,997 applicants.

DATES AND LOCATIONS FOR THE SPECIALIZED HIGH SCHOOLS APPLICATION PROCESS

SECTION 2

September 11, 2013 – October 9, 2013 ■ Meet with your school guidance counselor
October 9, 2013 ■ Last day to register for the Specialized High Schools Admissions Test (SHSAT)
October 18, 2013 ■ Test Ticket available for distribution
December 2, 2013 ■ Deadline for submission of the High School Admissions Application

SPECIALIZED HIGH SCHOOLS ADMISSIONS TEST (SHSAT) DATES AND LOCATIONS

All current 8th and first-time 9th grade students in public, private, and parochial schools applying to one or more of the Specialized High Schools in New York City must take the SHSAT. Testing sites are specified below, and students are assigned to a testing site based on the geographic district in which the student's school is located.

Students interested in taking the SHSAT should speak with their guidance counselor. 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. Conflicts should be reported to the student's guidance counselor before the test date.

TEST DATES (For location, see chart below)	
■ All current 8th grade students	Saturday, October 26, 2013 Sunday, October 27, 2013
■ All current 9th grade students ■ 8th and 9th grade students with special needs and approved 504 Accommodations	Saturday, November 2, 2013
■ 9th grade Sabbath observers ■ Sabbath observers with special needs and approved 504 Accommodations ■ Make-up test with permission only	Sunday, November 17, 2013 Test location is Brooklyn Technical High School only
■ Students new to NYC (Records must show that you arrived in NYC after the November make-up test)	End of summer 2014

TESTING LOCATIONS

8th and 9th Grade Students attending schools in:	TESTING SITE	ADDRESS
Manhattan	Stuyvesant High School	**345 Chambers Street, New York, NY 10282-1099 Tel:** (212) 312-4800 **Subways:** 1, 2, 3, 9, A, C, E to Chambers Street; 4, 5, J, Z to Fulton Street-Broadway-Nassau; 6 to Brooklyn Bridge; N, Q to Canal Street; R to City Hall **Buses:** BM1, BM2, BM3, BM4, BXM18, M05, M20, M22, QM11, QM25, QM7, QM8, X1, X10, X11, X12, X15, X17, X19, X27, X28, X3, X4, X7, X8, X9
Bronx	The Bronx High School of Science	**75 West 205th Street, Bronx, NY 10468 Tel:** (718) 817-7700 **Subways:** 1 to 238th Street; 4, B, D to Bedford Park Boulevard **Buses:** BX1, BX2, BX22, BX39 to West 205th Street & Paul Avenue; X32 to West 205th Street
Brooklyn Districts 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 32	Brooklyn Technical High School	**29 Fort Greene Place, Brooklyn, NY 11217 Tel:** (718) 804-6400 **Subways:** 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; F to Jay Street-Borough Hall; G to Fulton Street; M to Lawrence Street **Buses:** B103, B25, B26, B38, B41, B45, B52, B54, B57, B62, B63, B65, B67, B69
Brooklyn District 19 Queens Districts 27, 29	John Adams High School	**101-01 Rockaway Boulevard, Ozone Park, NY 11417 Tel:** (718) 322-0500 **Subway:** A to 104th Street **Buses:** Q11, Q21, Q37, Q41, Q53, Q7, Q8, QM15
Queens Districts 24, 25, 26, 28, 30	Long Island City High School	**14-30 Broadway, Long Island City, NY 11106-3402 Tel:** (718) 545-7095 **Subways:** F to 21st Street; M, R to Steinway Street; N, Q to Broadway **Buses:** Q18
Staten Island	Staten Island Technical High School	**485 Clawson Street, Staten Island, NY 10306 Tel:** (718) 667-5725 **Subways:** Staten Island Railway (SIR) to New Dorp **Buses:** S57, S74, S76, S78, S79, X1, X15, X2, X3, X4, X5, X7, X8, X9

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

ADMISSIONS PROCESS

- Admission to LaGuardia is based on a competitive audition and review of a student's record to ensure success in both the demanding studio work and the challenging academic programs.
- Successful candidates will exhibit an intermediate to advanced level of proficiency in all art forms. Students are evaluated based on preparation for the audition and level of commitment to their art form, technical proficiency, and artistic expression. Most students receiving an offer for one or more of the studios at LaGuardia will score between 3 and 5 out of a possible 5 points on the studio rubric.
- All applicants must bring a copy of their previous academic year's report card and/or transcript if no report card is issued by the school to the audition. ARIS printouts and printed receipts from the application process are not acceptable. Please bring one copy of the report card for each studio that the student auditions for. 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.

AUDITION INFORMATION

Students may audition for the below studios. Only students who are residents of New York City are eligible to apply and audition.

DANCE Students will participate in two auditions, one ballet and one modern, in which an evaluation is made as to the student's potential to succeed in the specific training offered. All candidates are expected to bring dance clothes for the audition, including footless tights and a leotard.

DRAMA Students should be prepared to perform two contrasting one-minute monologues. The applicant 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 Students will need a portfolio of 10-20 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 works may be included. For their audition, students 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 the audition will be supplied by the school at the time of the audition.

INSTRUMENTAL MUSIC Students should come to their audition with their instruments, except for those students who will audition on piano, percussion, tuba, double bass, and harp. These instruments will be provided by the school at the audition. In addition, amplifiers will be provided by the school at the audition for electric guitarists. Students should also bring one copy of the music they are going to perform. Students are expected to perform prepared selections without accompaniment. Applicants will be tested for rhythm and tonal memory and will be asked to complete a sight-reading of a given selection.

TECHNICAL THEATRE Students should prepare a typed 350-word essay that describes their experience in any aspect of technical theatre, for example, lights, scenery design, sound design, or special effects. Applicants will be asked to participate in a small-group, hands-on practical in one or more aspects of technical theatre, as well as in an interview.

VOCAL MUSIC Students should prepare a song to sing without accompaniment for the audition. Students may select a song from the online song list (www.laguardiahs.org). Student are not required to select from the song list. The musical selection can be classical or popular in style. Students will be asked to sing back melodic patterns and tap back rhythmic patterns.

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

2013–2014 AUDITION DATES

All auditions are held at LaGuardia High School. Dates are scheduled according to the borough in which your school is located, not where you live, and by the first letter of the student's last name.

BOROUGH	LAST NAME	AUDITION GROUP	DATE	START TIME
Bronx	A – Z	Students auditioning for a single or multiple studios	Saturday, November 23, 2013	8:00 AM
Brooklyn	A – L	Students auditioning for a single studio except Technical Theatre	Sunday, November 3, 2013	8:00 AM
	M – Z	Students auditioning for a single studio except Technical Theatre	Sunday, November 3, 2013	12:00 Noon
	A – Z	Students auditioning for two or more* studios or Technical Theatre	Saturday, November 2, 2013	8:00 AM
Manhattan	A – F	Students auditioning for a single studio except Technical Theatre	Sunday, November 17, 2013	8:00 AM
	G – L	Students auditioning for a single studio except Technical Theatre	Sunday, November 17, 2013	12:00 Noon
	M – R	Students auditioning for a single studio except Technical Theatre	Sunday, November 24, 2013	8:00 AM
	S – Z	Students auditioning for a single studio except Technical Theatre	Sunday, November 24, 2013	12:00 Noon
	A – Z	Students auditioning for two or more* studios or Technical Theatre	Saturday, November 16, 2013	8:00 AM
Queens & Staten Island	A – L	Students auditioning for a single studio in Dance or Drama only	Sunday, November 17, 2013	8:00 AM
	M – Z	Students auditioning for a single studio in Dance or Drama only	Sunday, November 24, 2013	8:00 AM
	A – L	Students auditioning for a single studio in the following studios: • Instrumental Music, Vocal Music, Fine Art • No auditions for Dance or Drama or Technical Theatre on this day	Sunday, December 8, 2013	8:00 AM
	M – Z	Students auditioning for a single studio in the following studios: • Instrumental Music, Vocal Music, Fine Art • No auditions for Dance or Drama or Technical Theatre on this day	Sunday, December 8, 2013	12:00 Noon
	A – Z	Students auditioning for two or more* studios or Technical Theatre	Saturday, December 7, 2013	8:00 AM

Students must arrive on time for the audition. Students should bring one copy of the audition ticket and one copy of his/her previous year's report card for each studio the student is auditioning for and be prepared as listed on the audition guidelines on the previous page. Students may wish to bring a light snack.

*Students registered for more than 2 studios may be asked by LaGuardia to audition over more than one day. Guidance counselors are encouraged to follow up with LaGuardia directly if they have any students requesting to audition for more than two studios.

Note: There are no Sunday Technical Theater auditions. A Saturday religious observer cannot audition for technical theater that same weekend.

AUDITION EXCEPTIONS

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

Students taking the SHSAT who have a conflict with the audition schedule are to report for their audition(s) on the weekend assigned to their borough on the Saturday or Sunday for which there is not a conflict with the SHSAT. If you have an approved audition exception, please have your guidance counselor contact the LaGuardia Admissions Office for rescheduling an audition.

AUDITIONS FOR STUDENTS NEW TO NEW YORK CITY

End of summer 2014 (official records must indicate that you became a New York City resident after November 1, 2013).

STEPS IN THE APPLICATION PROCESS

1 Contact Your Guidance Counselor

You should contact your school guidance counselor to indicate your intention to take the SHSAT and/or audition for LaGuardia High School.

2 Obtain a Test or Audition Ticket

Prior to the testing/audition date, your school guidance counselor will provide you 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, your student ID number, and the school code number of your current school. If you have a conflict with the test date to which you have been assigned, inform your counselor immediately to arrange an alternate test date. Once Test Tickets have been issued, you are expected to test on the date and time indicated on their ticket. Your test site is based on the location of your current school, not where you live.

3 Review Your Test or Audition Ticket

You should review all information on the Test or Audition Ticket for accuracy. Students with special needs or approved 504 accommodations should check their ticket and make sure they are scheduled for the appropriate testing date (see pages 9 and 11) with the appropriate accommodations. Inform your counselor immediately if there are any errors on the Test or Audition Ticket.

4 Rank Your Choices (SHSAT only)

On the front of the SHSAT Test Ticket you will need to rank, in priority order, your choices for the Specialized High Schools to which you want to apply. You will need to submit your ranking of the Specialized High School(s) on the day of the test. **Students will be considered for admission to a Specialized High School based on choices made on the answer sheet on test day and the score attained on the SHSAT.** Consider the focus of the academic program, the size of the school, travel arrangements, as well as travel time. You may choose to apply to only one school, or you can choose to apply to as many as eight schools, to increase your chances of being offered a seat in one of the Specialized High Schools. You should only list schools that you wish to attend if you are offered a seat. **Once choices have been submitted on the day of the test, they may not be changed.**

5 Sign Your Test or Audition Ticket

Students and parents must sign the Test or Audition Ticket prior to the exam.

SHSAT TESTING PROCEDURES

- Remember to bring your Test Ticket with you to your assigned test site on the day of the test. It is important to arrive at the test site at the time indicated on your SHSAT Test Ticket even though the test may not begin immediately after arrival. Students arriving without a Test Ticket are not guaranteed admittance. Please be advised that your picture will be taken at the test site prior to the start of the test.
- Before you begin the test, you will be asked to read and sign a statement 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, advise the test proctor immediately; do not begin the test, and do not sign the statement.** Once you have begun the test, you may not—either then or at a later date—request a make-up test because of illness. Any requests for a make-up test made after you have begun the test will not be honored.

Claims of Testing Irregularities

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

If you suspect any proctoring or testing irregularities during the test administration, you must submit a letter about the situation to:

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

This letter must be sent by certified mail with proof of delivery and postmarked no later than one week after the test administration. Letters postmarked later than one week after the test date will not be considered.

AUDITIONING FOR LAGUARDIA HIGH SCHOOL

- If you are interested in applying to one or more of the six studios at LaGuardia High School, review the audition requirements listed on page 10 of this handbook and also in the *2013-2014 Directory of the New York City Public High Schools* and prepare for your auditions.
- To audition for one or more of the programs at LaGuardia High School, inform your guidance counselor of your intention to audition and indicate for which studio(s) you wish to audition. Your guidance counselor will provide you with an Audition Ticket prior to the audition date.

NOTIFICATION INFORMATION

- Students must be a resident of New York City in order to receive results of the SHSAT/LaGuardia auditions.
- In February 2014, you will be notified as to whether or not you received an offer(s) to the Specialized High Schools.
- If you qualify for an offer to one of the Specialized High Schools based on your SHSAT score, then your score and your ranking of schools made in Grid 5 of the answer sheet (see page 15) will be used to determine your offer.
- If you audition for one or more of the studios at LaGuardia High School, it is possible for you to receive an offer to one or more of the studios at LaGuardia High School.
- If you receive any offers to a Specialized High School you may, at the same time, receive a match to one of the other high school choices that you submitted on your New York City High School Admissions Application, if applicable. At this time you may accept either your Specialized High School offer(s) or your other high school offer.

ADMISSIONS PROCESS

Specialized High Schools Admissions Test (SHSAT)

The process is designed to match students based on their SHSAT scores and how they ranked the Specialized High Schools.

- Acceptance to a Specialized High School is based first on the student's test score, then on the priority order in which the student placed the Specialized High Schools in Grid 5 of the answer sheet and on seat availability.
- All scores of the students taking 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 the 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 given 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.

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.

ADDITIONAL SHSAT INFORMATION

Alternate Test Dates

- If your test date conflicts with a religious observance, please notify your school counselor immediately after receiving your test date, and an alternate test date will be arranged.
- If you are ill and unable to take the test on your scheduled date, when you return to school immediately notify your counselor, present medical documentation, and request to take the SHSAT on the Make-Up Test Day. Only valid make-up requests submitted to counselors with the required documentation by Wednesday, November 6, 2013 will be considered. Students will NOT be admitted to the make-up test without a valid Test Ticket for the Make-Up Test Day.

Students with Disabilities

Students classified as having a disability, resulting in an Individualized Education Plan (IEP) or an approved 504 Plan, may be eligible for test accommodation(s) if prescribed in their IEPs or approved 504 Plans. The student's current school, including private and parochial schools, is responsible for submitting the IEP and/or approved 504 Plan documentation in the fall during the SHSAT registration process. Please note that the use of a calculator or mathematics tables is not allowed for the Mathematics section because the test measures students' proficiencies involving calculations. Similarly, because the Verbal section of the test measures reading comprehension, passages may not be read aloud in the Verbal section.

Students with disabilities should check their Test Ticket immediately and make sure they are scheduled to test on the appropriate testing date (see page 9) with the appropriate accommodations. Inform your counselor immediately if there are any concerns.

TEST DESCRIPTION & MATERIALS

SECTION 4

The Specialized High Schools Admissions Test has two sections, Verbal and Mathematics.

VERBAL SECTION (45 questions)

Verbal reasoning is measured by 5 questions on ordering sentences to form a paragraph and 10 questions on logical reasoning. Reading comprehension is measured by 5 reading selections, each of which is followed by 6 questions tapping your ability to understand, analyze, and interpret what you have read. You should not spend more than 75 minutes on this section. You may go back to this section after completing the Mathematics section.

MATHEMATICS SECTION (50 questions)

This section consists of word problems and computation questions. It is recommended that you allow yourself 75 minutes on this section. If you finish early, you may go back to questions in either section.

TEST MATERIALS

You must bring to the testing session:

- a Test Ticket signed by your parent/guardian with your 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

Students should not bring personal electronic devices such as a cell phone, iPod, calculator, tablet/iPad or ebook reader to the test.

For each student, the testing 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.

FILLING IN THE ANSWER SHEET

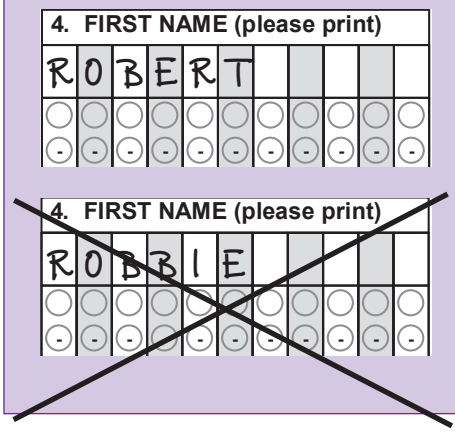
Your answer sheet will be attached to your test booklet. When the proctor instructs you to do so, you will detach the answer sheet and a sheet of scrap paper from the test booklet along the perforations, being careful not to tear the answer sheet or break the seal on the test booklet.

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

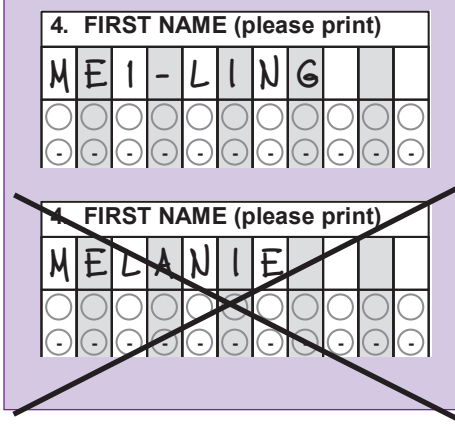
It is important to fill in the bubbles completely, so that your score will not be delayed.

In Grid 4 bubble in your name as it appears in your school records and on your high school application. Do not use your nickname or your "American" name. For example, if your name on school records is Robert, bubble in that name, even if most people call you "Robbie." Or if your name on school records is Mei-Ling, bubble in that name, even if most people call you "Melanie." See examples below.

