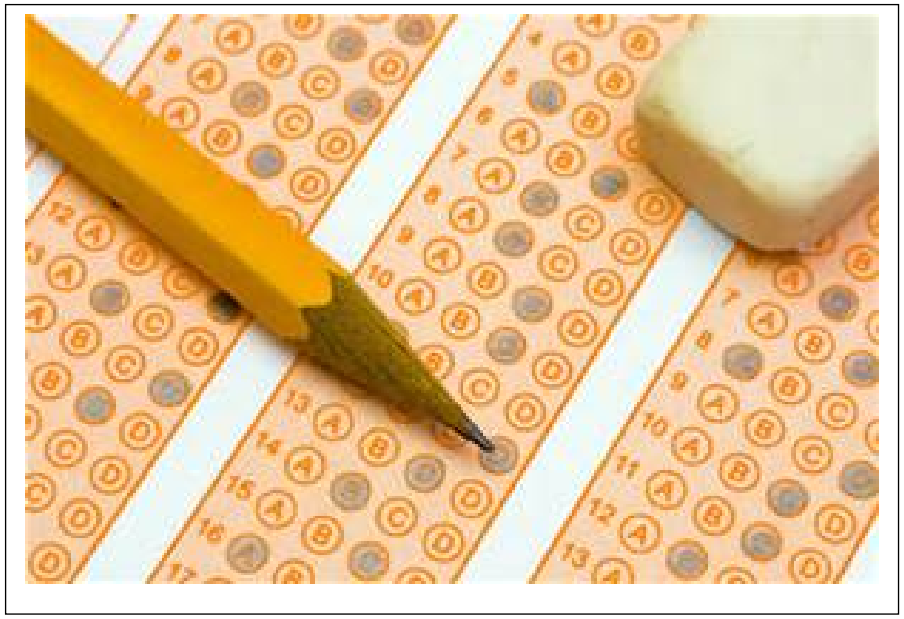
PATERSON PUBLIC SCHOOLS
Preparing All Children for College and Career

SAT PREP Curriculum



MATHEMATICS

Unit I

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Course Description

According to The College Board, the Math test of the redesigned SAT (2016) will assess students' readiness for college and career. Specifically, the Math test will assess the students' fluency with procedural steps, conceptual knowledge, and representational skills. The overarching goal of the New SAT is to ensure that the students are able to analyze real-life problems and use appropriate strategies to solve them.

The SAT Prep course (Math) will cover the Mathematics part during Marking Periods I and III. For ease of understanding and pacing, there will be a total of two units of Math, one in each Marking Period. In this course, students will explore how Mathematics as a tool is used to understand and solve problems in Physical Science, Social Science, Medical Science, History, Business, and Technology. They will be expected to analyze a given scenario, then abstract, develop mathematical models using multiple representations of the quantitative information, and answer related questions. The quality of students' responses to such real-life problems, and therefore their score, will depend to a great extent on their cognitive skills, use of effective mathematical processes, reasoning, critical thinking skills, and thinking time.

Regardless of the entry level of a student into this course, the teacher will teach the units providing enough opportunities for each student to practice problem solving in groups and individually. In addition to daily homework, the teacher will provide study guides, including time management strategies and web links for additional problems after each marking period. A mid-term exam will be administered using problems covered during the first marking period. At the end of the second Marking period, students will have the opportunity to take a full length sample SAT as the final exam for the course.

Assessment results from this course may be used to evaluate a student's quantitative skills for placement into higher level Math courses or as a graduation requirement.

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Pacing Chart			
Unit 1	September 1 – September 30	Number and Quantity	Instruction: 4 weeks
	October 1 – October 30	Geometry	Instruction: 4 weeks
Mid-Term Review and Exam	November 2 – November 13	Mid-Term Exam on Number and Quantity and Geometry	Remediation/Enrichment and Assessment: 1 week

Educational Technology

Standards

8.1.8.A.5, 8.1.8.A.4, 8.1.8.E.1, 8.2.8.B.1, 8.1.8.D.1

- **Technology Operations and Concepts**
  - Select and use appropriate tools and digital resources to accomplish a variety of tasks and to solve problems.

