August 2020

STATE OF NEW JERSEY
DEPARTMENT OF EDUCATION

Grade 8: New Jersey Student Learning Standards for Mathematics - Prerequisite Standards and Learning Objectives

Description

Included here are the prerequisite concepts and skills necessary for students to learn grade level content based on the New Jersey Student Learning Standards in mathematics. This tool is intended to support educators in the identification of any gaps in conceptual understanding or skill that might exist in a student's understanding of mathematics standards. The organization of this document mirrors that of the mathematics instructional units, includes all grade level standards, and reflects a grouping of standards and student learning objectives.

The tables are divided into three columns. The first column contains the grade level standard and student learning objectives, which reflect the corresponding concepts and skills in that standard. The second column contains standards from prior grades and the corresponding learning objectives, which reflect prerequisite concepts and skills essential for student attainment of the grade level standard as listed on the left. Given that a single standard may reflect multiple concepts and skills, all learning objectives for a prior grade standard may not be listed. Only those prior grade learning objectives that reflect prerequisite concepts and skills important for attainment of the associated grade level standard is listed. The third column contains Student Achievement Partners' recommendations (SAP) for the 2020-21 school year regarding preserving or reducing time as compared to a typical academic year.

Content Emphases Key: ■ : Major Cluster ▢: Supporting Cluster ◎ : Additional Cluster

Unit 1: Exponents, Irrational Numbers, and Linear Equations

Rationale for Unit Focus

Unit 1 introduces learners to the concept of irrational numbers, requiring them to classify numbers as either rational or irrational and approximate irrational expressions using rational numbers. The unit continues with the understanding and application of integer exponents and scientific notation. Learners not only know the properties of exponents, but also apply those properties to efficiently simplify and/or rewrite exponential expressions. With respect to scientific notation, learners perform simple mathematical operations with numbers written

in scientific notation and make comparisons between two quantities by estimating numbers written in scientific notation. Learners solve linear equations in one variable, including using square root and cube root symbols to represent solutions to simple equations.

Unit 1, Module A

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
8.NS.A.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number We are learning to/that… ▪ numbers that are not rational are called irrational ▪ every number has a decimal expansion ▪ show that rational numbers have decimal expansions that either terminate in zeros or repeats eventually ▪ convert a repeating decimal to a rational number	**7.NS.A.2** Apply and extend previous understandings of multiplication and division of fractions to multiply and divide rational numbers. d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. We have learned to/that… ▪ convert a rational number to a decimal using long division	*Integrate* foundational irrational numbers with students' work on square roots (8.EE.A.2) and the Pythagorean (8.G.B.7).
8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by*	n/a	*Integrate* foundational irrational numbers with students' work on square roots (8.EE.A.2) and the Pythagorean (8.G.B.7).

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. We are learning to/that… ▪ estimate the value of irrational numbers using rational approximations ▪ use rational approximations of irrational numbers to compare their size ▪ use rational approximations of irrational numbers to locate them on a number line		

Unit 1, Module B

Standard and Student Learning Objectives	**Previous Grade(s) Standards and Student Learning Objectives**	**Instructional Considerations** SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.* We are learning to/that… ▪ know the properties of integer exponents ▪ determine whether two numerical expressions involving integer exponents are equivalent ▪ generate equivalent expressions using the properties of exponents	**6.EE.A.1**. Write and evaluate numerical expressions involving whole-number exponents. We have learned to/that… ▪ write a numerical expression using whole-number exponents	*For curricula and lessons that are well aligned to work of integer exponents as detailed by the standard, no special considerations for shifting how time is dedicated are recommended.* Time spent on instruction and practice should **not** be reduced.
8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 × 108 and the population of the world as 7 × 109, and determine that the world population is more than 20 times larger* We are learning to/that… ▪ estimate a very large or very small number as a single digit times an integer power of ten	**5.NBT.A.2** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. We have learned to/that… ▪ denote powers of 10 by using whole-number exponents.	*Eliminate* lessons and practice dedicated to calculating with scientific notation. *Include* examples of numbers expressed in scientific notation in lessons about integer exponents as examples of how integer exponents are applicable outside of mathematics classes (8.EE.A.1) Note: While these standards or clusters are Major Work of the Grade, during the 2020-21 school year, it is recommended that they receive lighter treatment.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
▪ express how many times larger one quantity is compared to another when written as a single digit times an integer power of ten		
8.EE.A.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. We are learning to/that… ▪ add, subtract, multiply, and divide numbers expressed in scientific notation ▪ add, subtract, multiply, and divide numbers where one is expressed in decimal notation and the other is expressed in scientific notation ▪ choose appropriate units to represent measurements of very large or very small quantities ▪ interpret scientific notation generated by technology as a number multiplied by a power of ten	**7.EE.B.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. We have learned to/that… ▪ convert between forms (fractions, decimals, and whole numbers) as appropriate to solve multi-step real life and mathematical problems with positive and negative rational numbers in any form	*Eliminate* lessons and practice dedicated to calculating with scientific notation. *Include* examples of numbers expressed in scientific notation in lessons about integer exponents as examples of how integer exponents are applicable outside of mathematics classes (8.EE.A.1) Note: While these standards or clusters are Major Work of the Grade, during the 2020-21 school year, it is recommended that they receive lighter treatment.