GRID 4 EXAMPLE 1



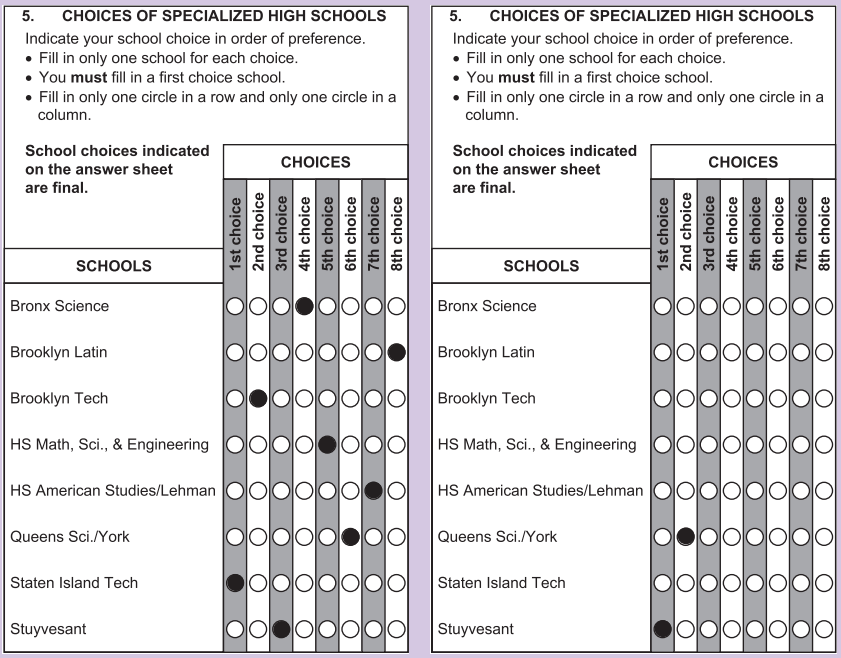
GRID 4 EXAMPLE 2



Grid 5 is for your choice of Specialized High Schools only. 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 in Grid 5. Therefore, it is very important that you make your decisions about ranking schools before the day of the test. Discuss the schools in which you are interested with your parents/guardians and then together determine the order in which you will list them on the answer sheet. Enter these rankings on your 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.**

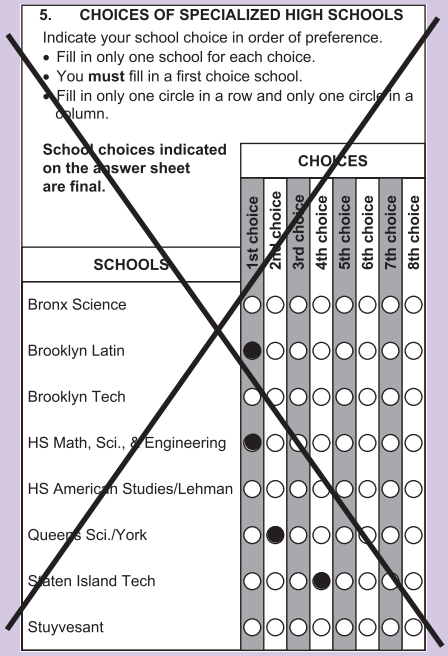
Fill in **one** and only **one** circle for each school for which you wish to be considered. You may make as few as one or as many as eight choices. To increase your chances of receiving an offer to one of the Specialized High Schools, you are encouraged to make more than one choice. You must fill in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

EXAMPLES OF CORRECT GRID 5

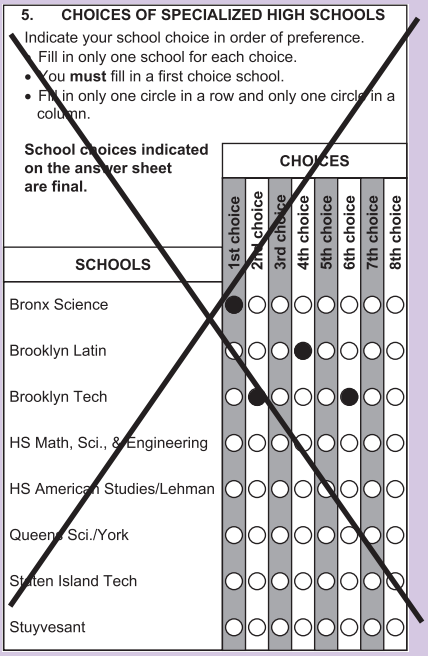


You MUST fill in a first choice school.

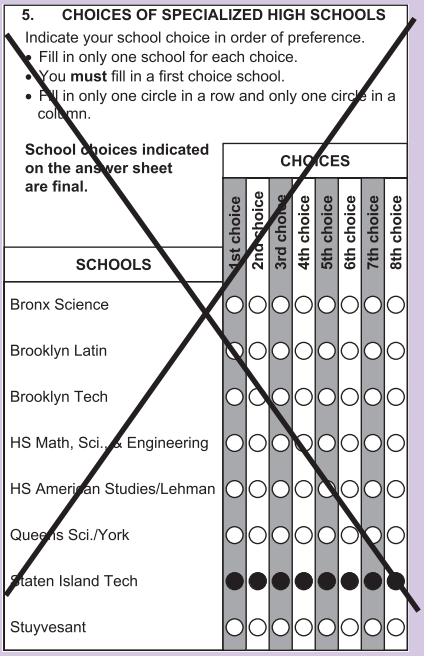
EXAMPLES OF INCORRECT GRID 5



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

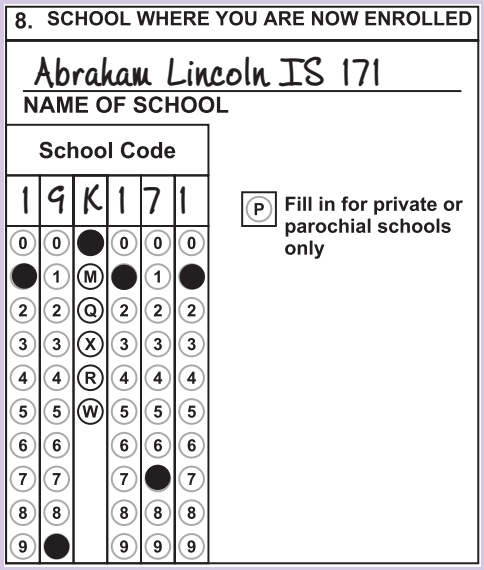


DO NOT fill in more than one circle in a row.



DO NOT fill in the same school for each choice.

GRID 8

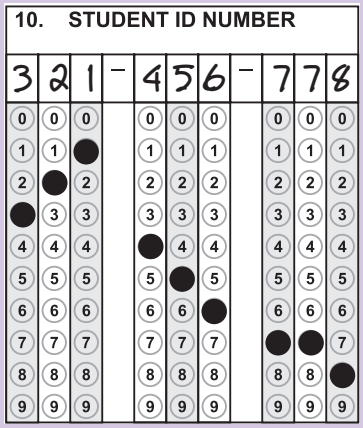


In Grid 8, print the name of the school where you are now enrolled. Then print your school code exactly as it appears on your Test Ticket or in the Feeder School List available from your test proctor. Bubble in the corresponding number or letter for each digit of your school code.

Next, bubble in the letter "P" if you attend a private or parochial school.

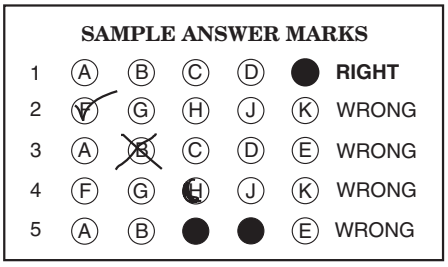
For example, a student who attends Abraham Lincoln IS 171 in Brooklyn should complete Grid 8 as shown in the example above. Fill in Grid 8 carefully: a bubbling error in Grid 8 may delay the reporting of your score.

GRID 10



Grid 10 is labeled "STUDENT ID NUMBER." All SHSAT test-takers should write their student ID number in Grid 10. You will find this number on your Test Ticket for the test. In the boxes in Grid 10, write your nine-digit student ID number. Below each box, fill in the circle containing the same numeral as the box. (See the example to the left.)

Answers must be recorded on the answer sheet to be counted. Answers left in the test booklet or on scrap paper will not be counted.



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

SHSAT SCORING, REPORTING, & REVIEW PROCEDURES

Your SHSAT score is based on the number of correct answers marked. There is no penalty for wrong answers. If you are not sure of an answer, mark your best guess. Do 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.

STUDENT NOTIFICATION

You must live in New York City at the time of result notification in order to obtain your SHSAT score. Students will receive their Specialized High School results at the same time that High School Admissions Round 1 results are made available. Students offered seats must indicate acceptance of the school to which they were selected by returning the signed letter to their guidance counselor.

The Specialized High Schools are prepared to provide whatever assistance students need to succeed. Should your son/daughter experience difficulty in transitioning to the assigned school, reach out to his/her guidance counselor to discuss your concerns and arrange for support. If a student feels that the Specialized High School is not a comfortable fit, that student is encouraged to apply for a new tenth grade seat through the High School Admissions Process.

REVIEW PROCEDURES

After the schools, students, and parents/guardians are informed of the results, parents/guardians accompanied by their child may review a copy of the student's answer sheet by requesting an appointment with a representative from the Office of Assessment. Appointments may be arranged by writing to:

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

The request must be sent by certified mail with proof of delivery and postmarked no later than April 1, 2014. An appointment date will be arranged within approximately four weeks of receipt of the letter. Copies of answer sheets are not available for distribution but will be reviewed at the scheduled appointment.

Discovery Program

As stated in the 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. The Office of Student Enrollment will determine the Specialized High Schools sponsoring a Discovery Program. Students will be notified if they are eligible to apply no earlier than May 2014.

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. 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, 2013; 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

3. 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. If you have questions, speak to your counselor.

SHSAT **USEFUL TIPS** FOR TESTING

SECTION 5

The Specialized High Schools Admissions Test (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 the ability to use problem-solving skills in mathematics. The test measures knowledge and skills you have gained over the years. Keeping up with your schoolwork throughout the year is the best possible preparation.

BEFORE TEST DAY

■ **The best way to improve your verbal skills is to read many books and articles.** This helps 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 2013 tests as closely as possible. A list of correct answers is provided for each test, along with explanations.

■ **It is helpful to simulate the actual testing situation.** You will have two and a half hours 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 on either section. It is recommended that you do not spend more than 75 minutes on either section. 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.

■ **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 the main idea questions wrong?

■ **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

■ **The night before the test, remember to get a good night's sleep.** Remember to bring your signed Test Ticket with you to your assigned test site, including your ranked choices of Specialized High Schools indicated on the front of the Ticket. Arrive at your assigned test site on time. Wear comfortable clothes and bring a watch to keep track of the time. Make sure that you have several sharpened Number 2 pencils and an eraser that erases cleanly. Students should not bring personal electronic devices such as a cell phone, iPod, calculator, tablet/iPad or ebook reader to 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.

■ **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.

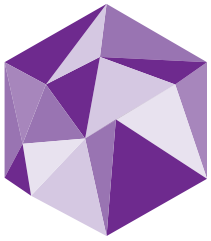
■ **Mark your answers carefully.** This is a machine-scored test, and you can lose credit by marking the wrong answer bubble or marking the answers to two questions on the same line. Make sure the number on the answer sheet matches the number of the question in your test booklet. To change an answer,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

■ **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 at the test site 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	Ⓠ	Ⓡ	Ⓢ	Ⓣ	●
The third sentence is	Ⓠ	●	Ⓢ	Ⓣ	Ⓤ
The fourth sentence is	Ⓠ	Ⓡ	●	Ⓣ	Ⓤ
The fifth sentence is	●	Ⓡ	Ⓢ	Ⓣ	Ⓤ
The sixth sentence is	Ⓠ	Ⓡ	Ⓢ	●	Ⓤ

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 English prose. There are five passages with six questions each. 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. There are no fictional passages.

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.

For each passage, one question will always assess your understanding of the main idea of the passage. Other questions will ask about factual details and inferences that can be drawn.

You may read the questions first, but do not attempt to answer the questions without reading the passage. It is also unwise to skim the passage instead of reading it carefully; you are likely to make inaccurate assumptions if you base them on only a few words or a short phrase. Often, the correct answer requires combining information from different parts of the passage. Since there will always be a question asking what the passage is about, try to formulate the answer by the time you have finished reading the passage. Likewise, try to answer each question before reading the choices. Then look at the choices to see which is closest to your answer. If none seems to be your answer, read the question again. You may 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. Which of the following is the best example of a wild animal that benefits from living near people?

F. a farm animal grazing in a field
G. a mouse building a nest in a basement
H. a tiger resisting capture
J. a seabird flying above a school of fish
K. a wild horse roaming the prairie

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. locating landfills near airports
H. eliminating hawks and other predators
J. paving over parks and green spaces
K. installing flashing lights on rooftops

Question 1

In Reading, the first question will always ask for the general theme of the passage. The correct answer 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 first paragraph describes wild animals, such as squirrels and pigeons, which live comfortably near people. Many of these animals live in buildings and eat human food (lines 5-7). The question asks for an example of another wild animal that benefits from living near people. Option F is incorrect because farm animals are not wild. In Option H, the wild animal, a tiger, is harmed, not benefited. Options J and K describe wild animals but do not provide any information about whether they live near people. Option G is the best example. Mice are wild animals that benefit from the shelter that buildings provide.

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 drink to 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 creatively 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.

TIPS FOR TAKING THE MATHEMATICS SECTION OF THE SHSAT

To improve your mathematics skills, choose a mathematics textbook and solve five to ten problems every day. Do both routine and difficult 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 learned more. Also, do not limit yourself to problems that test what you have learned in your mathematics class only. Go beyond what you have been taught and try new types of problems.

■ 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 know them by heart.

■ 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 106-108 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 "flip" 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°
G. 60°
H. 90°
J. 150°
K. 180°

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°. 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, $3x = 3(30) = 90°$.

EXAMPLE 8

What is the greatest common factor of 98 and 42?

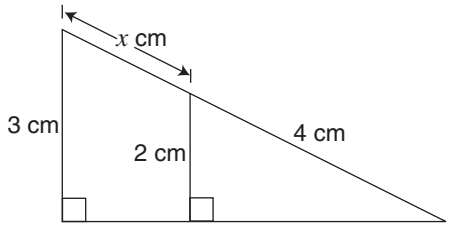
A. 2
B. 3
C. 6
D. 7
E. 14

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 28 and 29 and filling out side 1 of the Answer Sheet on page 30. For Form A, use side 2 of the Answer Sheet (page 31). When you are ready for Form B, use the Answer Sheet on page 69. You may tear out pages 31 and 69 to make it easier to mark your answers.

If you are taking the Grade 9 test, work the problems on pages 106-108 as well.

GRADE 8

A

NEW YORK CITY PUBLIC SCHOOLS

2013 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, 1999, would be 3-1-99.

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.

In **Grid 6**, fill in the circle that identifies your sex.

Grid 7 is labeled "BOOKLET LETTER AND NUMBER." In most cases, Grid 7 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 8:**

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 9 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

Grid 10 is labeled "STUDENT ID NUMBER." All SHSAT test-takers should write their student ID number in Grid 10. 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.

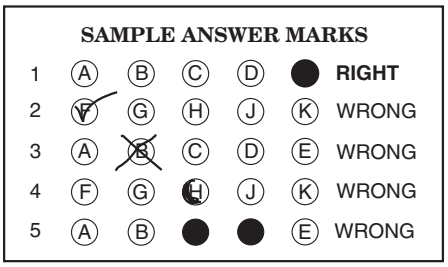
Now review Side 1 to make sure you have completed all lines and grids correctly. Review each column to see that the filled-in circles correspond to the letters or numbers in the boxes above them.

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



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

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

2013

NEW YORK CITY PUBLIC SCHOOLS

SPECIALIZED HIGH SCHOOLS ADMISSIONS TEST

GRADE 8

USE A PENCIL ONLY

SIDE 1

8

1. STUDENT STATEMENT: 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.

Signature (full name, first name first): _____

2. TODAY'S DATE: _____ (Month / Day / Year)

3. DATE OF BIRTH: _____ (Month / Day / Year)

CAREFULLY RECORD YOUR NAME, SCHOOL CHOICES, SEX, INFORMATION ABOUT THE SCHOOL WHERE YOU ARE NOW ENROLLED, DATE OF BIRTH, AND STUDENT ID NUMBER. USE A PENCIL ONLY. INCORRECT MARKS MAY DELAY THE SCORING OF YOUR ANSWER SHEET.

4. FIRST NAME (please print)

MI

LAST NAME (surname) (please print)

5. CHOICES OF SPECIALIZED HIGH SCHOOLS

Indicate your school choice in order of preference.

- Fill in only one school for each choice.
- You **must** fill in a first choice school.
- Fill in only one circle in a row and only one circle in a column.

School choices indicated on the answer sheet are final.

