Rhode Island State Assessment Program

The Rhode Island PSAT 10 and SAT Achievement Level Descriptors for Mathematics

The Mathematics portion of the redesigned SAT assesses how well a student demonstrates college and career readiness. The PSAT10 and SAT mathematics tests focuses on a range of skills and knowledge needed to formulate and solve problems with and without context. The mathematics test measures a students' ability in the areas of fluency, conceptual understanding, and application. Fluency requires that students solve problems accurately, efficiently and strategically. Conceptual understanding requires students to demonstrate their understanding of math concepts, operations and relations. Finally, application involves analyzing a situation to represent and solve the problem mathematically.

The PSAT10 and SAT Mathematics Achievement Level Descriptors (ALDs) are aligned to the Rhode Island Core State Standards for high school and therefore based on the progression of the standards. The achievement level descriptors are text descriptions of the fundamental skills and knowledge demonstrated by students in each category of achievement.

PSAT10 Achievement Level Descriptors
Grade 10: Mathematics

Achievement Level 4: Exceeding Expectations	Achievement Level 3: Meeting Expectations	Achievement Level 2: Partially Meeting Expectations	Achievement Level 1: Not Meeting Expectations
Score Range: 600-760	Score Range: 480-590	Score Range: 390-470	Score Range: 160-380
The student has exceeded the achievement level and demonstrates a thorough understanding of, and ability to apply the mathematics knowledge and skills needed *to be on track* for college and career readiness and achievement relative to the Rhode Island Core Mathematics Content Standards.	The student has met the achievement level and demonstrates an *adequate* understanding of, and ability to apply the mathematics knowledge and skills needed *to be on track* for college and career readiness and achievement relative to the Rhode Island Core Mathematics Content Standards.	The student has partially met the achievement level and demonstrates an *incomplete* understanding of, and ability to apply the mathematics knowledge and skills needed *to be on track* for college and career readiness and achievement relative to the Rhode Island Core Mathematics Content Standards.	The student has not met the achievement level and demonstrates a *minimal* understanding of, and ability to apply the mathematics knowledge and skills needed *to be on track* for college and career readiness and achievement relative to the Rhode Island Core Mathematics Content Standards.

SAT Achievement Level Descriptors

Grade 11: Mathematics

Achievement Level 4: Exceeding Expectations	Achievement Level 3: Meeting Expectations	Achievement Level 2: Partially Meeting Expectations	Achievement Level 1: Not Meeting Expectations
Score Range: 650-800	**Score Range: 530-640**	**Score Range: 420-520**	**Score Range: 200-410**
The student has exceeded the achievement level and demonstrates a thorough understanding of, and ability to apply the mathematics knowledge and skills needed for college and career readiness and achievement relative to the Rhode Island Core Mathematics Content Standards.	The student has met the achievement level and demonstrates an *adequate* understanding of, and ability to apply the mathematics knowledge and skills needed for college and career readiness and achievement relative to the Rhode Island Core Mathematics Content Standards.	The student has partially met the achievement level and demonstrates an *incomplete* understanding of, and ability to apply the mathematics knowledge and skills needed for college and career readiness and achievement relative to the Rhode Island Core Mathematics Content Standards.	The student has not met the achievement level and demonstrates a *minimal* understanding of, and ability to apply the mathematics knowledge and skills needed for college and career readiness and achievement relative to the Rhode Island Core Mathematics Content Standards.

ACHIEVEMENT LEVEL 1: Not Meeting Expectations

Students at Level 1 demonstrate knowledge of simple linear equations, mostly in one-step problems in context and can solve problems with given data displayed in graphs or tables. They can solve problems arising from familiar contexts and identify important quantities and begin developing models. They solve problems that involve simple logical reasoning with basic abstract concepts. Students at that level will:

- Understand some ratio concepts and use ratio reasoning to solve problems in a variety of contexts but lacks these foundational skills to advance to more problem solving. Inconsistently, use proportional relationships to solve multistep ratio and percent problems.

- Create and solve simple linear equations in one variable but makes limited strategic use of algebraic structure, including writing equivalent equations.

- Solve a system of linear equations to solve problems in a familiar context.

- Analyze and solve pairs of simultaneous linear equations given only algebraically and graphically.

- Solve real-world and mathematical problems leading to two linear equations in two variables given only familiar contexts.

- Solve real-world and mathematical problems about a geometric figure or an object that can be modeled by a geometric figure using given information such as length, area, surface area, or volume.