- **Technology Operations and Concepts**
  - Generate a spreadsheet to calculate, graph, and present information.

- **Research and Information Literacy**
  - Gather and analyze findings using data collection technology to produce a possible solution for a content-related or real-world problem.

- **Design: Critical Thinking, Problem Solving**
  - Design and create a product that addresses a real-world problem using the design process and working with specific criteria and constraints.

- **Digital Citizenship**
  - Model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics.

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21st Century Life & Career Skills

Standards:

9.1.8.A.1, 9.3.8.B.3, 9.3.8.B.17, 9.3.8.B.12, 9.1.8.A.2

- **Critical Thinking and Problem Solving**
  - Develop strategies to reinforce positive attitudes and productive behaviors that impact critical thinking and problem-solving skills.

- **Career Exploration**
  - Evaluate personal abilities, interests, and motivations and discuss how they might influence job and career selection.

- **Career Exploration**
  - Recognize that an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.

- **Career Exploration**
  - Explain how personal behavior, dress, attitudes, and other choices can impact the success or failure of a job applicant.

- **Critical Thinking and Problem Solving**
  - Implement problem-solving strategies to solve a problem in school or the community.

- **Critical Thinking and Problem Solving**
  - Relate academic achievement, as represented by high school diplomas, college degrees, and industry credentials, to employability and to potential level of income.

Link: http://www.nj.gov/education/aps/cccs/career/

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Differentiated Instruction

Accommodate Based on Students Individual Needs: Strategies

Time/General	**Processing**	**Comprehension**	**Recall**
• Extra time for assigned tasks • Adjust length of assignment • Timeline with due dates for reports and projects • Communication system between home and school • Provide lecture notes/outline	• Extra Response time • Have students verbalize steps • Repeat, clarify or reword directions • Mini-breaks between tasks • Provide a warning for transitions • Partnering	• Precise step-by-step directions • Short manageable tasks • Brief and concrete directions • Provide immediate feedback • Small group instruction • Emphasize multi-sensory learning	• Teacher-made checklist • Use visual graphic organizers • Reference resources to promote independence • Visual and verbal reminders • Graphic organizers
Assistive Technology	**Tests/Quizzes/Grading**	**Behavior/Attention**	**Organization**
• Computer/whiteboard • Tape recorder • Video-Tape	• Extended time • Study guides • Shortened tests • Read directions aloud	• Consistent daily structured routine • Simple and clear classroom rules • Frequent feedback	• Individual daily planner • Display a written agenda • Note-taking assistance • Color code materials

Enrichment

Accommodate Based on Students individual Needs: Strategies

- Evaluate Vocabulary
- Learning Centers
- Individual Response Board
- Open-ended activities
- Community/Subject expert mentorships

Assessments

Suggested Formative/Summative Classroom Assessments

Describe Learning Vertically
Identify Key Building Blocks
Make Connections (between and among key building blocks)
Short/Extended Constructed Response Items
Multiple-Choice Items (where multiple answer choices may be correct)
Drag and Drop Items
Use of Equation Editor
Quizzes
Journal Entries/Reflections/Quick-Writes
Accountable talk
Projects
Portfolio
Observation
Graphic Organizers/ Concept Mapping
Presentations
Role Playing
Teacher-Student and Student-Student Conferencing
Homework

Interdisciplinary Connections

Students will be expected to:

- Explore interdisciplinary contexts and solve a variety of real-life problems from Physical Sciences, Social Sciences, Medical Sciences, Business, and Technology.
- Recognize the underlying mathematical concepts while analyzing different contextual information.
- Make connections between concepts.
- Communicate mathematically while discussing scenarios from various disciplines.
- Demonstrate their computational and procedural skills while providing explanations and interpretations of solutions to problems from various disciplines.

The following examples from The College Board (https://collegereadiness.collegeboard.org/sample-questions/math/calculator-permitted/1) indicate a wide range of real-life scenarios students may expect to see on the redesigned SAT (2016).