SCHOOLS	CHOICES: 1st choice	2nd choice	3rd choice	4th choice	5th choice	6th choice	7th choice	8th choice
Bronx Science	○	○	○	○	○	○	○	○
Brooklyn Latin	○	○	○	○	○	○	○	○
Brooklyn Tech	○	○	○	○	○	○	○	○
HS Math, Sci., & Engineering	○	○	○	○	○	○	○	○
HS American Studies/Lehman	○	○	○	○	○	○	○	○
Queens Sci./York	○	○	○	○	○	○	○	○
Staten Island Tech	○	○	○	○	○	○	○	○
Stuyvesant	○	○	○	○	○	○	○	○

6. SEX ○ Female ○ Male

7. BOOKLET LETTER AND NUMBER

8. SCHOOL WHERE YOU ARE NOW ENROLLED

NAME OF SCHOOL

School Code

(P) Fill in for private or parochial schools only

9. DATE OF BIRTH

Month: JAN, FEB, MAR, APR, MAY, JUN, JUL, AUG, SEP, OCT, NOV, DEC

Day: 1–31

Year: 19, 20, 0–9

10. STUDENT ID NUMBER

NEW YORK CITY PUBLIC SCHOOLS

USE A PENCIL ONLY

SIDE 2

2013 SPECIALIZED HIGH SCHOOLS ADMISSIONS TEST

GRADE 8

Test Booklet Letter Test Booklet Number

Student's First Name (please print) Student's Last Name (please print)

PART 1 VERBAL

SCRAMBLED PARAGRAPHS

Paragraph 1

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

Paragraph 2

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

Paragraph 3

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

Paragraph 4

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

Paragraph 5

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

LOGICAL REASONING

11 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
12 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ
13 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
14 Ⓕ Ⓖ Ⓗ Ⓙ Ⓚ
15 Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
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PART 2 MATHEMATICS

MATHEMATICS PROBLEMS

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Sample Test, Form A
Part 1 — Verbal

Suggested Time — 75 Minutes

45 QUESTIONS

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

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.

CONTINUE ON TO THE NEXT PAGE ▶

Paragraph 2

In the remote mountain country of Nepal, a small band of "honey hunters" carry out a tradition so ancient that it is depicted in drawings dating back 10,000 years.

_____ **Q.** Throughout this entire dangerous practice, the hunter is stung repeatedly.

_____ **R.** To harvest the honey from these combs, a honey hunter climbs above the nest, lowers a bamboo-fiber ladder over the cliff, and climbs down.

_____ **S.** The honeybees that colonize the Nepalese mountainsides are among the largest in the world, building huge honeycombs on sheer rock faces that may be hundreds of feet high.

_____ **T.** Only veteran honey hunters, with skin that has been toughened over the years, can return from a hunt without the painful swelling caused by these stings.

_____ **U.** Once he has reached the level of the nest, the hunter uses two sturdy bamboo poles like huge chopsticks to pull it away from the mountainside and into a large basket, which is then lowered to people waiting below.

Paragraph 3

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.

CONTINUE ON TO THE NEXT PAGE ▶

Paragraph 4

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.

Paragraph 5

In the colder regions of the Northern Hemisphere, an energy-efficient house should have most of its windows facing south.

_____ **Q.** The reason that architects and builders want this "southern exposure" is related to the position of the sun in the sky.

_____ **R.** To take advantage of this, during the winter the south-facing windows should be uncovered during the day, allowing sunlight—and heat—to penetrate directly into the living space.

_____ **S.** Though the sun always rises in the east and sets in the west, in the Northern Hemisphere the sun is permanently situated in the southern portion of the sky.

_____ **T.** In these ways, the sun's warmth is retained in the house, a form of passive solar heating.

_____ **U.** At night, when temperatures go down, the windows should be covered by curtains or other insulating materials to prevent the heat from escaping.

CONTINUE ON TO THE NEXT PAGE ▶

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. At North High School, everyone who went to basketball camp is on the basketball team. Some students on the basketball team are also on the track team. Ahmed went to basketball camp.

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

A. Some members of the track team went to basketball camp.
B. Ahmed is on the basketball team, but he is not on the track team.
C. Some members of the track team are not on the basketball team.
D. Ahmed is on the basketball team.
E. Ahmed is on the basketball team and the track team.

12. A one-room school has three grades—6th, 7th, and 8th. Eight students attend the school: Ann, Bob, Carla, Doug, Ed, Filomena, George, and Heidi. In each grade there are either two or three students.

1) Ann, Doug, and Filomena are all in different grades.
2) Bob and Ed are both in the 7th grade.
3) Heidi and Carla are in the same grade.

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

F. Exactly two students are in the 6th grade.
G. Carla and Doug are in the same grade.
H. Exactly three students are in the 7th grade.
J. Heidi and Ann are in the same grade.
K. Filomena is in the 8th grade.

CONTINUE ON TO THE NEXT PAGE ▶

13. Four cars are parked side by side in a parking lot.

1) The blue car is parked on the far left.
2) The yellow car is immediately next to the red car.
3) The green car is between the yellow and blue cars.
4) Miriam's car is between the blue and red cars.

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

A. Miriam's car is green.
B. The green car is immediately next to the blue car.
C. Miriam's car is yellow.
D. The green car is immediately next to the red car.
E. The yellow car is between the red and green cars.

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14. Javon has three pets at home: a hamster, which is active only at night; a dog, which is active only during the day; and a cat, which alternately sleeps for an hour and then is active for an hour.

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

F. The hamster and the cat will never be active at the same time.
G. The dog and the cat will never be active at the same time.
H. There are times when none of the pets is active.
J. All three animals are active at alternate hours.
K. There never will be more than two pets active at the same time.

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15. 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?

A. If I cannot ride my bike, then it must be dark.
B. If I cannot ride my bike, then it must be snowing.
C. I do not have a headlight on my bike.
D. If I ride my bike, then it is not dark or snowing.
E. If it is snowing, then it must be dark.

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16. 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 ▶

17. 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.

18. In the country of Cordovia, all the teachers are left-handed. Every Cordovian teacher is near-sighted.

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

F. At least some left-handed Cordovians are near-sighted.
G. At least some right-handed Cordovians are teachers.
H. Every left-handed Cordovian is a teacher.
J. Every near-sighted Cordovian is left-handed.
K. Every near-sighted Cordovian is a teacher.

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 letters may or may not be presented in the same order as the words.

L	W	Q	P	R	means
"Michelle	paints	planes	and	birds."	
Z	V	R	U	N	means
"Stuart	draws	cars	and	dogs."	
L	V	P	T	R	means
"Javier	paints	cars	and	planes."	
Y	X	R	N	W	means
"Ivan	draws	birds	and	ships."	

19. Which word is represented by the letter Q?

A. birds
B. planes
C. Michelle
D. paints
E. and

20. Which letter represents the word "paints"?

F. L
G. P
H. R
J. W
K. Cannot be determined from the information given.

CONTINUE ON TO THE NEXT PAGE ▶

READING

QUESTIONS 21-50

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

One hundred and fifty million years ago, flowers were not as colorful as they are today. Blossoms that contained the pigment chlorophyll, such as oak blossoms, were green; otherwise, flowers lacking chlorophyll were white, like dogwood blossoms. Over millions of years, according to current theory, the coloration of individual blossoms was occasionally altered by genetic mutations. Mutations are, in effect, errors in the genetic codes inherited from parent plants. For example, the yellow in daffodils began with a mutation of the gene that carries instructions for the use of carotene, a yellow pigment that the plant uses to make food.

Although the blossoms of most wild plants are still green or white, there are more colors now than there were 150 million years ago. Of these newer colors, yellow shades are the most common, followed by orange and red, including shades of pink. Blue flowers are the rarest, because relatively few mutations resulted in that color.

If a color-related genetic mutation helps a plant to survive, that gene may be passed from the parent to its offspring. Many flowering plants reproduce by means of pollination, a process that requires outside assistance. Some plants are pollinated by the wind, a few by water. Others are pollinated by flying creatures such as insects, bats, and hummingbirds. Moreover, plant breeders deliberately cross-pollinate certain flowers to cultivate desirable traits, such as the unusual colors of some "designer" rose varieties.

Bird and insect pollinators seek out blossoms because they are looking for nectar, the sugary liquid in the heart of a flower. When the first color mutations appeared millions of years ago, the colorful blossoms became more noticeable and were visited more frequently. When the flying creatures drank the nectar from a flower, their bodies brushed against the pollen and carried it to the next plant, unintentionally fertilizing the plants as they went along. As a result, the more colorful plants were more likely to reproduce.

Many plants are pollinated only by day or only by night. Insects that are active during the day notice certain bright colors. Bees, for example, can distinguish hues of yellow and blue, but they cannot see red. Hummingbirds are strongly attracted to red blossoms, and some red flowers, such as the cardinal flower, are pollinated only by hummingbirds. Night-flying moths are attracted by white flowers, whose paleness is visible by moonlight. Many night-pollinated flowers also have fragrances that are attractive to moths.

Over millions of years, the combination of color mutations and pollination by flying creatures has led to an abundance of colorful blossoms across the earth.

21. Which of the following best tells what this passage is about?

- **A.** how genetic changes affect birds and insects
- **B.** how bees fertilize flowers
- **C.** how insects see colors
- **D.** how flowering plants reproduce
- **E.** how colorful blossoms developed

22. Which of the following blossoms would most likely be pollinated by night-flying moths rather than bees?

F. red, lightly scented blossoms
G. yellow blossoms with blue centers
H. dark blue, heavily perfumed blossoms
J. bright green blossoms that sway in the wind
K. pale white blossoms with a strong scent

23. Why are blue flowers so rare?

A. There were fewer mutations resulting in blue flowers.
B. Bees and other insects avoid blue flowers.
C. Blue flowers have insufficient pollen.
D. Bees cannot perceive the color blue.
E. Blue flowers do not contain carotene.

24. Why were flowers of 150 million years ago always green or white?

F. Yellow and red flowers were not hardy enough to survive.
G. At that time, the only pigment in flowers was chlorophyll.
H. Yellow and red flowers did not contain nectar.
J. Oak blossoms and dogwood blossoms were the only flowers.
K. Insects were not attracted to colorful flowers.

25. Why do birds and insects fly from one plant to another?

A. to fertilize the plants
B. to help plants with mutations to reproduce
C. to produce more color mutations
D. to create desirable traits in the plants
E. to search for nectar to drink

26. In lines 28-29, what does the author mean by the statement that pollination "requires outside assistance"?

F. Color-related mutations are passed from parent to offspring.
G. Only flowering plants reproduce by pollination.
H. The plants rely on wind, water, or flying creatures for pollination.
J. Some methods of pollination are intentional, while others are not.
K. Blossom colors other than green and white were produced by genetic mutations.

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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.

27. 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

28. According to the passage, "detective cameras" were popular with

- **F.** spies.
- **G.** airplane pilots.
- **H.** the German army.
- **J.** professional photographers.
- **K.** amateur photographers.

CONTINUE ON TO THE NEXT PAGE ▶

29. 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 activites by secret agents
- **D.** to take pictures without the subjects' knowledge
- **E.** to be carried by homing pigeons for surveillance

30. 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.

31. 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.

32. 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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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 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 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; 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 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 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 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 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!

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 also blamed. Some people believed that lightning rods had interrupted the natural temperature balance of the earth, causing the cooler temperatures.

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 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 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 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, demonstrating the global nature of weather. The dust in the atmosphere eventually settled, and the spring of 1817 was back to normal.

33. 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

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34. 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.

35. 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."

36. 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 the same part 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.

37. 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 was larger than the eruption of Mount Tambora.

38. 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.

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As France moved toward revolution at the end of the eighteenth century, a new artistic style, Neoclassicism, gave expression to the changed attitudes that contributed to the fall of the French monarchy. Most art from the first half of the eighteenth century had been decorative and sentimental. Subjects of paintings were typically domestic scenes or stories from mythology containing simple moral lessons. With the advent of the Neoclassical movement, however, art began to return to the classical style and heroic themes of the ancient Greeks and Romans.

The new movement was largely defined by the work of Jacques-Louis David, although he was not its founder. His 1785 painting *The Oath of the Horatii* is considered to be the finest example of Neoclassicism. It is also one of the finest examples of French Revolutionary art. David admired the ancient Roman republic, governed by its elected consuls and senate rather than by a king (the way that France was governed). He chose as his subject a famous story from Roman history in which the Horatius brothers swear an oath of loyalty to the republic. The setting of the painting resembles a bare stage, with only three shadowy stone arches to provide a backdrop for the figures. Three brothers stand together, their hands raised dramatically toward the swords held by their father. Behind the father's back, the mother and sisters are slumped in grief. All of the figures are positioned so closely to the foreground that it is difficult for viewers to distance themselves from the scene. Light falls from an unseen window, illuminating the family against the dark background.

At first, some critics condemned David's composition as too stark and severe. However, the French middle class, for whom the work was intended, had no trouble interpreting it in terms of their own times. To them, *The Oath of the Horatii* represented a call to civic devotion and the promise of a future in which the wasteful, self-indulgent excesses of the French royal family and aristocracy would be replaced by honor, self-sacrifice, and patriotism. Four years after the painting was first shown in 1785, the social trends reflected in the work of David and other Neoclassicists exploded into revolution against King Louis XVI.

39. Which of the following best tells what this passage is about?

- **A.** The French aristocracy were among the first supporters of Neoclassicism.
- **B.** Jacques-Louis David was a great French artist and patriot.
- **C.** Neoclassicism began with *The Oath of the Horatii*.
- **D.** The French Revolution was the result of the extravagance and wastefulness of the French monarchy.
- **E.** David's painting in the Neoclassic style expressed the political mood of late-eighteenth-century France.

40. Why did late-eighteenth-century art critics give *The Oath of the Horatii* negative reviews?

- **F.** They did not understand the story of the Horatius brothers.
- **G.** They thought the style of the painting was too harsh.
- **H.** They feared that David would become the leader of a new art movement.
- **J.** They objected to a French painter's using a Roman setting for the painting.
- **K.** They knew that King Louis XVI would not like the painting.

41. Which of the following was most likely to have been the subject of a Neoclassical painting?

- **A.** a simple story from mythology
- **B.** a portrait of King Louis XVI
- **C.** a soldier defending the city gates
- **D.** a mother and her three small children sitting at the dinner table
- **E.** a vase of flowers, a basket, and spilled fruit lying on a plush drapery

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42. David's painting *The Oath of the Horatii* depicts three brothers

F. pledging their allegiance to Rome.
G. acting on the set of a stage play.
H. handing their swords to their father.
J. slumped in grief.
K. fighting in the French Revolution.

43. The Neoclassicism movement was an advance indication of

A. the decorative art of the eighteenth century.
B. the French Revolution.
C. the Roman Republic.
D. the self-indulgence of the French monarchy.
E. the popularity of stories from mythology.

44. How did the French middle class interpret *The Oath of the Horatii*?

F. The father represented King Louis XVI.
G. The light from an unseen window symbolized the call to arms.
H. The story of the Horatius brothers was an appeal to French patriotism.
J. The three brothers represented the new Neoclassical painters.
K. The three stone arches suggested honor, self-sacrifice, and patriotism.

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On Monday evening, September 26, 1960, sixty million Americans turned on their TV sets to view the first televised political debate in a campaign for the presidency of the United States. As of that date, it was by far the largest number ever to witness a political discussion. The novelty of the event drew even those with little or no interest in politics.

The candidates, Republican Vice President Richard M. Nixon and Democratic Senator John F. Kennedy, had agreed to face each other and the nation in four one-hour sessions that the press dubbed the "Great Debates." Many expected Vice President Nixon to win the debates easily. He was ahead in the newspaper polls, he was an experienced public speaker, and he had served as vice president for nearly eight years. Senator Kennedy was less well-known and, at forty-three, was the youngest man ever to run for president. Throughout the presidential race, his opponents criticized him for his relative youth and inexperience.

By mutual agreement, the first session was limited to domestic issues. Each candidate was given eight minutes to make his opening remarks. During the remainder of the hour, the candidates took turns responding to questions posed by selected reporters. Both Kennedy and Nixon dealt with the issues calmly and carefully. Viewers who expected to see a free-for-all were disappointed. The way the two men appeared on the television screen, however, may have been as important as what they said. Kennedy looked at the camera while answering questions, appearing to speak directly to his viewers and give them straight answers. Nixon was recovering from a severe bout of influenza, and he appeared tense and tired. He looked at the reporters who asked the questions instead of at the camera, giving some viewers the impression that he avoided eye contact with his audience, and thus suggesting that he was not trustworthy. Most commentators agreed that Kennedy gained from the encounter: many viewers who had previously felt he lacked the maturity necessary to be president were won over by his charm, poise, and confident manner.

While far fewer people watched the three later sessions, much discussion ensued regarding the influence of the Great Debates on the outcome of the 1960 presidential election. Some feared that the better TV performer was bound to come across as being the better candidate. "Is this a good way to judge a person's ability to serve as president of the United States?" they asked.

Kennedy ultimately won the election, but it was by the narrowest popular vote margin in more than eighty years. Some observers concluded that, had the Great Debates been broadcast on radio and not on television, Nixon would have won.

45. Which of the following best tells what this passage is about?

- **A.** the careers of Nixon and Kennedy
- **B.** how elections have changed since 1960
- **C.** domestic issues in the Kennedy-Nixon debates
- **D.** the presidential debates of 1960
- **E.** the qualifications of Nixon and Kennedy

46. According to the passage, why did people who were not normally interested in politics tune in to the first of the Great Debates?

- **F.** Vice President Nixon was a popular politician.
- **G.** Television had never before been used in this way.
- **H.** They had heard that Kennedy was young and attractive.
- **J.** They wanted to see if the newspaper polls were correct.
- **K.** The election was expected to be very close.