- Demonstrate some procedural fluency by selecting the correct area or volume formula and correctly calculating a specified value.

- Use the relationship between variables shown mostly in a graph to make predictions and conclusions given a simple context.

- Understand and recognize linear and non-linear functions but cannot differentiate between quadratic and exponential functions.

- Interpret information from a representation of data given in a familiar context.

- Given an appropriate data set, determine the measures of center (mean, median) to summarize a data set.

- Use some concepts related to congruence and similarity of triangles to solve familiar problems.

- Apply some knowledge of the relationship of angles (complementary, supplementary, corresponding, vertical, etc…) formed when a transversal cuts parallel lines.

ACHIEVEMENT LEVEL 2: Partially Meeting Expectations

Students at this level demonstrate some knowledge of more complex linear and systems of linear relationships in one and two variables with and without context. They can apply, inconsistently, their knowledge of multiple representations and the interpretation of these representations. They have some difficulty with multi-step problems that require several skills and concepts. Overall, students use a limited range of strategies needed to solve different types of problems. They can solve problems that require identifying key quantities and recognizing and developing missing information. They can begin to identify logical assumptions within a model and produce partial justifications and explanations with the model. Students at this level will:

- Apply proportional relationships, ratios, rates, and units in a wide variety of contexts. Examples include but are not limited to scale drawings and problems in the natural and social sciences.
- Solve problems involving unit conversion within measurement systems.
- Understand and use the fact that when two quantities are in a proportional relationship, if one changes by a scale factor, then the other also changes by the same scale factor.
- Use percentages to solve problems in a variety of contexts. Examples include, but are not limited to, discounts, interest, taxes, tips, and percent increases and decreases for many different quantities.
- Understand and use the relationship between percent change and growth factor (5% and 1.05, for example); include percentages greater than or equal to 100%.
- Make strategic use of algebraic structure and the properties of operations to identify and create equivalent expressions (linear, quadratic and exponential).
- Add, subtract and multiply polynomials.
- Create and use linear equations in one- and two-variables to model and solve problems in a context.
- Interpret slope (rate of change) and the intercept (constant term) of a linear model in the content of the data.
- Use the relationship between variables shown in a graph to make predictions and conclusions given a context.
- Interpret and solve a linear equation in one variable, making strategic use of algebraic structure.
- Interpret the meaning of a linear function that represents a context using two variables, explain how the quantities are related.
- Make connections between tabular, algebraic, and graphical representations of a linear equation in two variables - deriving one representation from the other.
- Write an equation for a line given different conditions (two points on the line, one point and the slope of the line, or one point and a parallel or perpendicular line).
- Create and use a system of two linear equations in two variables to solve problems in a context.
- Choose an appropriate graphical representation for a given data set.
- Summarize, represent and interpret information from a given representation of data in a variety of context.

- Given an appropriate data set, determine the measures of center (mean, median) and spread (interquartile, standard deviation) to summarize one set of data.

- Use concepts related to congruence and similarity of triangles to solve problems.

- Apply knowledge that changing by a scale factor of k changes all lengths by a factor of k, but angle measures remain unchanged.

- Apply knowledge of the relationship of angles (complementary, supplementary, corresponding, vertical, etc…) formed when a transversal cuts parallel lines.

ACHIEVEMENT LEVEL 3: Meeting Expectations

Students at this level demonstrate some mastery of linear and non-linear relationships and can apply these in different contexts. They can derive, create, and solve equations or functions to model problems in a variety of contexts with multiple variables. They can analyze data to make predictions and calculate probability concepts with and without contexts. They fluently use properties of the number system to solve equations with rational exponents and make sense of the algebraic structure to solve these problems in multiple representations. They can apply properties of right triangles to solve problems. They can construct chains of reasoning to justify a model used, produce justification of interpretations, state logical assumptions, and compare and contrast multiple plausible solutions.

- Create, use, and apply proportional relationships, ratios, rates, and units in a wide variety of contexts. Examples include but are not limited to scale drawings and problems in the natural and social sciences.

- Understand and use the fact that when two quantities are in a proportional relationship, if one changes by a scale factor, then the other also changes by the same scale factor to solve problems in different contexts.

- Make strategic use of algebraic structure and the properties of operations to identify and create equivalent expressions, (linear, rational, radicals and rational and exponential expressions)

- Add, subtract, multiply, and factor polynomials.