Example 1: **Question Difficulty: EASY**

Objective: Students must identify the correct mathematical notation for an inequality to represent a real-world situation.

The recommended daily calcium intake for a 20-year-old is 1,000 milligrams (mg). One cup of milk contains 299 mg of calcium and one cup of juice contains 261 mg of calcium. Which of the following inequalities represents the possible number of cups of milk m and cups of juice j a 20-year-old could drink in a day to meet or exceed the recommended daily calcium intake from these drinks alone? **Answer: A**

Select an Answer

A. $299m + 261j \geq 1000$

B. $299m + 261j > 1000$

C. $299/m + 261/j \geq 1000$

D. $299/m + 261/j \geq 1000$

Example 2: **Question Difficulty: MEDIUM**

Objective: Students must construct a linear equation to represent a real-world situation.

When a scientist dives in salt water to a depth of 9 feet below the surface, the pressure due to the atmosphere and surrounding water is 18.7 pounds per square inch. As the scientist descends, the pressure increases linearly. At a depth of 14 feet, the pressure is 20.9 pounds per square inch. If the pressure increases at a constant rate as the scientist's depth below the surface increases, which of the following linear models best describes the pressure p in pounds per square inch at a depth of d feet below the surface? **Answer: B**

Select an Answer

A) $p = 0.44d + 0.77$

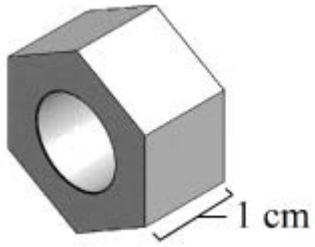
B) $p = 0.44d + 14.74$

C) $p = 2.2d - 1.1$

D) $p = 2.2d - 9.9$

Example 3: Question Difficulty: MEDIUM

Objective: Students must make connections between physical concepts such as mass and density and essential geometric ideas such as the Pythagorean Theorem and volume formulas.



The figure above shows a metal hex nut with two regular hexagonal faces and a thickness of 1 cm. The length of each side of a hexagonal face is 2 cm. A hole with a diameter of 2 cm is drilled through the nut. The density of the metal is 7.9 grams per cubic cm. What is the mass of this nut, to the nearest gram? (Density is mass divided by volume.) **Answer: 57 grams**

Grade: 9-12	Unit 1	Topics: Number and Quantity and Geometry

Common Core State Standards (CCSS)

Unit 1
Number and Quantity
CCSS.Math.Content.HSN-RN
CCSS.Math.Content.HSN-Q
CCSS.Math.Content.HSN-VM
Geometry
CCSS.Math.Content.HSG-SRT
CCSS.Math.Content.HSG-C
CCSS.Math.Content.HSG-GPE
CCSS.Math.Content.HSG-GMD
CCSS.Math.Content.HSG-MG

NJDOE Student Learning Objective	Essential Questions	Skills, Strategies & Concepts	Sample Activities	Resources
1. Use properties of integer exponents to explain and convert between expressions involving radicals and rational exponents, using correct notation. *For example, we define* $5^{1/3}$ *to be the cube root of 5 because we want* $(5^{1/3})^3 = 5^{(1/3)3}$ *to hold, so* $(5^{1/3})^3$ *must equal 5.* (N.RN.1, N.RN.2)	How to write equivalent expressions involving integer and rational exponents?	Applying the properties of exponents working with arithmetic operations on exponents	Use equations such as, $(x^2)^{(1/3)} = 9$ or $(x - 3)^{(1/3)} = 8^{(2/3)}$ to rewrite their equivalent forms and solve for x.	**Use the following resources provided by The College Board for all Student Learning Objectives:** 1. Published SAT book of The College Board 2. Visit their official sites https://professionals.collegeboard.com/k-12/prepare/srp/free The Official SAT Question of the Day™ Official SAT Practice Test https://sat.collegeboard.org/practice/sat-skills-insight
2. Prove (understand) that all circles are similar (and apply this property to solve problems) (G.C.1)	How to show similarity among different circles?	Writing and using proportionality statements. Using ratio-proportions to compute the unknown quantity.	Construct circles of different radii using a compass. Use ratio-proportions of the radius and circumference of two different circles to establish similarity. Analyze the relationship	