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47. Which of the following issues was most likely to be discussed during the first debate?

A. problems of American industry
B. politics of the Middle East
C. world nuclear disarmament
D. trade with Europe
E. the status of Cuba

48. What evidence does the author provide to support the last sentence of the passage?

F. Far fewer people watched the three later debates.
G. Both candidates dealt with the issues calmly and carefully.
H. The candidates did not cause a free-for-all.
J. The debate sessions were each limited to specific issues.
K. Nixon was more experienced and well-known than Kennedy.

49. According to the passage, how did Kennedy benefit from the debates?

A. His grasp of domestic issues was shown to be superior to Nixon's.
B. The debates focused on his years of experience in the Senate.
C. He appeared to have attractive personal characteristics.
D. He maintained eye contact with the reporters asking the questions.
E. He spoke well despite his recent illness.

50. According to the passage, which of the following would have been the most likely result if the candidates had **not** debated on television in 1960?

F. Kennedy would have won the election anyway.
G. The election results would have been much closer.
H. Nixon would have had a better chance of winning the election.
J. The candidates would not have debated at all.
K. Nixon would not have improved his on-screen performance.

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

A. 12
B. 15
C. 20
D. 36
E. 60

52. 1 sind = 5.6 ricks
1 sind = 12.88 dalts

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

F. 0.43 dalts
G. 2.3 dalts
H. 7.28 dalts
J. 18.48 dalts
K. 72.128 dalts

53. 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?

A. 15
B. 16
C. 17
D. 18
E. 21

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

F. 10,000
G. 100,000
H. 1,000,000
J. 100,000,000
K. 1,000,000,000

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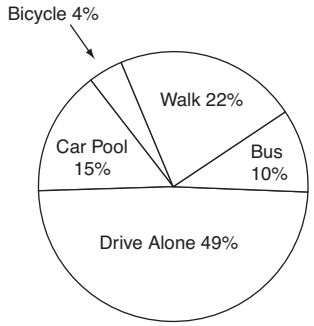
55.

HOW PEOPLE GET TO WORK IN CENTER CITY



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

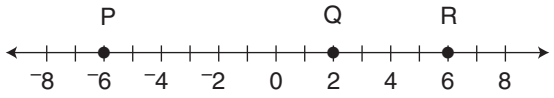
How many more people walk to work than ride their bicycles to work in Center City?

A. 18
B. 22
C. 2,700
D. 2,800
E. 3,000

56. Judy is n years older than Carmen and twice as old as Frances. If Frances is 15, how old is Carmen in terms of n?

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

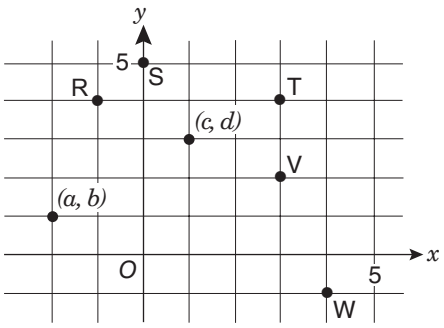
57.



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

58.



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

F. R
G. S
H. T
J. V
K. W

59. $\dfrac{(^{-}51)^2}{17^3} =$

A. $^{-}2$

B. $-\frac{1}{17}$

C. $\frac{9}{17}$

D. $\frac{16}{17}$

E. 2

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

F. 147
G. 245
H. 441
J. 735
K. 1,225

61. $|190 - 210| + |19 - 21| + x = 100$

In the equation above, what is the value of x?

A. 78
B. 88
C. 100
D. 122
E. 123

62. 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

63. 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

64. 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

65. 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?

A. 0.25 in.
B. 0.75 in.
C. 3 in.
D. 9 in.
E. 144 in.

66. 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

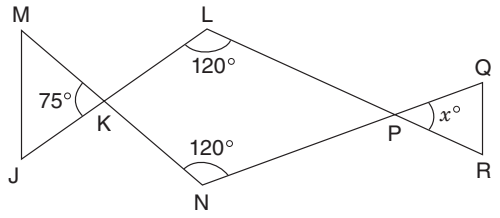
67. How many different two-digit numbers can be formed from the digits 7, 8, 9 if the numbers must be even and no digit can be repeated?

A. 0
B. 1
C. 2
D. 3
E. 6

68. 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?

F. 3
G. 6
H. 15
J. $27\frac{1}{2}$
K. 165

69.



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

A. 25
B. 45
C. 50
D. 60
E. 75

70. 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?

F. 5
G. 12
H. 13
J. 14
K. 15

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

A. 3
B. 4
C. 5
D. 10
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

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.

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

76. 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?

F. 11:00 p.m.
G. 4:00 a.m.
H. 9:00 a.m.
J. 7:00 p.m.
K. 2:00 p.m.

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. 3π
E. 9

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78. 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?

F. \$0.07
G. \$0.15
H. \$0.17
J. \$0.22
K. \$0.24

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 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?

A. 1
B. 2
C. 3
D. 4
E. 5

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.

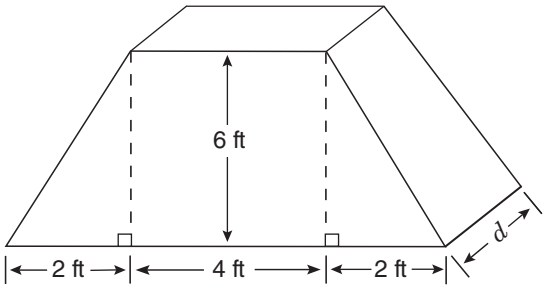
86. Today, Tom is $\frac{1}{4}$ of Jordan's age. In 2 years, Tom will be $\frac{1}{3}$ of Jordan's age. How old is Jordan today?

F. 4 yr
G. 6 yr
H. 12 yr
J. 16 yr
K. 22 yr

87. 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?

A. 2
B. 4
C. 6
D. 7
E. 12

88.



The end of a tent has a 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

89. 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

90. 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

91. 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?

A. $3\frac{1}{3}$ min
B. $3\frac{1}{2}$ min
C. $4\frac{1}{2}$ min
D. 5 min
E. 7 min

92. How many positive two-digit numbers are evenly divisible by 4?

F. 22
G. 23
H. 24
J. 25
K. 26

93. 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. $\frac{3y}{4}+\frac{x}{3}$

94. 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?

F. \$1,875
G. \$2,500
H. \$3,125
J. \$3,750
K. \$4,375

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

F. $^{-}1$
G. 0
H. 1
J. 2
K. Infinity

97. 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.

CONTINUE ON TO THE NEXT PAGE ▶

98.

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?

F. $1\frac{3}{4}$ pages

G. 10 pages

H. $16\frac{1}{2}$ pages

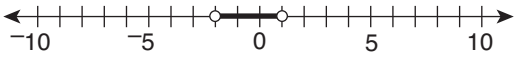
J. $17\frac{1}{4}$ pages

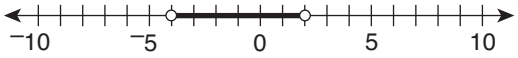
K. $17\frac{1}{2}$ pages

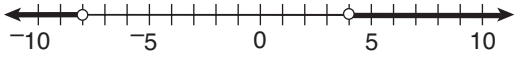
99. A rectangular floor is 12 feet wide and 16 feet long. It must be covered with square tiles that are 8 inches on each side. Assume there is no space between adjacent tiles. If the tiles cost \$8 each, how much will it cost to buy the tiles needed to cover the floor?

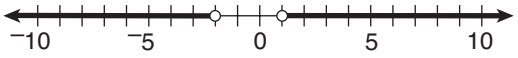
A. \$24
B. \$64
C. \$192
D. \$2,304
E. \$3,456

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

F.


G.


H.


J.


K.


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 two daily meals mentioned in the opening sentence are further described in T—the main course (a thick stew) and a starchy food. U continues the distinction between the main dish and the starch, explaining that the main dish is served on individual plates, while the diners serve themselves 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 as well, which is to cool the spicy taste of the main dish, as described in Q.

Paragraph 2 (SRUQT)
The opening sentence introduces a new term, the "honey hunters" of Nepal, and the paragraph goes on to describe what honey hunters do. Honeybees, the source of honey, are mentioned in S, which also refers to Nepalese mountainsides, a link to the opening sentence. The job of a honey hunter is explained in R and continued in U. "This entire dangerous practice" in Q refers back to the procedures described in R and U. The hunter is stung repeatedly (Q), and T continues the description of the stinging that the hunters endure.

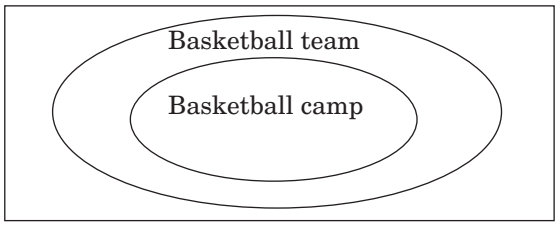
Paragraph 3 (UTRSQ)
The two definitions of "bluegrass" given in the opening sentence are connected by U, which introduces bluegrass music and its founder, Bill Monroe. The description of Monroe's traditional bluegrass sound, including its instruments, is in T. R continues the description of the instruments and mentions two instruments **not** in a bluegrass band. The idea of 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 the style that is **not** heard at traditional bluegrass festivals (Q).

Paragraph 4 (USTRQ)
The opening sentence says that John Wesley Powell developed the first topographical maps of the entire United States. U gives another name for a topographical map, explains how these maps differ from other maps, and defines the term "contour line." S supplies another function of contour lines, which is to indicate the slope of the land. T explains in more detail how contour lines indicate slope. R describes how blue lines are used to represent waterways and how the course of a waterway can be detected using the contour lines alone. Q explains how this can be done: by looking for V-shaped contour lines.

Paragraph 5 (QSRUT)
The opening sentence is a generalization about the most energy-efficient orientation for houses in the Northern Hemisphere, but does not explain why it is true. The explanation begins with "The reason that . . ." in Q. "The position of the sun in the sky" in Q is further described in S—the sun is always in the southern portion of the sky. The next sentence is more difficult to identify. To find it, try each of the remaining sentences (R, T, and U) after S. R is the only one that makes sense. "To take advantage of this" in R refers to the sun's position in S. R goes on to say that south-facing windows, uncovered during the day, allow sunlight and heat to enter a house. U, with its reference to covering windows at night to conserve heat, contrasts daytime and nighttime activities. T concludes the paragraph. "In these ways" refers back to uncovering windows during the day and covering them at night in R and U. The result is the retention of the sun's warmth in the house.

Logical Reasoning

11. (**D**) Draw a diagram to illustrate the relationship between those who went to basketball camp and those on the basketball team.



In addition, some students on the basketball team are also on the track team. However, there is not enough information to determine where to place the track team on the diagram. We do not know if the track team has members who are not on the basketball team (Option C), and we do not know if any members of the track team also went to basketball camp (Option A). Similarly, Options B and E **might** be true, but are not necessarily true. Only Option D must be true. Ahmed—just like everyone else who attended basketball camp—is on the basketball team.

12. (**H**) Draw a diagram showing the three grades and the students in each grade. There are a total of eight students, with either two or three students per grade. Two grades must have three students, and one grade must have two students, but we do not know which grades these are. Start by filling in the definite information provided in Statement 2, that Bob and Ed are both in Grade 7.

Statement 1 says that Ann, Doug, and Filomena are all in different grades, but does not say which grade each student is in. Write the letter combination ADF (their initials) in each grade as a placeholder because we know that one of these three must be in each grade.

Grade	Student	Student	Student
6	ADF		
7	Bob	Ed	ADF
8	ADF		

According to Statement 3, Heidi and Carla are in the same grade. They cannot be in Grade 7—that would put five students in that grade, and the maximum number of students per grade is three. Heidi and Carla must be in either Grade 6 or Grade 8. There is no information about George. He could be in either Grade 6 or 8, whichever grade Heidi and Carla are **not** in.

Options F, G, J, and K might be true, but none of them **must** be true. For example, Option F would not be true if three students (ADF, Carla, and Heidi) are in Grade 6. Only Option H **must** be true. Grade 7 contains Bob, Ed, and one other student (Ann, Doug, or Filomena), for a total of three students.

---

13. (**B**) Write "LEFT" on the far left of your scrap paper, and fill in the definite information found in Statement 1, that the blue car is in the far left position. Leave spaces for the remaining three cars.

Left B _____ _____ _____

The remaining information is less definite. According to Statement 4, Miriam's car is between the blue and red cars, so her car cannot be blue or red and must be either green or yellow. We know that the yellow car must be immediately next to the red car (Statement 2), but we do not know which order is correct (YR or RY). According to Statement 3, the green car must be between, but not necessarily immediately next to, the blue and yellow cars. Two possibilities satisfy all of these conditions.

BGYR BGRY

Options A and C are not true—we still do not know the color of Miriam's car. Options D and E may or may not be true. Only Option B **must** be true. In each possible arrangement, the green car is in the second position, immediately next to the blue car.

---

14. (**K**) The activity of Javon's three pets can be represented like this:

Time	Hamster Active?	Dog Active?	Cat Active?
Night	Yes	No	Alternately sleeps for an hour and active for an hour.
Day	No	Yes	Alternately sleeps for an hour and active for an hour.

Options F and G are not true: there will be times when the hamster and the cat—or the dog and the cat—will be active at the same time. H can be ruled out because at least one pet is active at any given time. J is contradicted by the information in the question. Option K is always true. Of the three pets, a maximum of two will be active at any one time.

---

15. (**D**) 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 A and B. Option C is not mentioned at all, and E is wrong because it incorrectly combines two pieces of information. D 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.

---

16. (**K**) This question provides information about two relationships: matching each driver with a car color, and putting 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. Based only on this information, there are several possible orders (using the first initial of each driver).

AJMP AJPM PAJM

Maybe the colors of the cars will help to place Patrick. 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.

OSBW OSWB

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).

---

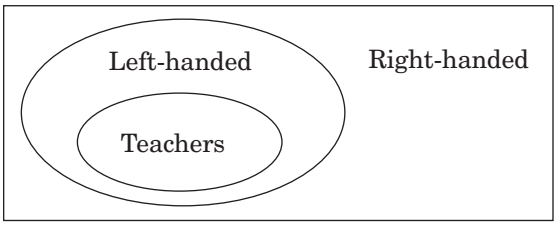
17. (**A**) Write "FIRST" on the left side of your scrap paper. Using the initial for each horse's name, list what each statement says about which horse entered before or after other horses. (Notice that these positions are relative to each other. The problem does not give any definite information about a horse's position.)

FIRST
1. SR
2. AER
3. ETS

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

---

18. (**F**) Represent the first sentence in a diagram like this. (Everyone who is not left-handed can be considered right-handed.)



The second sentence states that every Cordovian teacher is also near-sighted. However, the problem does not provide enough information to determine where to place near-sightedness on the diagram. We do not know whether all near-sighted Cordovians are teachers (Option K) or are left-handed (Option J). Similarly, we do not know whether all left-handed Cordovians are teachers (Option H). Option G is incorrect—the first sentence states that all Cordovian teachers are left-handed. Only Option F must be correct.

19. and 20. *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 (Michelle). You need not find out what every letter represents in the code.*

19. (**C**) The letter Q appears only in the first sentence. Thus, the word represented by Q must appear only in the first sentence. That word is "Michelle" (Option C).

20. (**K**) The word "paints" appears only in the first and third sentences, so start by identifying the letters that appear in both the first and third sentences—L, P, and R. However, the letter R appears in all four sentences and thus cannot represent the word "paints." Either L or P could represent "paints," but there is no way to figure out which is correct. The answer cannot be determined (Option K).

Reading

Colors

21. (**E**) The first question for a Reading passage always asks for the general theme of the passage. The correct answer must encompass the main points without being overly broad. Option A is incorrect because the passage is about genetic changes in plants, not in birds and insects. Options B, C, and D are mentioned but are not the main themes. Option E is best. The development of colorful blossoms includes genetics, mutations, pollination, and blossom colors, all of which are discussed.

---

22. (**K**) The passage says that night-flying moths are attracted by white flowers, whose paleness is visible by moonlight (lines 58-60), which is Option K. Options F and H are incorrect because daytime insects, not nighttime insects, are attracted to red and blue flowers. The passage does not say anything about the attractiveness of yellow flowers with blue centers (Option G) or bright green flowers (Option J).

---

23. (**A**) The color frequencies among blossoms are discussed in the second paragraph. According to lines 21-23, blue flowers are rarest because relatively few mutations resulted in that color. Option A restates that information. Options B, C, and D are not mentioned, and there is no information in the passage to determine whether Option E is true.

24. (**G**) The flowers of 150 million years ago are described in the first two sentences. They were either green or white, depending on whether they contained chlorophyll, which is Option G. Options F and H are not mentioned. Option J is incorrect because the reading passage mentions oak blossoms and dogwood blossoms as **examples**, implying that other green and white flowers existed as well. Option K cannot be correct because at that time there were no colorful flowers to attract insects.

---

25. (**E**) The answer is found in the first sentence of the fourth paragraph: to search for nectar, which is Option E. Options A and B might seem attractive, since birds and insects do fertilize plants and help plants reproduce. However, that is the unintentional result, not the reason, for birds and insects to travel from one plant to another. Options C and D imply that the birds and insects desire to change plant characteristics. Again, this may be the consequence, but it is not the intention.