Unit 1, Module C

Standard and Student Learning Objectives	**Previous Grade(s) Standards and Student Learning Objectives**	**Instructional Considerations** SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
8.EE.C.7 Solve linear equations in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. We are learning to/that… ▪ a linear equation in one variable can result in one solution, infinitely many solutions, or no solution ▪ show which of these outcomes is the case by transforming the original equation into the form x = a, a = a, or a = b ▪ solve linear equations in one variable with rational number coefficients, including equations that require expanding expressions using the	**7.EE.A.1** Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. We have learned to/that… ▪ apply the properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?* We have learned to/that… ▪ solve equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are	*Incorporate* students' work on rewriting expressions (7.EE.A) and solving algebraic equations (7.EE.B.4) to support students in analyzing and solving one-variable linear equations.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
distributive property and combining like terms	specific rational numbers with accuracy and efficiency	
8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. We are learning to/that… ▪ use square root and cube root symbols to represent solutions to equations in the form $x^2 = p$ and $x^3 = p$ ▪ evaluate square roots of small perfect squares and cube roots of small perfect cubes ▪ √2 is an irrational number	**7.NS.A.3** Solve real-world and mathematical problems involving the four operations with rational numbers. We have learned to/that… ▪ solve real-world and mathematical problems involving the four operations with rational numbers in decimal form **6.EE.B.5** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. We have learned to/that… ▪ determine if a given number from a specified set is a solution to an equation or an inequality using substitution	*Limit* lessons and problems about cube roots.
8.G.C.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems	n/a	*Combine lessons to address key concepts with volume, with an emphasis on cylinders, in order to reduce the amount of time on this topic.*

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
We are learning to/that… ▪ apply the formulas for volume of a cone, cylinder, or sphere in a real-world context ▪ calculate the volume of a cone, cylinder, or sphere ▪ find a missing dimension of a cone, cylinder or sphere given its volume		

November 2020

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Unit 2: Pythagorean Theorem, Congruence, and Similarity

Rationale for Unit Focus

Unit 2 provides a continuation of solving linear equations as it pertains to the Pythagorean Theorem. Learners apply the Pythagorean Theorem to find unknown side lengths of right triangles in both two- and three-dimensional figures, and to find distances between coordinate points on a coordinate plane. The unit continues with an analysis of transformations (i.e. reflections, rotations, translations, and dilations) in which learners should develop an understanding of congruence and similarity. They understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. They understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections,

translations, and dilations. These understandings are then used to establish facts about the angle sum and exterior angle of triangles, the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

Note: Double asterisks (**) indicate that the example(s) included within the New Jersey Student Learning Standard may be especially informative when considering the Student Learning Objective.