- Construct and use linear equations and inequalities in one or two variables to solve problems and interpret the solutions in a variety of contexts.

- Make connections between tabular, algebraic, and graphical representations of linear equations and inequalities in one or two variables by deriving one from the other.

- Solve systems of linear equations and inequalities in a variety of context.

- Make strategic use of algebraic structure, the properties of operations, and reasoning to solve quadratic equations in one variable presented in a wide variety of forms (standard form, completing the square).

- Determine the conditions under which a quadratic equation has no solution, one real solution, or two real solutions.

- Use structure and reasoning to solve simple rational, radical, quadratic, exponential, polynomial, and absolute value equations in one variable.

- Solve systems of nonlinear equations in two variables.
- Fluently solve quadratic equations in one variable, either written as a quadratic expression in standard form equal to zero or completing the square.
- Use function notation to represent and interpret input/output pairs in terms of a context and points on the graph.
- Interpret the meaning of an input/output pair, constant, variable, factor, or term based on the context, particularly, seeing structure to solve the problem in its context.
- Identify, construct, and use quadratic or exponential functions to model a relationship between quantities and solve problems.
- Make connections between tabular, algebraic, and graphical representations of the function by (i) when given one representation, select another representation; (ii) identifying features of one representation given another representation, including maximum and minimum values of the function; (iii) determining how a graph is affected by a change to its equation, including a vertical shift or scaling of the graph.
- Factor a polynomial or simple rational function, represent and interpret input/output pairs in terms of a context and points on the graph; the solutions, intercepts, and key features in terms of a context;
- Identify the graph given an algebraic representation of the function or an algebraic representation given the graph (with or withouta context).
- Interpret the effect of outliers on measures of center and spread.
- Estimate and interpret the slope and intercepts of the line of best fit for a given scatterplot in context.
- Represent data on two quantitative variables in graphs, tables, and scatterplots and describe how the variables are related.
- Fit linear, quadratic, and exponential functions to sets of data and use them to solve problems in the context of the data.
- Construct and interpret one- and two-way tables, tree diagrams, area models, and other representations to find relative frequency, probabilities, and conditional probabilities.
- Find probability and conditional probability in simple contexts.
- Use trigonometric ratios and the Pythagorean Theorem to solve multistep right triangle problems. Use concepts, theorems and proofs of congruence and similarity of triangles to solve problems.
- Know and apply relevant theorems such as (i) the vertical angle theorem; (ii) triangle similarity and congruence criteria; (iii) triangle angle sum theorem; and (iv) the relationship of angles formed when a transversal cuts parallel lines.
- Determine which statements may be required to prove certain relationships or to satisfy a given Theorem.

ACHIEVEMENT LEVEL 4: Exceeding Expectations

Students at this level demonstrate a strong command of reasoning and the previous math content and skills in the first three levels. They can fluently apply linear and non-linear concepts (quadratic and exponential) to model and solve problems and make estimates that do not involve an exact number for either growth or decay. They can create, solve, and interpret non-linear functions and demonstrate how changes in parameters can affect their models algebraically and graphically. They can apply right triangle and trigonometric concepts to solve real-world problems in a variety of contexts. Students can fluently solve multistep contextualized problems that integrate more than one standard. Overall, students effectively use a range of strategies and reasoning to solve a variety of problem types. They can solve unfamiliar problems by insightful, creative use of models. They can identify the logical assumptions in models, they can analyze, apply, interpret, and justify models with accurate, careful reasoning, and they can compare multiple plausible approaches to modeling in a setting and thoughtfully choose the most appropriate model. Students at this level will:

- Solve problems in a variety of contexts using the Pythagorean Theorem; right triangle trigonometry; trigonometric ratios, and properties of special right triangles.
- Apply knowledge and understanding of the complex number system to add, subtract, multiply, and divide with complex numbers and solve problems
- Use definitions, properties, and theorems relating to circles and parts of circles, such as radii, diameters, tangents, angles, arcs, arc lengths, and sector areas, to solve problems.
- Create an equation of the form $(x - h)^2 + (y - k)^2 = r^2$ to represent a circle in the xy-plane.
- Describe how the change to the equation representing a circle in the xy-plane affects the graph of the circle or vice versa.
- Fluently, complete the square in an equation representing a circle to determine properties of the circle when it is graphed in the xy-plane, and use the distance formula in problems related to circles.