---

26. (**H**) To answer this question, look at the entire third paragraph, not just lines 28-29. Option H best summarizes how pollination occurs—by wind, water, or flying creatures, which can be considered "outside assistance." Options F and K are true statements as written, but they do not answer the question about "outside assistance." There is no information in the passage to support Option G. Option J is incorrect because it does not explain what "outside assistance" means.

Camera

27. (**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.

---

28. (**K**) The answer, Option K, is found in lines 9-11. Despite the name of the camera, amateur photographers, not detectives, used this camera.

---

29. (**D**) The correct answer, Option D, is found in lines 9-12. It is true that 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.

30. (**J**) According to lines 23-25, 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 in the passage.

---

31. (**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.

---

32. (**G**) Reread the entire 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" was not impractical. In other words, the idea of taking photographs from overhead, without detection, was practical, which is Option G, and the passage gives the example of satellite-mounted cameras to illustrate its practicality. Options F and J were true of other cameras as well as aerial photography, and are too broad to be the "idea" referred to in line 40. Option H describes a use for aerial photography and is not the "idea." Option K refers to the impractical attempt, not to the idea behind it.

No Summer

33. (**B**) 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.

---

34. (**F**) The correct answer requires you to make an inference based on information provided early 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 is Option F. Options H and K are incorrect because the snow and cold weather 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).

35. (**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.

---

36. (**J**) Reread the entire fourth and fifth paragraphs to understand the phrase "the global nature of weather." They explain how a volcanic eruption in Indonesia affected the weather in New England. In other words, conditions in one part of the world (Indonesia) can affect weather in another part of the world (New England), which is Option J. None of the other options are supported by the passage.

---

37. (**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 would you expect to have happened? Option B seems possible; dust from the volcanic eruption might block the sunlight and lower temperatures in other areas of the world as well. Options A, C, D, and E are not supported by the passage.

---

38. (**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's theory. Options H and J may or may not be true statements, but they were not part of Bessel's theory. The eruption of Mount Pinatubo occurred nearly two centuries after the eruption of Mount Tambora, long after Bessel's lifetime, so he could not have compared the two events.

David

39. (**E**) While the passage presents general information on Neoclassicism, it focuses on one Neoclassical painting by Jacques-Louis David and its relationship to the revolution against the French monarchy in the late eighteenth century. This theme is best summarized in Option E. Options A and C are both contradicted by facts presented in the passage. Options B and D may both be true, but they are not the theme of the passage.

40. (**G**) The opinion of art critics about David's painting is presented in lines 39-40, which says that critics saw it as "too stark and severe." Option G restates this information. Option F is contradicted by line 24, which describes the story of the Horatius brothers as "famous." There is no evidence in the passage to support Options H, J, or K.

---

41. (**C**) Lines 10-13 describe the "classical style" and "heroic themes" that characterize Neoclassicism. The option that best reflects these qualities is Option C. Options A, D, and E are all examples of the "domestic scenes or stories from mythology" (lines 8-9) that were typical of artwork from earlier in the eighteenth century. Option B is unlikely given the political impact of Neoclassicism described in lines 51-53.

---

42. (**F**) The story of the Horatius brothers is summarized in lines 25-26: they were swearing loyalty ("allegiance") to the Roman republic, which is Option F. Option J refers to the sisters, not the brothers. Option H is incorrect because the father was already holding the swords, and Option G is incorrect because the passage describes the setting as **resembling** a stage, not actually being one. Finally, the painting shows an episode from Roman history, not French history, ruling out Option K.

---

43. (**B**) Neoclassicism as a movement is discussed in two places: at the beginning of the first paragraph and the end of the third paragraph. Reread these sections. You are looking for information on what the movement foresaw ("advance indication"). Lines 3-5 describe how Neoclassicism reflected attitudes that led to the "fall of the French monarchy." Similarly, lines 51-53 state that the movement's works reflected trends that "exploded into revolution." Thus, the correct answer is Option B. Options A and E both refer to an earlier art style, and Option C is an earlier period in history. The self-indulgence of the French monarchy (Option D) was occurring at the same time as the Neoclassical movement (lines 46-48).

---

44. (**H**) How the French middle class understood David's painting is discussed in the third paragraph, in particular in lines 44-49. The call to civic devotion and patriotism described here is best summarized in Option H. There is no support in the passage for Options G, J, or K. Option F is not likely given the attitude toward Louis XVI described in lines 51-53.

Debates

45. (**D**) Option A is too broad—the passage focuses on a specific event, not on entire careers. Option B is implied in the second-to-last paragraph, but is not specifically discussed. Option C is a detail, not a main point. The best summary is Option D, which includes considerations prior to the debates, the actual event, and some of the consequences. Option E is an important detail, but not the main theme.

---

46. (**G**) The answer is given in lines 7-9, which is summarized in Option G. Option F is a true statement, but it does not explain why people not interested in politics would watch the debates. Kennedy's attractive appearance is not mentioned in the passage, ruling out Option H. Option J does not make sense as a reason for watching the debates, and the passage says that Vice President Nixon was ahead in the polls, which rules out Option K.

---

47. (**A**) The first debate was limited to domestic issues (lines 26-27). Domestic issues are a country's internal affairs, not including international relationships. Only Option A presents a domestic issue, problems of American industry. The other options refer to issues involving other countries or regions of the world.

---

48. (**K**) Reread the last sentence of the passage, and then read each option before choosing your answer. The first three options are true statements, but they do not say anything about the effect of televising the event. The passage does not supply any information to support Option J. Option K is correct. Nixon's greater experience (lines 15-20) would have been more apparent to radio listeners who were not distracted by his poor television appearance.

---

49. (**C**) Kennedy's benefit is summarized in lines 49-53, especially his "charm, poise, and confident manner." These qualities are summarized by Option C: "his attractive personal characteristics." Option A is contradicted by lines 32-33, which state that both candidates dealt calmly and carefully with the issues. The debate centered on domestic issues, ruling out Option B. Options D and E describe Nixon, not Kennedy.

50. (**H**) The question asks you to use the information given in the passage to predict what would have happened if the debates had **not** taken place on television (for example, if they had occurred only on radio or in printed form). To answer the question, review the information given about each candidate before the debate. Nixon was ahead in the polls, an experienced public speaker, and had served as vice president (lines 15-20). Kennedy had been criticized for his relative youth and inexperience (lines 22-25). Without the televised debate, if events had followed their course, it is more likely that Nixon, not Kennedy, would have won the election, which is Option H. This line of reasoning rules out Options F and G. Option J is contradicted by lines 67-68. Nixon would have no reason to consider his on-screen performance, which rules out Option K.

51. (**D**) $\frac{4}{5}P = 48$

$\frac{1}{5}P = \frac{48}{4} = 12$

$\frac{3}{5}P = 12 \bullet 3 = 36$

---

52. (**G**) 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:

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

$5.6d = 12.88$

$d = 2.3$

---

53. (**D**) 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:

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

---

54. (**G**) $0.00102 = \frac{102}{N}$

$\frac{100{,}000}{100{,}000} \bullet (0.00102) = \frac{102}{N}$

$\frac{102}{100{,}000} = \frac{102}{N}$

$N = 100{,}000$

---

55. (**C**) 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):

$15{,}000 \bullet 0.18 = 2{,}700$

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

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

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

$C + n = J$
$C + n = 30$
$C = 30 - n$

---

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

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

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

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

$4 - (^-2) = 6$

---

58. (**F**) Since the figure is drawn to scale, use the values from the grid to solve:

$(c, d) = (1, 3)$ and $(a, b) = (^-2, 1)$

Then, $c + a = 1 + (^-2) = ^-1$, and

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

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

---

59. (**C**) $\frac{(^-51)(^-51)}{17 \bullet 17 \bullet 17} = \frac{(^-3)(^-3)}{17} = \frac{9}{17}$

---

60. (**J**) First, find the prime factorization of each number:

$2{,}205 = 3 \bullet 3 \bullet 5 \bullet 7 \bullet 7$
$3{,}675 = 3 \bullet 5 \bullet 5 \bullet 7 \bullet 7$

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

$2{,}205 = 3 \bullet (3 \bullet 5 \bullet 7 \bullet 7) = 3 \bullet 735$
$3{,}675 = 5 \bullet (3 \bullet 5 \bullet 7 \bullet 7) = 5 \bullet 735$

The greatest common factor is 735.

---

61. (**A**) $|190 - 210| + |19 - 21| + x = 100$

$|^-20| + |^-2| + x = 100$

$20 + 2 + x = 100$

$x = 78$

62. (**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. The mean is $\frac{17 + 19}{2} = 18$.

---

63. (**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:

$$\frac{12 + x}{44 + x} = \frac{1}{3}$$

$$3(12 + x) = 44 + x$$

$$36 + 3x = 44 + x$$

$$2x = 8$$

$x = 4$ ounces

---

64. (**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.

---

65. (**B**) 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:

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

$$12x = 36(0.25)$$

$$12x = 9$$

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

66. (**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:

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

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

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

$$0.60x = 6$$

$$x = 10$$

---

67. (**C**) 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.

---

68. (**H**) 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:

$$\frac{x}{33} = \frac{5}{11}$$

$x = 15$ ounces

---

69. (**B**) Angle LKN = 75° because vertical angles are congruent. The interior angles of quadrilateral KLPN sum to 360°. So, angle LPN = 360 – (120 + 120 + 75) = 45°. Angle LPN and angle QPR are vertical angles, so $x = 45$.

---

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

$$\frac{x}{416} = \frac{3}{96}$$

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

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

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

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. (**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) ÷ 2 = $\frac{^-4 + 6}{2} = 1$

Point F = (point B + point D) ÷ 2 = $\frac{^-2 + 10}{2} = 4$

Now calculate the length of $\overline{EF}$: 4 – 1 = 3 units

---

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

\$1.89 • 0.06 = \$0.1134 = \$0.11 (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

---

76. (**K**) 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.

---

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. (**H**) 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 • 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 ÷ 12 = \$0.16917, which rounds to \$0.17

---

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:

$$\frac{\text{Gallons of blue}}{\text{total gallons}} = \frac{8}{8+3} = \frac{6}{x}$$

$8x = 6(11)$

$x = 8\frac{1}{4}$ 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 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 L = (1,000)(1,000) cu mm = 1,000,000 cu mm

---

83. (**D**) 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.

---

84. (**F**) To find the speed of the plane, divide the miles travelled by the number of hours:

First leg:
900 miles ÷ 2 hours = 450 mph

Second leg:
1,400 miles ÷ $2\frac{1}{2}$ hours = 560 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:

$\frac{4}{5}x = \frac{1}{3}x + 21$

$\frac{12}{15}x - \frac{5}{15}x = 21$

$7x = 15 \cdot 21$

$x = 45$ 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:

$\frac{1}{4}J = \frac{1}{3}(J + 2) - 2$

$\frac{1}{4}J = \frac{1}{3}J + \frac{2}{3} - 2$

$\frac{1}{4}J = \frac{1}{3}J - \frac{4}{3}$

Multiply both sides of the equation by the common denominator (12):

$12(\frac{1}{4}J) = 12(\frac{1}{3}J - \frac{4}{3})$

$3J = 4J - 16$

$^{-}J = {}^{-}16$

$J = 16$

87. (**C**) 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

---

88. (**G**) Because the volume of the tent is calculated using the area of the cross-section × 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:

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

The area of the center rectangle is:
$A = 4 \times 6 = 24$ sq ft

So the total area of the cross-section is:
$A = 6 + 6 + 24 = 36$ sq ft

Use that to calculate the depth of the tent:
$V = 36d$
$216 = 36d$
$6 = d$

---

89. (**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:

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

90. (**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)

$81 - 10 + 1 = 72$

---

91. (**B**) First, find the amount by which Joe is currently exceeding the speed limit of 55 miles per hour:

$65\frac{1}{2} - 55 = 10\frac{1}{2}$ 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:

$10\frac{1}{2} \div 3 = \frac{7}{2} = 3\frac{1}{2}$ minutes

---

92. (**F**) The question asks for the number of positive two-digit numbers evenly divisible by 4. The smallest such number is 12 (4 × 3), and the largest is 96 (4 × 24). Thus, the two-digit numbers evenly divisible by 4 are 4 × 3, 4 × 4, 4 × 5, and so on up to 4 × 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 × 3 and 4 × 24), add 1 to that value to get the exact count of the numbers: 21 + 1 = 22

---

93. (**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:

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

94. (**F**) 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 per chair

If Arnold makes and sells 25 chairs in a week, his initial profit is 25 • $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

---

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:

$$\frac{272{,}000 + 376{,}000}{4 + 8}$$

$$= \frac{648{,}000}{12}$$

= $54,000

---

96. (**H**) 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 $x = 0$.

97. (**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 cubic feet ÷ 5 cubic feet per minute
= 100 minutes

100 minutes is equal to 1 hour 40 minutes.
1 hour 40 minutes after 9:00 a.m. is 10:40 a.m.

---

98. (**K**) 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:

$(10 \bullet \frac{1}{4}$ page$) + (10 \bullet \frac{1}{2}$ page$) + (10 \bullet 1$ page$)$

$= 2\frac{1}{2} + 5 + 10 = 17\frac{1}{2}$ pages

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. (**K**) 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.

Answer Key for Sample Form A

Paragraph 1
T U S R Q

Paragraph 2
S R U Q T

Paragraph 3
U T R S Q

Paragraph 4
U S T R Q

Paragraph 5
Q S R U T

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

NEW YORK CITY PUBLIC SCHOOLS

USE A PENCIL ONLY

SIDE 2

2013 SPECIALIZED HIGH SCHOOLS ADMISSIONS TEST

GRADE 8

Test Booklet Letter Test Booklet Number

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
12	F	G	H	J	K
13	A	B	C	D	E
14	F	G	H	J	K
15	A	B	C	D	E
16	F	G	H	J	K
17	A	B	C	D	E
18	F	G	H	J	K
19	A	B	C	D	E
20	F	G	H	J	K

READING

21	A	B	C	D	E
22	F	G	H	J	K
23	A	B	C	D	E
24	F	G	H	J	K
25	A	B	C	D	E
26	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
33	A	B	C	D	E
34	F	G	H	J	K
35	A	B	C	D	E
36	F	G	H	J	K
37	A	B	C	D	E
38	F	G	H	J	K
39	A	B	C	D	E
40	F	G	H	J	K
41	A	B	C	D	E
42	F	G	H	J	K
43	A	B	C	D	E
44	F	G	H	J	K
45	A	B	C	D	E
46	F	G	H	J	K
47	A	B	C	D	E
48	F	G	H	J	K
49	A	B	C	D	E
50	F	G	H	J	K

PART 2 MATHEMATICS

MATHEMATICS PROBLEMS

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

Sample Test, Form B
Part 1 — Verbal

Suggested Time — 75 Minutes

45 QUESTIONS

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

Tycho Brahe, a seventeenth-century Danish astronomer, is more famous for his odd and arrogant personality than for any contribution he made to our knowledge of the stars and planets.

_____ **Q.** That discovery was made by his assistant, Johannes Kepler, who had been denied full access to Brahe's data until after Brahe's death.

_____ **R.** The disagreement turned into a sword fight, and part of Brahe's nose was sliced off.

_____ **S.** As a student, he got into an argument with another student about who was the better mathematician.

_____ **T.** He made a replacement nose for himself out of an alloy of gold and silver, which he reportedly glued to his face.

_____ **U.** Later in his life, his arrogance may have kept him from playing a part in one of the greatest astronomical discoveries in history—the elliptical orbits of the planets around the sun.

CONTINUE ON TO THE NEXT PAGE ▶

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

Caving, the recreational pastime of exploring caves, is an obsession for people called cavers or spelunkers, who dream of finding caves never explored before.

_____ **Q.** Preserving caves from damage is important because they are part of the system of aquifers that store ground water.

_____ **R.** Occasionally a new series of caves is discovered by some of these devoted and lucky spelunkers.

_____ **S.** For example, the cave-dwelling bacteria *Actinomyctes* possesses antibiotic properties—according to some cavers with colds, it has eliminated their cold symptoms while underground.

_____ **T.** Equally as important, scientists believe that newly-discovered caves may contain disease-fighting microorganisms not found in any other environment.

_____ **U.** After such a discovery, the role of the caver shifts from explorer to protector because the cave environment is so easily damaged.

CONTINUE ON TO THE NEXT PAGE ▶

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

The Tsachin are a nomadic group of about 300 people who live in the mountains and forests of northern Mongolia, near the Russian border.

_____ **Q.** They are completely dependent on their reindeer herds for food, clothing, and transportation.

_____ **R.** After the reindeer cows have their calves, the Tsachin immediately begin to gather the milk, from which they make cheese, yogurt, and other dairy-based foods.

_____ **S.** The most difficult part of the migration for the Tsachin is the spring, when the reindeer leave their wintering grounds and travel to the places where they give birth.

_____ **T.** The Tsachin people follow them on these migrations, moving six to eight times a year and living in portable shelters that resemble Native American tepees.

_____ **U.** Some of these animals are tamed for riding or milking, but the herds are allowed to roam freely as they migrate.

CONTINUE ON TO THE NEXT PAGE ▶

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. The shortest member of the basketball team is 5 feet 11 inches tall. Cheng is 6 feet 2 inches tall.

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

A. Only members of the basketball team are taller than 5 feet 11 inches.
B. Cheng is shorter than some members of the basketball team.
C. At least one member of the basketball team is shorter than Cheng.
D. Cheng is a member of the basketball team.
E. Cheng is the tallest member of the basketball team.