Unit 2, Module A

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
8.G.B 6 Explain a proof of the Pythagorean Theorem and its converse. We are learning to/that… ▪ the Pythagorean Theorem states that the square of the hypotenuse of a right triangle is equal to the sum of the squares of the other two sides ▪ explain a proof of the Pythagorean Theorem ▪ explain a proof of the converse of the Pythagorean Theorem	**7.G.B.6** Solve real-world and mathematical problems involving area, volume and surface area of two and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. We have learned to/that… ▪ solve real-world and mathematical problems involving area of two-dimensional objects composed of triangles and quadrilaterals	*Limit* lessons and problems that require students to develop and/or explain a proof of the Pythagorean Theorem. Lessons should present a proof of the theorem to students. *Limit* lessons about the converse of the Pythagorean Theorem.
8.G.B.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. We are learning to/that… ▪ apply the Pythagorean Theorem to find the distance between two points in a coordinate system	**6.G.A.3** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. We have learned to/that…	*Limit* lessons and problems dedicated to applying the Pythagorean Theorem to find the distance between two points in a coordinate system.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
	▪ find the length of a side of a polygon using coordinates with the same first coordinate or the same second coordinate.	
8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. We are learning to/that… ▪ apply the Pythagorean Theorem to determine unknown side lengths in right triangles in two-dimensional figures ▪ apply the Pythagorean Theorem to determine unknown side lengths in right triangles in three-dimensional figures ▪ apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world problems	n/a	*For curricula and lessons that are well aligned to applying the Pythagorean Theorem to solve real world and mathematical problems as detailed by 8.G.B.7, no special considerations for shifting how time is dedicated are recommended.* Time spent on instruction and practice should **not** be reduced.

Unit 2, Module B

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
8.G.A.1 Verify experimentally the properties of rotations, reflections, and translations: a. Lines are transformed to lines, and line segments to line segments of the same length. b. Angles are transformed to angles of the same measure. c. Parallel lines are transformed to parallel lines We are learning to/that… ▪ verify that when a reflection, rotation, and/or translation is performed, lines are transformed to lines, and line segments to line segments of the same length ▪ verify that when a reflection, rotation, and/or translation is performed, angles are transformed to angles of the same measure ▪ verify that when a reflection, rotation, and/or translation is performed, parallel lines are transformed to parallel lines	n/a	*Combine* lessons to address key concepts in congruence and *combine* lessons to address key concepts in similarity of two-dimensional figures in order to *reduce* the amount of time on this topic. Note: While these standards or clusters are Major Work of the grade, during the 2020-21 school year, it is recommended that they receive lighter treatment.
8.G.A.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by	n/a	*Combine* lessons to address key concepts in congruence and *combine* lessons to address key concepts in

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. We are learning to/that… ▪ two figures are congruent if one can be obtained from the other by a sequence of rotations, reflections, and/or translations ▪ describe a sequence of transformations that maps one congruent figure onto another		similarity of two-dimensional figures in order to *reduce* the amount of time on this topic. Note: While these standards or clusters are Major Work of the grade, during the 2020-21 school year, it is recommended that they receive lighter treatment.
8.G.A.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. We are learning to/that… ▪ dilate, translate, rotate, and reflect two-dimensional figures on a coordinate plane ▪ describe the effects of dilations, translations, rotations, and reflections using coordinates	**6.G.A.3** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. We have learned to/that… ▪ draw polygons in the coordinate plane given coordinates of the vertices ▪ find the length of a side of a polygon using coordinates with the same first coordinate or the same second coordinate	*Combine* lessons to address key concepts in congruence and *combine* lessons to address key concepts in similarity of two-dimensional figures in order to *reduce* the amount of time on this topic. Note: While these standards or clusters are Major Work of the grade, during the 2020-21 school year, it is recommended that they receive lighter treatment.
8.G A.4 Understand that a two-dimensional figure is similar to another if the	n/a	*Combine* lessons to address key concepts in congruence and *combine*

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. We are learning to/that… ▪ two figures are similar if one can be obtained from the other by a sequence of dilations and rotations, reflections, and/or translations ▪ describe a sequence of transformations that maps one similar figure onto another		lessons to address key concepts in similarity of two-dimensional figures in order to *reduce* the amount of time on this topic. Note: While these standards or clusters are Major Work of the grade, during the 2020-21 school year, it is recommended that they receive lighter treatment.
8.G.A.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so*. We are learning to/that… ▪ the sum of the interior angles of a triangle is 180 degrees	n/a	*Combine* lessons to address key concepts in congruence and *combine* lessons to address key concepts in similarity of two-dimensional figures in order to *reduce* the amount of time on this topic. Note: While these standards or clusters are Major Work of the grade, during the 2020-21 school year, it is recommended that they receive lighter treatment.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations *SAP* recommendation to preserve or reduce time in 20-21 as compared to a typical year
▪ the measure of an exterior angle of a triangle is equal to the sum of the two remote interior angles ▪ when parallel lines are cut by a transversal, corresponding, alternate interior, and alternate exterior angles are congruent ▪ if two sets of corresponding angles in two triangles are congruent, then the triangles are similar ▪ use facts about angles to construct an informal argument		