NJDOE Student Learning Objective	Essential Questions	Skills, Strategies & Concepts	Sample Activities	Resources
			between the circumference and radius of the circles by graphing those values. Show that the ratio of the circumference to the diameter of the circles is the constant of proportionality.	https://sat.collegeboard.org/SAT/public/pdf/getting-ready-for-the-sat.pdf https://sat.collegeboard.org/practice (includes free practice tests from Khan Academy)
3. Solve multi-step problems that can be represented algebraically with accurate and appropriately defined units, scales, and models (such as graphs, tables, and data displays). (N.Q.1, N.Q.2, N.Q.3)	How to convert units from one system to another to solve word problems? How to apply scales while representing practical scenarios?	Converting units Using scale models Working with ratios-proportions	Apply scale models and unit conversion while solving problems represented in graphs, charts, or matrices.	
4. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g. find the equation of a line parallel or perpendicular to a given	What is the relationship between the slopes of parallel and perpendicular lines? How to find the equation of a line given the equations of its parallel and perpendicular lines?	Understanding the relation between the slopes of parallel and perpendicular lines. Writing the equation of a line given the equations of its parallel and perpendicular lines.	Analyze any patterns between the calculated values of slopes of parallel and perpendicular lines. Use the format $(y - y_1) = m(x - x_{1})$ to write the equation of a parallel and perpendicular lines using the appropriate	

NJDOE Student Learning Objective	Essential Questions	Skills, Strategies & Concepts	Sample Activities	Resources
line that passes through a given point.) (G.GPE.5)			slope	
5. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. (G.GPE.7)	How do locations of the vertices of polygons help compute their perimeters? How do locations of the vertices of triangles and rectangles help compute their areas? How do the same x- or y-values of two points help find the distance between the points without using the distance formula?	Computing distance between two pints using the distance formula Computing distance between two pints without using the distance formula when the x- or y-values of the two points are equal Computing the areas of a triangles and rectangles and perimeters of other polygons when the coordinates of their vertices are given.	Use graph paper to compute the distance between two points with the same *x*- or *y*-values with or without using the distance formula. Use graph paper to compute the distance between two points with different *x*- or *y*-values using the Pythagorean Theorem. Discover the relation between the above two methods.	
6. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in	How to apply the properties of similarity and congruence of triangles to solve problems?	Understanding congruence and similarity of geometric figures	Analyze a variety of problems involving similarity and congruence of triangles. Differentiate between the properties of similarity and	

NJDOE Student Learning Objective	Essential Questions	Skills, Strategies & Concepts	Sample Activities	Resources
geometric figures. (G.SRT.5)			congruence of triangles.	
7. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. (G.SRT.3)	How to prove that two triangles are similar?	Understanding the properties of rigid transformation for angles Working with ratio-proportions and similarity of two triangles	Construct two triangles with two pairs of congruent angels. Establish using ratio-proportions that their sides are proportional.	
8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems (G.SRT.8)	How to choose a trigonometric ratio for solving a word problem involving a right triangle?	Understanding the trigonometric ratios Applying trigonometric ratios to solve word problems involving right triangles	Write a trigonometric ratio as a proportion, e.g., $\frac{\sin x}{1} = \frac{Opposite}{Hypotenuse}$ and determine what is given out of these quantities in a problem. Depending on what is given, an appropriate ratio may be selected to solve for the unknown. (remember, out of three quantities in a trigonometric ratio, two must be known in order to solve for the third)	