---

12. All of Selma's friends who are in the senior class voted for her for president of the school council. Some of Selma's friends voted for Ted for president of the school council.

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

F. If Nam is not Selma's friend, then he voted for Ted.
G. All of Selma's friends are in the senior class.
H. If Yuki is Selma's friend, then she voted for Selma.
J. No one is friends with both Selma and Ted.
K. Selma has friends who are not in the senior class.

13. 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.

---

14. Six people are seated at a six-sided table, facing inward, one at each side.

1) Jorge sits directly across from Bree.
2) Susana sits directly across from Michael.
3) Darius sits directly across from Lucy.
4) Bree is immediately next to Darius, on his right.
5) Susana is immediately next to Jorge.

Who sits on Michael's immediate left?

F. Susana
G. Bree
H. Lucy
J. Darius
K. Cannot be determined from the information given.

CONTINUE ON TO THE NEXT PAGE ▶

Questions 15 and 16 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."	

15. Which word is represented by the letter Z?

A. are
B. we
C. late
D. again
E. Cannot be determined from the information given.

16. Which letter represents the word "again"?

F. H
G. N
H. P
J. Q
K. Cannot be determined from the information given.

17. 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?

A. When Soon Bae sings, then she is dancing.
B. Soon Bae sings only when she is dancing.
C. When Soon Bae listens to music, then she is also singing.
D. If Soon Bae is not listening to music, then she is not dancing.
E. If Soon Bae is not dancing, then she is not singing.

18. 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?

F. 4
G. 5
H. 6
J. 7
K. 8

19. 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

CONTINUE ON TO THE NEXT PAGE ▶

20. Six students stood in a line. Their names are Larnell, Masha, Nikia, Pedro, Ryan, and Sara, in that order.

1) The two students that wear glasses are immediately next to one another.
2) Three students are wearing school T-shirts.
3) None of the students wearing a school T-shirt is next to each other.
4) No student is wearing both glasses and a school T-shirt.

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

F. Pedro and Ryan are wearing glasses.
G. Nikia is wearing a school T-shirt.
H. Pedro is wearing a school T-shirt.
J. Larnell and Sara are wearing school T-shirts.
K. Either Masha or Nikia is wearing a school T-shirt, but it is not possible to determine which one.

CONTINUE ON TO THE NEXT PAGE ▶

READING

QUESTIONS 21-50

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

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.

CONTINUE ON TO THE NEXT PAGE ▶

21. 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

22. 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

23. Which of the following is the most likely reason that no good artificial 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.

24. 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.

25. 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

26. 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.** artificial flavors are added to consumer products other than food.
- **K.** people may come to strongly prefer artificial flavors over natural flavors.

CONTINUE ON TO THE NEXT PAGE ▶

In many cultures, the ugly physical appearance of the bat has given it an unearned reputation as an evil and vicious bearer of diseases. Many people, for example, believe that the American brown bat carries rabies. In fact, it is no more likely to transmit the disease than other animals, such as dogs. Brown bats actually help to prevent disease, not spread it. The basis of their diet is the mosquito, an insect that transmits more diseases than all the bats in the world combined.

A group of bat species known as flying foxes or fruit bats serve another important purpose, as a critical link in the reproduction of many tropical trees and shrubs. In the tropical rain forests of Africa, Asia, and Australia, plants such as avocadoes, date trees, cashews, and mangoes rely in part on flying foxes for pollination. One of Africa's most valuable hardwood trees, the iroko, is entirely dependent on this type of bat for pollination. Flying foxes feed on flowers, fruit, and nectar, flying from one plant to another and pollinating the plants as they go, much as bees do in other parts of the world. Because they are sloppy eaters, flying foxes drop fruit as they go, dispersing the seeds. They can travel great distances and convey pollen and seeds far from their origins, thereby maintaining the genetic biodiversity within a plant species.

Because of the importance of bats' role in pollination and seed distribution, scientists consider them a keystone in the ecosystems of tropical rain forests. Without bats, many bat-pollinated plants—and the animals that depend on them for food and shelter—would be threatened to the point of extinction. Areas outside the rain forests would be impacted as well, since the rain forests' lush vegetation replenishes the oxygen in the global atmosphere.

Unfortunately, many people are determined to get rid of bats. Flying foxes are at particular risk. In the wild, they feed on wild fruit, but when their rain forest habitat is reduced by conversion into farmland or residential areas, they occasionally raid cultivated fruit trees, spoiling the crops. Several flying fox species have been hunted to extinction, while others are seriously endangered.

Conservation groups and government agencies in many countries are attempting to change people's attitudes toward bats. When people learn that bats pollinate the trees and crops that provide their livelihood, they are more likely to appreciate and protect the bats in their area. There are also effective, non-harmful ways to deal with troublesome bats. Orchard owners can cover their trees with netting to discourage the bats, and there are humane methods for moving bats from places where they are not wanted. For the sake of the rain forests, and for life forms everywhere that depend on them, it is urgent that people apply a new twist to an old adage, and realize that ugliness is only skin deep.

27. Which of the following best tells what this passage is about?

- **A.** why plant species in the tropical rain forest are becoming endangered
- **B.** how the misunderstood bat benefits other life forms
- **C.** why rain forests are an important world resource
- **D.** how bats spread rabies and other diseases
- **E.** how bats pollinate tropical plants

28. What does the author intend to convey by the statement "ugliness is only skin deep" (line 70)?

- **F.** Some ugly animals eventually become beautiful.
- **G.** Bats are not really ugly.
- **H.** People shouldn't think that bats are harmful simply because they are ugly.
- **J.** People who find bats ugly do not believe that bats have an important environmental role.
- **K.** Beneficial animals are often considered ugly.

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29. Which of the following best describes animal species that function as a "keystone" (line 35)?

- **A.** They are a major factor in disease prevention.
- **B.** They are a food source for other animals.
- **C.** They pollinate every plant species.
- **D.** They are crucial in maintaining the balance of their ecosystem.
- **E.** They generate the oxygen in the atmosphere.

30. What would be the most immediate result if flying foxes became extinct?

- **F.** Other animal species would take their place.
- **G.** Tropical rain forests would become free of disease.
- **H.** Many animals would lose a food source.
- **J.** Many tropical plants would have difficulty in reproduction.
- **K.** The oxygen in the atmosphere would be quickly used up.

31. Why do flying foxes sometimes eat fruit from cultivated fruit trees?

- **A.** They prefer eating cultivated fruit to wild fruit.
- **B.** They are better able to spread pollen from cultivated fruit trees.
- **C.** The number of wild fruit trees has decreased.
- **D.** Cultivated fruit trees are completely dependent on bats for pollination.
- **E.** Declining mosquito populations can no longer feed the bats.

32. What is the most likely reason that the author mentioned the iroko tree?

- **F.** to provide an example of a useful plant that would die out without flying foxes
- **G.** to demonstrate that there are alternate ways to pollinate tropical plants
- **H.** to illustrate how rain forests supply oxygen to the atmosphere
- **J.** to show what flying foxes will do when wild fruit trees are unavailable
- **K.** to encourage farmers to cover their trees with netting

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The British novelist Charles Dickens is well known for the colorful and eccentric characters he created in his many novels. But one of his books, *David Copperfield*, seems to have a great deal to do with fact as well as fiction. After attempting to write his autobiography, Dickens abandoned the project and began to work on a novel, the plot of which was loosely based on his own boyhood experiences. Apparently, it was easier for him to weave the events of his own life into the fiction of *David Copperfield* than to write about them in nonfiction.

Some of Dickens' most troubling memories involved a job he held in 1824 as a 12-year-old child. Because his family was deeply in debt, he was forced to quit school and go to work in a London factory, pasting labels on pots of shoe polish. Young Charles lived in a boardinghouse, using his meager wages to support himself and to help pay his family's debts. He worked in the dreary, run-down factory six days a week from 8:00 a.m. to 8:00 p.m. Such long hours were not unusual at the time, for children or adults, but Dickens was miserable during the entire four months he spent working at the factory.

Even when the family finances improved, the boy continued to work at the factory until his father quarreled with Dickens' boss, who promptly dismissed the son. Charles was upset at being fired, but relieved to be out of the factory. Thus he felt betrayed when his mother, anxious for the boy's weekly wage, succeeded in making peace and getting Dickens' job back for him. The father, however, now sided with his son and the boy was sent back to school. "I know how these things have worked together to make me what I am," Dickens later wrote, but he never forgot that his mother was eager for him to return to work.

As an adult, Dickens always remembered the shame and humiliation he felt during those months at the factory. For years afterward, whenever in London, he could not go near the sites of the factory and boardinghouse, going out of his way to avoid those painful reminders of his past. In fact, Dickens never told his wife and children about his childhood work experience. It was only after his death that they heard of it from a family friend whom Dickens had confided in.

Instead, Dickens expressed his feelings by giving his fictional "other self," David Copperfield, a job similar to the one he had so hated. In the novel, ten-year-old David is forced by his harsh stepfather to work as a bottle washer in a factory. Young David, who "suffered exquisitely" as a child manual laborer, was apparently Dickens' way of dealing with his own past. *David Copperfield* was to become Dickens' most popular novel, and Dickens himself called it his "favorite child."

33. Which of the following best tells what this passage is about?

- **A.** Dickens' childhood dreams and desires
- **B.** Dickens' autobiography written while he was a child
- **C.** Dickens' childhood relationship with his parents
- **D.** the autobiographical basis for Dickens' *David Copperfield*
- **E.** the many characters created by Dickens for *David Copperfield*

34. When did Dickens begin writing *David Copperfield*?

- **F.** after giving up work on his own life story
- **G.** shortly after he worked at the shoe polish factory
- **H.** when he decided to resume his long-delayed schooling
- **J.** after revisiting the shoe polish factory as an adult
- **K.** when he no longer felt ashamed about his childhood

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35. Which of the following is the most reasonable inference about Dickens as a child?

A. He believed that children should learn to work and support themselves.
B. He was dreamy and imaginative.
C. He planned to be a factory owner when he grew up.
D. He thought that all work was worthwhile if done well.
E. He preferred attending school to working in a factory.

36. Which of the following is the primary reason that Dickens wrote *David Copperfield*?

F. He needed money from the novel to help pay his debts.
G. It was too painful for him to confront his memories directly in an autobiography.
H. He wanted his own children to know of his work in the factory.
J. His autobiography had not been well accepted by the public.
K. He wanted to demonstrate that his childhood job had helped him succeed in later life.

37. What can be concluded about the relationship between Dickens and his mother as described in the third paragraph?

A. He never saw her again after he left to work in the shoe polish factory.
B. He was grateful that she got his job back for him.
C. He resented her for putting the need for his wages above his own happiness.
D. He never included her in any of his novels.
E. He blamed her for quarreling with his boss.

38. What most directly enabled Charles Dickens to return to school?

F. a downturn in the family's finances
G. his father's quarrel with the factory owner
H. getting fired from the factory
J. his mother's desire for his weekly wage
K. his father's intervention

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

The first known attempt to use wind power 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 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 century, windmills were used throughout central Asia; they were used in China as early as the thirteenth century.

In Europe, windmills came into widespread 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 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 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 such as dyes, tobacco, cocoa, and spices.

In the 1700s, as steam engines gained in 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 watering livestock and meeting other water needs. In many remote areas even today, livestock production would be impossible without the use of windmills to provide water.

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

39. 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

40. Where were the first known windmills built?

- **F.** Persia
- **G.** North America
- **H.** Europe
- **J.** China
- **K.** Holland

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41. 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.

42. 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.

43. 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.

44. 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.

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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. $8 \times 3\frac{1}{4} =$

A. $11\frac{1}{4}$

B. $24\frac{1}{4}$

C. $24\frac{1}{2}$

D. 25

E. 26

52. $100(2 + 0.1)^2 - 100 =$

F. 101
G. 141
H. 200
J. 301
K. 341

53. 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?

A. 8 red, 7 green, 7 blue
B. 10 red, 7 green, 5 blue
C. 10 red, 8 green, 4 blue
D. 11 red, 6 green, 5 blue
E. 12 red, 6 green, 4 blue

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

F. 28
G. 70
H. 76
J. 88
K. 112

55. $3.99 \div 1.5 =$

A. 0.266
B. 0.267
C. 2.0
D. 2.66
E. 2.67

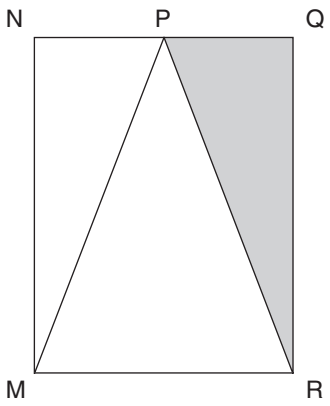
56. What time will it be 46 hours after 9:30 p.m. on Friday?

F. 7:30 p.m. Saturday
G. 7:30 a.m. Sunday
H. 6:30 p.m. Sunday
J. 7:30 p.m. Sunday
K. 9:30 p.m. Sunday

57. How many positive integers satisfy the inequality $x + 7 < 23$?

A. 15
B. 16
C. 17
D. 29
E. 30

58.



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

59. 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.)

A. 6
B. 7
C. 8
D. 9
E. 12

60. If x and y are positive integers such that $0.75 = \frac{x}{y}$, what is the **least** possible value for x?

F. 1
G. 3
H. 4
J. 25
K. 75

61.

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

62.

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.)

F. \$28
G. \$52
H. \$182
J. \$282
K. \$988

63.

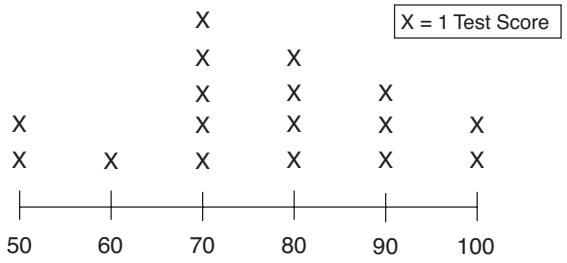
$$\begin{array}{r} -2 \\ 4 \\ -6 \\ 8 \\ . \\ . \\ -22 \\ \underline{+\ 24} \end{array}$$

If the missing terms in the problem above were filled in according to the pattern, what would be the sum of all the terms?

A. -6
B. 2
C. 6
D. 10
E. 12

64.

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

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. 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. $\frac{11}{3}, \frac{18}{5}, \frac{25}{7}$

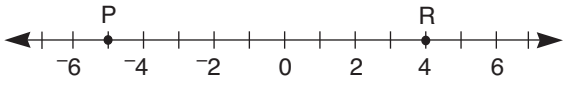
67.

Item	Quantity Puchased	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

68.



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 $\overline{PQ}$?

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

69. 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

70. 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

71. $4\frac{1}{2}$ 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?

A. 1
B. 2
C. 4
D. 6
E. 30

72. 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?

F. $111.30
G. $143.10
H. $270.30
J. $286.20
K. $297.00

73.

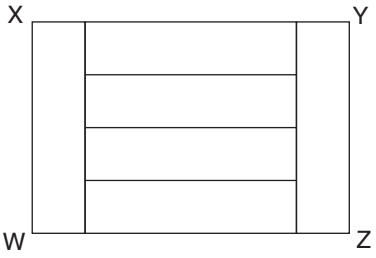


Figure WXYZ above is composed of 6 congruent rectangular panels. The area of figure WXYZ is 54 square centimeters. What is the perimeter of figure WXYZ in centimeters?

A. 24 cm
B. 30 cm
C. 36 cm
D. 45 cm
E. 50 cm

74. 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?

F. 2
G. 5
H. 6
J. 13
K. 15

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. 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

77. For what value of z is $z - \frac{1}{3}z = 12$?

A. -18
B. 4
C. 8
D. 12
E. 18

78.
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

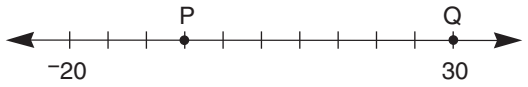
79. If Crystal multiplies her age by 3 and then adds 2, she will get a number equal to her mother's age. If m is her mother's age, what is Crystal's age in terms of m?

A. $-\frac{2}{3}m$
B. $\frac{m-2}{3}$
C. $3m + 2$
D. $\frac{m}{3} - 2$
E. $\frac{3}{m} - 2$

80. A certain insect has a mass of 75 milligrams. What is the insect's mass in grams?

F. 0.075 g
G. 0.75 g
H. 7.5 g
J. 75 g
K. 7,500 g

81.



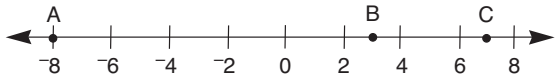
Points P and Q are points on the number line above, which is divided into equal sections. What is the value of PQ?

A. −5
B. 7
C. 30
D. 35
E. 50

82. If $r = 3q + 2$ and $q = \frac{1}{3^n}$ for $n = 1, 2$, or 3, what is the **least** possible value of ?

F. 1
G. $2\frac{1}{9}$
H. $2\frac{1}{3}$
J. 3
K. 5

83.



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 $\overline{DE}$?

A. −1.5
B. 1.25
C. 1.75
D. 2.25
E. 7.5

84. Let $N = -(|-3| - |-8| + |-4|)$. What is the value of $-|N|$?

F. −9
G. −4
H. −1
J. 1
K. 9

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 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?