February 2021

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Unit 3: Linear Relationships and Functions

Rationale for Unit Focus

Unit 3 introduces learners to the idea of a function as a precursor to concepts about functions that are included in the high school standards. Learners begin the unit describing qualitatively the relationship between two quantities by analyzing a graph as an informal introduction to functions. They describe a function more formally by identifying it as a rule that assigns to each input exactly one output. In this unit, the concepts developed in grades 6 and 7 such as modeling relationships with variables and equations and ratio and proportional reasoning, are used to make connections between proportional relationships, lines, and linear equations. Learners graph linear functions, construct a

function to model a linear relationship, interpret the rate of change and initial value of a linear function in a real-world context, and compare linear functions presented in different ways. The unit concludes with analyzing and solving pairs of simultaneous linear equations. Learners solve systems of linear equations algebraically, and solve real-world mathematical problems leading to two linear equations in two variables.

Unit 3, Module A

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. We are learning to/that… ▪ a function is a rule that assigns to each input exactly one output ▪ the graph of a function is the set of ordered pairs consisting of an input and the corresponding output	**5.OA.B.3** Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example,* given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so. We have learned to/that… ▪ form ordered pairs consisting of corresponding terms from the two patterns and graph the ordered pairs on a coordinate plane	*For curricula and lessons that are well aligned to the domain of Functions as detailed in the clusters and standards within the domain, no special considerations for shifting how time is dedicated are recommended.* Time spent on instruction and practice should **not** be reduced.
8.F.B.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where	n/a	*For curricula and lessons that are well aligned to the domain of Functions as detailed in the clusters and standards*

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. We are learning to/that… ▪ describe qualitatively the functional relationships between two quantities by analyzing a graph ▪ sketch a graph that exhibits the qualitative features of a function given a verbal description		*within the domain, no special considerations for shifting how time is dedicated are recommended.* Time spent on instruction and practice should **not** be reduced.
8.F.A.3 Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example,* the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line. We are learning to/that… ▪ the equation $y = mx + b$ defines a linear function ▪ interpret a set of points forming a straight line as the graph of a linear function ▪ graph linear equations ▪ give examples of nonlinear functions	**6.EE.C.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example,* in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time. We have learned to/that…	*For curricula and lessons that are well aligned to the domain of Functions as detailed in the clusters and standards within the domain, no special considerations for shifting how time is dedicated are recommended.* Time spent on instruction and practice should **not** be reduced.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
	▪ two quantities which change in relationship to one another are expressed as independent and dependent variables ▪ write an equation using two quantities, an independent and a dependent variable, to represent a real-world problem	

Unit 3, Module B

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example,* compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. We are learning to/that… ▪ graph proportional relationships represented in different ways (i.e. ordered pairs, table, equation, phrases, etc.) ▪ recognize that for proportional relationships, the unit rate is the slope of the graph	**7.RP.A.2** Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. We have learned to/that… ▪ decide whether two quantities show a proportional relationship by graphing on	*For curricula and lessons that are well aligned to the work of understanding the connections between proportional relationships, lines, and linear equations as detailed by the cluster, no special considerations for shifting how time is dedicated are recommended.* Time spent on instruction and practice should **not** be reduced.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
▪ compare the unit rates of two proportional relationships represented in different ways	a coordinate plane and observing whether the graph is a straight line through the origin ▪ identify the constant of proportionality (unit rate) in equations and verbal descriptions of proportional relationships. ▪ identify the constant of proportionality (unit rate) in tables, graphs, and diagrams	
8.EE.B.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b. We are learning to/that… ▪ explain why the slope is the same between any two distinct points on a non-vertical line by drawing similar right triangles and comparing the ratios of their sides ▪ derive the equation $y = mx$ for a line through the origin ▪ derive the equation $y = mx + b$ for a line intercepting the y-axis at b	**7.RP.A.2** Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. We have learned to/that… ▪ decide whether two quantities show a proportional relationship by testing for equivalent ratios in a table	*For curricula and lessons that are well aligned to the work of understanding the connections between proportional relationships, lines, and linear equations as detailed by the cluster, no special considerations for shifting how time is dedicated are recommended.* Time spent on instruction and practice should **not** be reduced.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x*, *y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. We are learning to/that… ▪ construct a function to model a linear relationship between two quantities ▪ determine the rate of change and initial value of a function from a description of a relationship or from two (*x*, *y*) values, including reading these from a table or from a graph ▪ interpret the rate of change and initial value of a function in terms of the situation it models	**7.RP.A.2** Recognize and represent proportional relationships between quantities. b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. We have learned to/that… ▪ identify the constant of proportionality (unit rate) in equations and verbal descriptions of proportional relationships. ▪ identify the constant of proportionality (unit rate) in tables, graphs, and diagrams **6.EE.C.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example,* in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the	*For curricula and lessons that are well aligned to the domain of Functions as detailed in the clusters and standards within the domain, no special considerations for shifting how time is dedicated are recommended.* Time spent on instruction and practice should **not** be reduced.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
	equation $d = 65t$ to represent the relationship between distance and time. We have learned to/that… ▪ two quantities which change in relationship to one another are expressed as independent and dependent variables ▪ write an equation using two quantities, an independent and a dependent variable, to represent a real-world problem	
8.F.A.2 Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example,* given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. We are learning to/that… ▪ compare properties such as rate of change, intercepts, domain and range of two functions each represented in a different way	n/a	*For curricula and lessons that are well aligned to the domain of Functions as detailed in the clusters and standards within the domain, no special considerations for shifting how time is dedicated are recommended.* Time spent on instruction and practice should **not** be reduced.