NJDOE Student Learning Objective	Essential Questions	Skills, Strategies & Concepts	Sample Activities	Resources
9. Solve problems using volume formulas for cylinders, pyramids, cones, and spheres. (G. GMD.3)	How to find the volume of regular geometric solids?	Working with arithmetic operations, including exponents	Solve a variety of word problems involving the computation of volume of regular geometric solids, e.g., volume of a community water tank of cylindrical or conical shape, volume of a soccer ball or a Jupiter's moon of spherical shape, volume of an Egyptian pyramid etc.	
10. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). (G.MG.1)	How to model practical shapes using geometric figures?	Understanding dimensions of geometric figures, e.g., 0-D, 1-D, 2-D, and 3-D figures Representing practical shapes as geometric figures	Represent a tennis ball as a 0-D object when its dimensions are not relevant, but its height from the ground is relevant in a problem. Represent the same tennis ball as a 2-D object (a circle) when its radius or circumference is relevant in another problem. Represent the same tennis ball as a 3-D object (sphere) when its volume is relevant in yet another problem.	

NJDOE Student Learning Objective	Essential Questions	Skills, Strategies & Concepts	Sample Activities	Resources
11. Use density concepts in modeling situations based on area and volume. (e.g., persons per square mile, BTUs per cubic foot). (G.MG.2)	How to compute density under different practical situations?	Understanding density as a quotient of two quantities, weight and volume. Computing density using arithmetic operations and proper units.	Given the weight and volume of a material, calculate its density. Given the population of a bacteria and area or volume of its container, calculate the density of bacteria per square unit or per cubic unit of the container, respectively.	

Unit Vocabulary

- Absolute Value
- Acute Angle
- Adjacent Angle
- Arc
- Area
- Arithmetic mean
- Average
- Central Angle
- Chord
- Circle
- Circumference
- Circumscribe
- Coefficient
- Complementary Angle
- Complementary Angles
- Congruent
- Consecutive Even Numbers
- Consecutive Multiples of 3
- Consecutive Odd Numbers
- Natural Numbers
- Negative
- Numerator
- Obtuse Angle
- Cube
- Cubic
- Data
- Denominator
- Depth
- Density
- Diameter
- Dilation
- Distance
- Dividend
- Divisor
- Endpoints
- Equilateral Triangle
- Equivalent Fractions
- Equivalent ratios
- Estimate
- Even Numbers
- Exceed
- Exponent
- Expression
- Exterior Angle
- Odd Numbers
- Opposite Angles
- Origin
- Parallel
- Factor
- Factor Form
- Factorial
- Fewer than
- FOIL
- Fraction
- Greater than
- Greater than or equal to
- Greatest Common Factor
- Height
- Hypotenuse
- Image
- In terms of
- Inequality
- Inscribe
- Inscribed Angle
- Integer
- Interval
- Inverse Variation
- Irrational Number
- Perimeter
- Perpendicular Bisector
- Perpendicular Lines
- Subset
- Supplementary Angle
- Vertical Angles
- Vertical Lines
- Volume of regular solids
- Isolate
- Isosceles Triangle
- Least common Multiple
- Leg
- Less than
- Less than or equal to
- Line
- Mass
- Maximum
- Mean
- Median
- Midpoint
- Minimum
- Mode
- Multiple
- Multiplicative Inverse
- Positive
- Prime Numbers
- Prism
- Pythagorean Theorem
- Quotient
- Range
- Rational
- Rational Number
- Real Numbers
- Regular Polygons
- Remainder
- Set
- Similarity

RUBRICS

The Redesigned SAT (2016) Scoring Guidelines and Rubrics

According to The College Board (https://www.collegeboard.org/delivering-opportunity/sat/higher-ed/scores), the redesigned SAT will have a scale score of 400 points to 1600 points equally distributed over two main sections, (1) Evidence-Based Reading and Writing and (2)Mathematics.

NOTE: Every correct response will receive a credit, but there will be no deductions for wrong or blank responses.

The Math part will have a total of 57 problems with the following break-up.

Section	Number of Questions	Time Allowed	Calculator Allowed
1	37	55 minutes	YES
2	20	25 minutes	NO
Total	57 Questions	80 minutes	

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RUBRICS

Type of Question	Number of Questions	Points Worth	Total Points
Multiple-Choice	45	1 point	45
Grid-in	11	1 point	11
Grid-in-Extended Response	1	4 points	4
Total	57 Questions		60 points