F. $\frac{1}{30}$
G. $\frac{1}{18}$
H. $\frac{1}{6}$
J. $\frac{1}{5}$
K. $\frac{1}{3}$

87. 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?

A. 55
B. 56
C. 57
D. 59
E. 66

CONTINUE ON TO THE NEXT PAGE ▶

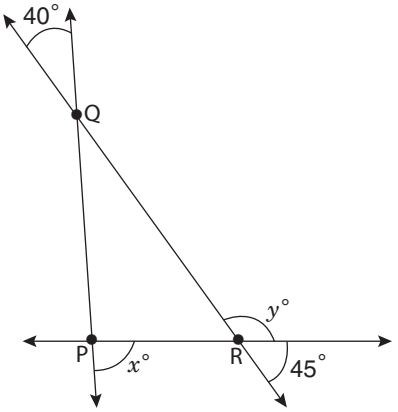
88. A cylindrical oil drum can hold 4,320 liters when it is completely full. Currently, the drum is $\frac{1}{3}$ full of oil. How many **kiloliters** (kL) of oil need to be added to fill the drum completely?

F. 1.44 kL
G. 2.88 kL
H. 4.32 kL
J. 14.40 kL
K. 28.80 kL

89. If x, y, and z are numbers such that $xy + xz = 100$, what is the value of $\frac{x}{5}(3y + 3z) + 10$?

A. $60 + 2x$
B. 62
C. 70
D. 130
E. $130 + 2x$

90.



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

91. $(2p + 8) - (5 + 3p) =$

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

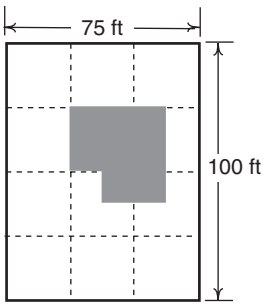
92. A recent survey asked students what pets they have. Based on the results, the following statements are all true:

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

93.



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?

A. 4,000 sq ft
B. 5,000 sq ft
C. 6,000 sq ft
D. 7,000 sq ft
E. 8,000 sq ft

CONTINUE ON TO THE NEXT PAGE ▶

94. 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

95. 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. $2(m - 5) + 5$

96. 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 π.)

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

97. 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?

A. \$0.23
B. \$0.25
C. \$0.30
D. \$0.45
E. \$0.50

98. 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

99. What is the greatest prime factor of 5,355?

A. 17
B. 51
C. 119
D. 131
E. 153

100. {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
K. 720

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 (**SRTUQ**)
The opening sentence introduces the astronomer Tycho Brahe as an "odd and arrogant" person. Arrogance implies pride, and S continues that line of thought by describing Brahe's argument with another student about being the better mathematician. The argument turned into a sword fight in R, and the result was an injury to Brahe's nose. To compensate for his loss, Brahe made a new nose (T). That concludes an episode from Brahe's earlier life. U begins, "Later in his life," and explains how Brahe's arrogance may have prevented him from making a major scientific discovery. Brahe had refused to share data with his assistant, Johannes Kepler (Q), who would later trace the orbits of the planets around the sun.

Paragraph 2 (**TSURQ**)
The opening sentence states a problem: cowboys had to use untreated hides, or rawhide, for their gear because they did not have chemicals to soften it. One effective way for softening leather without chemicals, created by the gauchos of South America, is mentioned in T. Sentence T suggests that the paragraph will explain a step-by-step process—in this case, softening rawhide leather. 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 one end of 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 given in Q: a soft, supple piece of leather.

Paragraph 3 (**RUQTS**)
The sport of cave exploration, called caving, and the people who engage in it, cavers or spelunkers, are introduced in the opening sentence. Cavers hope to discover new caves that have not been explored before, a goal that is realized by some spelunkers in R. The discovery of new caves leads to a transition from exploration to protection of fragile cave environments (U). The paragraph continues with two reasons for protecting caves, starting with their role in ground water storage (Q). T must follow Q because "Equally as important" in T implies that it is a second reason, in this case, the possibility that caves contain disease-fighting microorganisms. An example of such a microorganism is described in S.

Paragraph 4 (**QSRUT**)
According to the opening sentence, the jingle dress dance is popular at contemporary 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. The availability and the sounds of the lids and shells are contrasted in T.

Paragraph 5 (**QUTSR**)
Sentence Q must follow the opening sentence because it introduces the Tsachin people's reindeer herds, which are discussed in the remaining sentences. U clarifies that while some reindeer are tame, implying domestication by their human owners, most reindeer roam freely. The movement of people or animals from one region to another is migration, and T connects the reindeer migration with the movement of the Tsachin people who follow their herds. One of the yearly migrations is the spring calving migration (S), when the reindeer return to their calving grounds. Spring calving is the birth of reindeer young. R mentions the reindeer cows giving birth and producing milk, which benefits both the reindeer calves and the Tsachin people who gather the milk for their own nourishment.

Logical Reasoning

11. (**C**) The first sentence implies that all the members of the basketball team are 5 feet 11 inches or taller. Cheng's height is 6 feet 2 inches. The question does not state whether Cheng is on the basketball team. Options A, B, D, and E **might** be true, but there is not enough information to determine that they **must** be true. Only Option C **must** be true. At least one member of the basketball team (the shortest member, who is 5 feet 11 inches) is shorter than Cheng.

---

12. (**K**) To solve this problem, it is necessary to figure out the relationships among several groups—Selma's friends, seniors, people who voted for Selma, and people who voted for Ted. The question says that all of Selma's friends who are seniors voted for Selma. This leaves open the possibility that some of Selma's friends are not seniors, ruling out Option G. The question also says that some of Selma's friends (who cannot be seniors) voted for Ted, which eliminates Option H. The question does not provide any information about voters who are not Selma's friends, ruling out Option F. Similarly, there

is no information about Ted's friends, which rules out Option J. Only Option K **must** be true. Some of Selma's friends are seniors, while others—the ones who voted for Ted—are **not** seniors.

---

13. (**C**) Draw a grid to show who owned each pet. An X indicates that the person does **not** own the pet. According to the information given, 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 who owned a pet, and filling in X's wherever you can.

Option A

	Parrot	Iguana	Hamster
Raquel			X
Tiara	X	X	yes
Xing			X

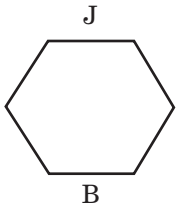
Option A does not allow us to figure out who owns the iguana—the owner could be either Raquel or Xing—so it cannot be correct. Only Option C allows us to determine the owner of the iguana. If we know that Raquel owns the parrot and that Xing does not own the hamster, then Xing must own the iguana.

Option C

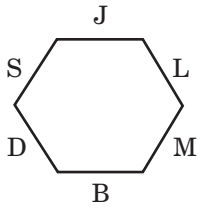
	Parrot	Iguana	Hamster
Raquel	yes	X	X
Tiara	X	X	yes
Xing	X	yes	X

---

14. (**G**) Draw a diagram of the six-sided table. There is no definite information about who sits at a particular position—only about the relationship between where people sit—but the correct answer only requires understanding the relationships. Choose a position at the table to start, and use an initial to represent each person. According to Condition 1, Jorge sits directly across from Bree.



Look for another condition that relates to either Jorge or Bree. Condition 4 places Bree immediately next to Darius, on his right, and Condition 3 states that Darius sits directly across from Lucy. According to Condition 5, Susana is immediately next to Jorge. Since Lucy is already on one side of Jorge, Susana must be on the other side. That leaves Michael in the remaining position, opposite Susana. All six people are now seated relative to one another.



Because the question states that the people at the table are facing inward, you know that the person sitting on Michael's immediate left is Bree (Option G).

---

*15. and 16. 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." To answer these questions, you need not find out what every letter represents.*

15. (**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 both appear in the same position in the second sentence. Thus P must represent "we," leaving Z to represent "are," which is Option A.

16. (**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 of those letters represents "again," so the answer is Option K.

---

17. (**C**) 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.

Music ⟶ Dancing ⟶ Singing

The arrows indicate the direction of the condition. Notice that the arrows point in only one direction, ruling out Option A. Music might not be the only thing that causes Soon Bae to dance and sing. The diagram leaves open the possibility that other factors, beside music, lead to her dancing and singing. Thus Options B, D, and E are not valid conclusions. The only valid conclusion is Option C.

---

18. (**G**) 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 G is correct.

19. (**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.

New students	Bai	Gloria	Sandro	Henry
Older student partners			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).

---

20. (**J**) One way to solve this problem is to create a grid with a row for each of the six students, in the order presented in the question. According to the conditions, two students wear glasses and three students wear school T-shirts. None of the students wearing school T-shirts is next to each other (Condition 3) and the two students wearing glasses **are** next to each other (Condition 1). No student wears both glasses and a school T-shirt (Condition 4). These conditions allow two possibilities:

Place in line	Name	Wearing glasses?	Wearing school T-shirt?
1	Larnell		yes
2	Masha		
3	Nikia		yes
4	Pedro	yes	
5	Ryan	yes	
6	Sara		yes

OR

Place in line	Name	Wearing glasses?	Wearing school T-shirt?
1	Larnell		yes
2	Masha	yes	
3	Nikia	yes	
4	Pedro		yes
5	Ryan		
6	Sara		yes

There is no information to determine which possibility is correct. Check the options one by one. Options F, G, H, and K are true for one possibility but not the other, so you cannot conclude that any of them **must** be true. Option J is always true—Larnell and Sara wear school T-shirts in both possibilities.

Reading

Flavors

21. (**C**) The answer to the first question for each passage 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 is a good summary of the passage. It 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.

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22. (**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.

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23. (**B**) Lines 65-67 state that some flavors, including strawberry, are nearly impossible to duplicate. The passage then goes on to say 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. Option A may be true, but does not explain why no good artificial strawberry flavoring exists. Option C is unlikely, given that the use of a gas chromatograph to duplicate flavors seems to be a standard procedure. The passage does not support Option D. Option E is contradicted by lines 20-22.

---

24. (**H**) The process of collecting aromas during food preparation is described in the third paragraph. For this kind of question, be sure to read every option to identify the option 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 described in the passage. Option H is best. The odor of food as it is being prepared can be captured and distilled to synthesize the food's flavor.

25. (**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. The passage does not support Option E.

---

26. (**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. The passage does not mention how flavorists view the use of artificial flavors in other products, which rules out Option J.

Bats

27. (**B**) Option A cannot be correct because the passage discusses animal species, not plants, that are becoming endangered. Option C is an important detail, but it is not the theme of the passage. Option D is contradicted by lines 4-7. Option E is also important, but the passage is about much more than the pollination of tropical plants. Option B is best. It incorporates the notion of bat stereotypes contrasted with the advantages that bats provide to plants and animals, including humans.

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28. (**H**) "Ugliness is only skin deep" (line 70) is a play on the expression "Beauty is only skin deep," which means that an attractive outward appearance does not necessarily indicate inward beauty. The intended meaning—that an ugly outward appearance does not always imply evil or harmfulness—is Option H. None of the other options correctly apply to this "new twist to an old adage."

---

29. (**D**) The far-reaching impact of a keystone species is described in the third paragraph. The flying fox, a keystone in the rain forest, pollinates and distributes seeds, and thus helps provide food and shelter for many other plants and animals in its ecosystem. Rain forests in turn help to maintain a balanced global atmosphere for living creatures everywhere. Option D best summarizes the far-reaching impact of a keystone species. None of the other options are supported by the passage.

30. (**J**) The question asks for the most immediate result that would occur before other, more distant consequences took place. Read every option before deciding which describes the most immediate result. Options F and H are possible, but they are long-term, not immediate, results. Options G and K are not supported by the passage. Option J is the only immediate result.

---

31. (**C**) The passage discusses bats' consumption of cultivated fruit in lines 46-50. Bats in the wild feed on wild (uncultivated) fruit; they eat cultivated fruit only when wild fruit cannot be found due to reduced habitat for wild fruit trees, which is Option C. Option A is contradicted by the passage. Options B, D, and E are not supported.

---

32. (**F**) The iroko tree is mentioned in lines 20-23 as a valuable tree that depends entirely on flying foxes for pollination. The previous sentence stated the importance of flying foxes for pollination of plants such as avocadoes and date trees. Both sentences are about the importance of flying foxes for the pollination of useful plants, which is Option F. Option G is not mentioned. Options H, J, and K do not explain why the author mentioned the iroko tree.

Dickens

33. (**D**) Options A, C, and E are important details, but they are not the main themes. Option D correctly combines the information in the passage about Dickens' childhood and the novel *David Copperfield*. Option B might look appealing because it also contains the ideas of Dickens' childhood and an autobiography, but his autobiography was never written, either in childhood or in adulthood.

---

34. (**F**) Dickens began writing *David Copperfield* after abandoning work on his own life story, or autobiography (lines 6-8), which is Option F. He wrote the book well into adulthood, ruling out Options G and H. The events in Options J and K never occurred.

---

35. (**E**) Dickens' childhood is described in the second and third paragraphs. Read each option to determine whether it is a reasonable inference, based on the information in the passage. Option E is a reasonable inference, based on line 17 (Dickens was "forced to quit school") and lines 26-27 (he was miserable at his job). Options A, B, C, and D are not supported by the passage.

36. (**G**) The correct answer is found in lines 10-13 and in the fourth paragraph. Dickens wrote *David Copperfield* because he was unable to complete his autobiography, and writing the novel helped him deal with painful childhood memories. Option G is the best summary. Dickens' father had debts, not Charles Dickens himself, ruling out Option F. Options H and K are contradicted by the passage. Dickens never wrote his autobiography, eliminating Option J.

---

37. (**C**) The passage says little about the relationship between Dickens and his mother, only that Charles felt betrayed when his mother, anxious for the boy's wages, got his job back for him (lines 33-36). Option C best expresses this information. Options B and E are contradicted by the passage. The passage does not address the issues presented in Options A and D.

---

38. (**K**) The passage states, "The father, however, now sided with his son and the boy was sent back to school" (lines 37-38). In other words, Charles was able to return to school because of his father's intervention (Option K). Options F and J were obstacles, not aids, to his returning to school. Option G led to dismissal from his job, not to his return to school. Option H occurred before Dickens returned to school, but was not the direct reason for it.

Wind Energy

39. (**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 through medieval windmills to modern turbines. Option C is not mentioned. Options D and E are important points, but neither is the main theme.

---

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

---

41. (**D**) The future use of wind energy is discussed in the last paragraph. Reread the paragraph to determine the author's opinion. 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 information in the passage.

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

---

43. (**D**) The need for windmills to produce electricity on American farms before the 1950s is discussed in lines 53-58. The next two sentences explain that the need for windmills 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.

---

44. (**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, there is no reason to conclude that the windmills are what made the country famous, eliminating Option H. Options J and K are contradicted by the passage.

Smiles

45. (**A**) Options B and D are mentioned but they 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 theories 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, which is Option K. Option F is related to the researchers' theory, but it 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 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 may or may not be true, but they do not explain why Darwin's theory was not accepted during his lifetime.

---

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 volunteers feeling happier. According to the theory in lines 33-36, a smile lowers 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**) All five options are true statements as they stand. You are asked to choose the option that best describes the notion in line 19. A smile in one's heart (lines 19-20) signifies a feeling of happiness. Thus consciously smiling can produce feelings of happiness, which is Option A. None of the other options correspond to this "notion."

---

50. (**G**) The passage describes the hypothalamus as 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**) $8 \times 3\frac{1}{4} = 8 \times \frac{13}{4} = 26$

---

52. (**K**) $100(2 + 0.1)^2 - 100$
$= 100(2.1)^2 - 100$
$= 100(4.41) - 100$
$= 441 - 100$
$= 341$

---

53. (**E**) 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 × 11 = 22) to get the number of each color pencil in a set of 22 randomly chosen pencils:

12 red, 6 green, 4 blue

---

54. (**H**) First, use the given information to calculate the value of b:

$\frac{a}{b} = 2$

$\frac{8}{b} = 2$

$8 = 2b$
$4 = b$

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

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

---

55. (**D**) Multiply the numerator and denominator by 100 to eliminate the decimals:

$3.99 \div 1.5 =$

$\left(\frac{3.99}{1.5}\right)\left(\frac{100}{100}\right) = \frac{399}{150} = \frac{133}{50} = \frac{266}{100} = 2.66$

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

---

56. (**J**) 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.

57. (**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.

---

58. (**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 sq cm
MPQ = 2(RQP) = 48 sq cm

Thus, the area of the unshaded region is
24 + 48 = 72 sq cm

---

59. (**A**) 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 ÷ \$2.27 = 6.6…

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.

---

60. (**G**) 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 $x = 3$

---

61. (**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:

$$\frac{(14 \cdot 8) + (15 \cdot 4) + (16 \cdot 4) + (17 \cdot 5) + (18 \cdot 9)}{30}$$

$$= \frac{112 + 60 + 64 + 85 + 162}{30}$$

$= 16.1$

62. (**G**) Use proportions to make the conversions:

Lorgs to dollars

$\frac{140}{x} = \frac{7}{1}$

$7x = 140$

$x = \$20$

Dalts to dollars

$\frac{16}{x} = \frac{0.5}{1}$

$0.5x = 16$

$x = \$32$

Total dollars = 20 + 32 = \$52

---

63. (**E**) 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:

$^{-}$2	$^{-}$6	…	$^{-}$22
4	8	…	24

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:

$^{-}$2	$^{-}$6	$^{-}$10	$^{-}$14	$^{-}$18	$^{-}$22
4	8	12	16	20	24

To find the sum, combine the terms as follows:
($^{-}$2 + 4) + ($^{-}$6 + 8) + ($^{-}$10 + 12) + … + ($^{-}$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 + … + 2 = 6(2) = 12

---

64. (**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).

---

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 miles ÷ 20 miles per gallon = 10 gallons of gas
10 gallons • \$4.50 = \$45.00

66. (**F**) It may be easier to see the order of the fractions by changing them to mixed numbers or decimals:

$\frac{11}{3} = 3\frac{2}{3} = 3.666\ldots$

$\frac{25}{7} = 3\frac{4}{7} = 3.57\ldots$

$\frac{18}{5} = 3\frac{3}{5} = 3.6$

The smallest fraction is $\frac{25}{7}$, followed by $\frac{18}{5}$, and finally $\frac{11}{3}$.

---

67. (**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 × 0.06 = \$6.12

---

68. (**K**) 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:

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

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

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

---

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

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

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

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

$x = \frac{70}{100} = 0.70$

---

70. (**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.

71. (**C**) 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: $1 \times 2 \times 2 = 4$

---

72. (**J**) 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:

$\$270 + \$16.20 = \$286.20$

---

73. (**B**) 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:

Width of WXYZ = $4x$
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:

Width of WXYZ = $4(\frac{3}{2}) = 6$
Length of WXYZ = $6x = 6(\frac{3}{2}) = 9$

So, the perimeter of WXYZ = $2(6) + 2(9)$
$= 12 + 18 = 30$ cm

74. (**H**) 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.

---

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

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

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

---

76. (**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:

$420 \times 25\% = 105$ cars

---

77. (**E**) $z - \frac{1}{3}z = 12$

$\frac{2}{3}z = 12$

$z = \frac{36}{2} = 18$

---

78. (**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.).

---

79. (**B**) Let c be Crystal's age:

$3c + 2 = m$

$3c = m - 2$

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

---

80. (**F**) One gram is equal to 1,000 milligrams, or

1 milligram is equal to $\frac{1}{1{,}000}$ gram.

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

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**) First, calculate the three possible values of q:

If $n = 1$, then $q = \frac{1}{3^1} = \frac{1}{3}$.

If $n = 2$, then $q = \frac{1}{3^2} = \frac{1}{9}$.

If $n = 3$, 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: $r = 3(\frac{1}{27}) + 2 = \frac{1}{9} + 2 = 2\frac{1}{9}$

---

83. (**B**) 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 $\overline{DE}$:

$$\frac{-\frac{5}{2} + 5}{2} = \frac{\left(\frac{5}{2}\right)}{2} = \frac{5}{4} = 1.25$$

---

84. (**H**) First, simplify N:

$N = {}^{-}(3 - 8 + 4) = {}^{-}(^{-}1) = 1$

Then, find $^{-}|N|$:

$^{-}|N| = {}^{-}|1| = {}^{-}1$

---

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% × \$40.05 = \$8.01, so the final price of the video game is \$40.05 − \$8.01 = \$32.04.

86. (**G**) If the song is 5 minutes long, then it could be played up to 60 ÷ 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 × 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 $\frac{6}{108} = \frac{1}{18}$.

---

87. (**B**) 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.

---

88. (**G**) First, find the number of liters that need to be added:

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

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

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

---

89. (**C**) 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:

$$\frac{1}{5}x(3y + 3z) = \frac{300}{5}$$

$$\frac{x}{5}(3y + 3z) = 60$$

Finally, add 10 to both sides:

$$\frac{x}{5}(3y + 3z) + 10 = 60 + 10$$

$$\frac{x}{5}(3y + 3z) + 10 = 70$$

Now that the left side looks like the expression in the question, the answer is the number on the right side (70).

90. (**G**) Angle PQR and the marked 40° angle are vertical angles and thus are congruent, so angle PQR is 40°. Similarly, angle QRP is 45° because it is a vertical angle with the one marked 45°. Given those two angles, calculate the third angle of triangle PQR (angle RPQ):

$40 + 45 + RPQ = 180$
$RPQ = 95$

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 $y = 180 - 45 = 135$.

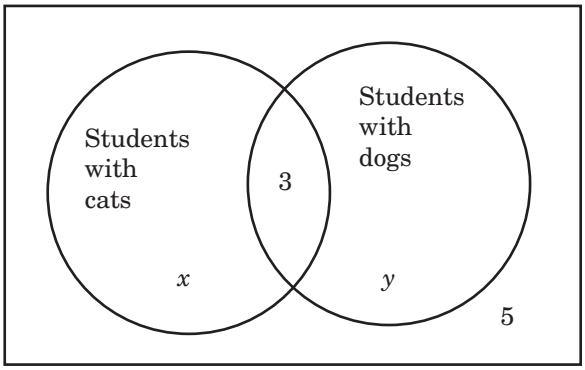
Thus, the value of $y - x = 135 - 85 = 50$

---

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

---

92. (**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:

$3 + 5 + x + y = 8 + 17 + 20 = 45$

93. (**C**) First, calculate the area of the entire lot:
$75 \times 100 = 7{,}500$ 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.

---

94. (**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

---

95. (**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:

$k - 5 = 2(m - 5)$
$k = 2(m - 5) + 5$

---

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

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

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

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

97. (**D**) 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 gallons • \$0.05 = \$0.45

---

98. (**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:

$2(x + 2) = 2(6.5 + 2) = 2(8.5) = 17.0$ hours

99. (**A**) First, find the prime factorization of 5,355:

$5{,}355 = 5 \bullet 1{,}071 = 5 \bullet 9 \bullet 119 = 3^2 \bullet 5 \bullet 7 \bullet 17$

The greatest prime factor is 17.

---

100. (**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 $6 \times 5 \times 4 = 120$.

Answer Key for Sample Form B

Paragraph 1: S R T U Q
Paragraph 2: T S U R Q
Paragraph 3: R U Q T S
Paragraph 4: Q S R U T
Paragraph 5: Q U T S R

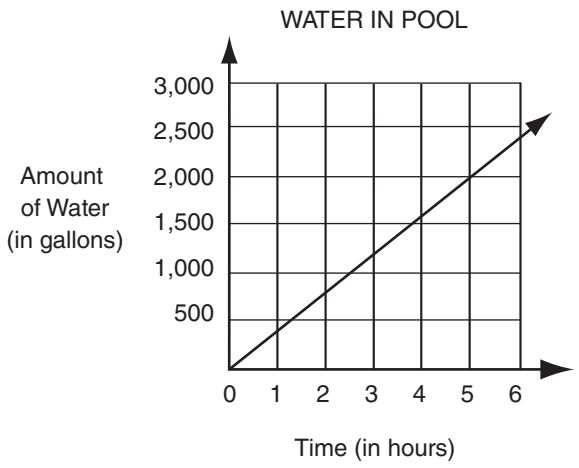
11. C	21. C	31. C	41. D	51. E	61. C	71. C	81. D	91. A
12. K	22. J	32. F	42. K	52. K	62. G	72. J	82. G	92. H
13. C	23. B	33. D	43. D	53. E	63. E	73. B	83. B	93. C
14. G	24. H	34. F	44. G	54. H	64. J	74. H	84. H	94. G
15. A	25. D	35. E	45. A	55. D	65. D	75. B	85. B	95. E
16. K	26. K	36. G	46. K	56. J	66.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

SAMPLE PROBLEMS
FOR GRADE 9 MATHEMATICS

GRADE **9**

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 48 and 86. There is no sample answer sheet for this section; mark your answers directly on this page or on a separate piece of paper.

1.



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.

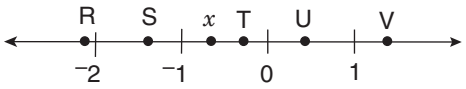
2. Define the operation ◘ as follows:

$a \square \left(\frac{b}{c}\right) = \frac{a}{\left(\frac{b}{c}\right)}$, where b and c are not zero.

If $2 \square \left(\frac{4}{x}\right) = \frac{3}{2}$, what is the value of x?

F. 1
G. 2
H. 3
J. 6
K. 12

3.



On the number line above, which letter could represent the location of x^2 ?

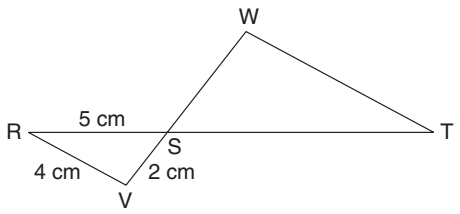
A. R
B. S
C. T
D. U
E. V

4. $7^{-2} + 7^{-1} + 7^0 = \frac{x}{49}$

What is the value of x in the equation above?

F. 8
G. 9
H. 10
J. 57
K. 58

5.



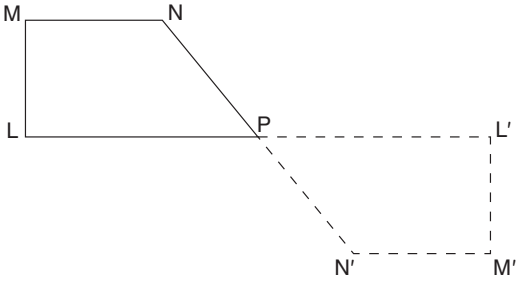
In the figure above, $\overline{RST}$ and $\overline{VSW}$ are straight line segments and $\overline{WT}$ is parallel to $\overline{RV}$. What is $\frac{WT}{ST}$?

A. $\frac{2}{5}$
B. $\frac{4}{5}$
C. 1
D. $\frac{5}{4}$
E. 20

6. 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

7.



A geometry game awards a different score for each geometric transformation. Each 90° rotation about a point will earn a score of 2, a reflection over a horizontal or vertical line will earn a score of 3, and a horizontal or vertical translation will earn a score of 4. Which set of transformations would earn the highest score to transform LMNP to L′M′N′P as shown above?

A. two reflections
B. two translations
C. two 90° rotations
D. a translation, followed by a reflection
E. a 90° rotation, followed by a reflection

8.

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?

F. $1\frac{1}{2}$

G. 3

H. $3\frac{1}{3}$

J. 4

K. 5

9. Let $(x, y) \rightarrow (x + 10, y - 10)$. Using that rule, if $(n, r) \rightarrow (100, 100)$, what is (n, r)?

A. (90, 90)
B. (90, 110)
C. (100, 100)
D. (110, 90)
E. (110, 110)

10. 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.

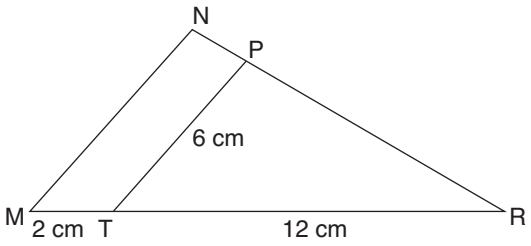
G. $\frac{2}{3}\pi$ in.

H. 4 in.

J. 2π in.

K. 4π in.

11.



In the figure above, if $\overline{MN}$ is parallel to $\overline{TP}$, what is the length of $\overline{MN}$?

A. 7 cm
B. 8 cm
C. 10 cm
D. 12 cm
E. 14 cm

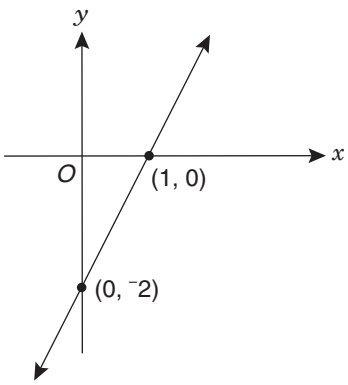
12.

$$|x - 1| < 3$$
$$|x + 2| < 4$$

How many integer values of x satisfy both inequalities shown above?

F. 0
G. 1
H. 3
J. 4
K. 5

13.



The straight line shown above is the graph of $y = f(x)$. Which of the following points satisfies the inequality $y > f(x)$?

A. $(-2, -7)$
B. $(-1, -3)$
C. $(1, 0)$
D. $(2, 1)$
E. $(3, 4)$

14. $\frac{p}{q},\ p + q,\ p - q,\ p^2 + q^2,\ \frac{p^2}{q^2}$

If $p = q = \frac{1}{\sqrt{2}}$, which one of the expressions above does **not** represent a rational number?

F. $\frac{p}{q}$

G. $p + q$

H. $p - q$

J. $p^2 + q^2$

K. $\frac{p^2}{q^2}$

15. Straight line k passes through the point $(-3, 4)$ with an x-intercept of 3. What is the equation of line k?

A. $y = -\frac{3}{2}x + 3$

B. $y = -\frac{2}{3}x - 3$

C. $y = -\frac{2}{3}x + 2$

D. $y = -\frac{1}{3}x + 3$

E. $y = \frac{2}{3}x - 2$

16. 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. $7k - 6$

17. 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?

A. 5
B. 8
C. 14
D. 15
E. 44

1. (**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.

---

2. (**H**) $\frac{2}{\left(\frac{4}{x}\right)} = \frac{3}{2}$

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

$2x = 6$

$x = 3$

---

3. (**D**) 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.

---

4. (**J**) $7^{-2} + 7^{-1} + 7^0 = \frac{x}{49}$

$\frac{1}{49} + \frac{1}{7} + 1 = \frac{x}{49}$

$1 + 7 + 49 = x$

$57 = x$

---

5. (**B**) $\overline{WT}$ and $\overline{RV}$ are parallel, and $\overline{RT}$ is a transversal; thus $\angle RVS$ and $\angle TWS$ are alternate interior angles and are congruent. Angles WST and VSR are vertical angles, and therefore they are congruent. Since there are two sets of congruent angles, the third set of angles must also be congruent. Thus, $\triangle WTS$ is similar to $\triangle VRS$. Since the triangles are similar, a proportion can be set up to solve for $\frac{WT}{ST}$.

$\frac{WT}{ST} = \frac{VR}{SR} = \frac{4}{5}$

6. (**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, $k = 1.249$

---

7. (**A**) The quickest way to solve this problem may be to test the options and see which results in the highest score. We can immediately eliminate options B, D, and E because those do not result in the correct transformation. Option A results in a score of $3 + 3 = 6$. Option C results in a score of $2 + 2 = 4$. Thus, A is the correct answer.

---

8. (**F**) 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:

$\frac{30}{20} = 1\frac{1}{2}$

9. (**B**) 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, $(n, r) = (90, 110)$

---

10. (**J**) First, calculate the volume of the cylinder:

$V = \pi r^2 h = \pi(4)^2(8) = 128\pi$ 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:

$V = lwh$
$128\pi = (8)(8)h$
$128\pi = 64h$
$2\pi = h$

---

11. (**A**) Triangles MNR and TPR are similar, so use a proportion to solve for the length of $\overline{MN}$:

$$\frac{MN}{MR} = \frac{TP}{TR}$$

$$\frac{MN}{2 + 12} = \frac{6}{12}$$

$$MN = \frac{1}{2}(14) = 7 \text{ cm}$$

12. (**H**) First, determine which integer values of x would make each inequality true:

$|x - 1| < 3$ 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.

13. (**B**) First, calculate the equation of the given line $f(x)$. The slope is calculated using the difference in y-values of two given points divided by the difference in x-values of those points. In this case, $m = \frac{(^-2 - 0)}{(0 - 1)} = 2$. The y-intercept (b) is the value of y when the line crosses the y-axis, so $b = ^-2$. Using the slope-intercept form of a line ($y = mx + b$), the equation is $f(x) = 2x - 2$.

To determine which of the given values satisfies $y > f(x)$, or in this case $y > 2x - 2$, insert each value into the inequality to find which one makes the inequality true. You can immediately eliminate Option C, because the point (1, 0) is shown in the graph as one of the points on the line.

For inequality $y > 2x - 2$:

Option A
$^-7 > 2(^-2) - 2$
$^-7 > ^-6$ is false

Option B
$^-3 > 2(^-1) - 2$
$^-3 > ^-4$ is true

Option D
$1 > 2(2) - 2$
$1 > 2$ is false

Option E
$4 > 2(3) - 2$
$4 > 4$ is false
(Note that this point is also on the given line.)

---

14. (**G**) 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)

$p^2 + q^2 = \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2 = \frac{1}{2} + \frac{1}{2} = 1$ (rational)

Thus, $p + q$ is not a rational expression.

15. (**C**) 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 B and C 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 B: $y = -\frac{2}{3}(3) - 3 = ^-2 - 3 = ^-5$

Option C: $y = -\frac{2}{3}(3) + 2 = ^-2 + 2 = 0$

Option C is the correct answer.

---

16. (**G**) The question asks for the second integer, so let n be the second integer. Then, the sum of the 7 integers is:
$(n - 1) + n + (n + 1) + (n + 2) + (n + 3) + (n + 4) + (n + 5) = 7k$
$7n + 14 = 7k$
$7(n + 2) = 7k$
$n + 2 = k$
$n = k - 2$

---

17. (**B**) Since the number of red flashes is known (15), first calculate where the robot would be after the 15 red flashes. For each red flash, $(x, y) \longrightarrow (x - 1, y + 4)$. 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, $(x, y) \longrightarrow (x + 4, y - 5)$. 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:

$^-14 + 4n = 58 - 5n$
$9n = 72$
$n = 8$

Answer Key for Grade 9 Mathematics

1. C	3. D	5. B	7. A	9. B	11. A	13. B	15. C	17. B
2. H	4. J	6. H	8. F	10. J	12. H	14. G	16. G	

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