Unit 3, Module C

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
8.EE.C.8 Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3*x* + 2*y* = 5 and 3*x* + 2*y* = 6 have no solution because 3*x* + 2*y* cannot simultaneously be 5 and 6. c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example,* given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair. We are learning to/that… ▪ solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs	**6.EE.B.5** Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. We have learned to/that… ▪ determine if a given number from a specified set is a solution to an equation or an inequality using substitution.	*Emphasize* the correspondences among: (1) a solution to a pair of simultaneous two-variable equations, (2) a point of intersection of the corresponding lines, and (3) the real-world context for which the equations were created. *Limit* the amount of required student practice in solving systems algebraically.

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
▪ points of intersection satisfy both equations simultaneously ▪ solve systems of two linear equations in two variables algebraically ▪ estimate solutions of two linear equations in two variables by graphing the equations ▪ determine the number of solutions a system of two linear equations will have based upon inspection ▪ solve a system of two linear equations modeling real-world and mathematical problems		

February 2021

Grade 8: New Jersey Student Learning Standards for Mathematics - Prerequisite Standards and Learning Objectives

Description

Included here are the prerequisite concepts and skills necessary for students to learn grade level content based on the New Jersey Student Learning Standards in mathematics. This tool is intended to support educators in the identification of any gaps in conceptual understanding or skill that might exist in a student's understanding of mathematics standards. The organization of this document mirrors that of the mathematics instructional units, includes all grade level standards, and reflects a grouping of standards and student learning objectives.

The tables are divided into three columns. The first column contains the grade level standard and student learning objectives, which reflect the corresponding concepts and skills in that standard. The second column contains standards from prior grades and the corresponding learning objectives, which reflect prerequisite concepts and skills essential for student attainment of the grade level standard as listed on the left. Given that a single standard may reflect multiple concepts and skills, all learning objectives for a prior grade standard may not be listed. Only those prior grade learning objectives that reflect prerequisite concepts and skills important for attainment of the associated grade level standard is listed. The third column contains the recommendations from Student Achievement Partners' recommendations (SAP) for the 2020-21 school year regarding preserving or reducing time as compared to a typical academic year.

Content Emphases Key: ■ : Major Cluster ▣: Supporting Cluster ◎: Additional Cluster

Unit 4: Linear Models for Scatter Plots and Two-Way Tables

Rationale for Unit Focus

Unit 4 provides a continuation of the analysis of linear models as they pertain to bivariate data. Learners investigate patterns of association in bivariate data using scatter plots and two-way tables, including informally fitting and assessing the fit of a linear model for a scatter plot, interpreting the slope and intercept of a linear model in the context of bivariate data, and using joint and relative frequencies of a two-way table to describe possible association between two variables.

Unit 4, Module A

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. We are learning to/that… ▪ construct scatter plots ▪ interpret scatter plots to investigate patterns of association between two quantities ▪ describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association	**6.SP.B.5** Summarize numerical data sets in relation to their context, such as by: a. Reporting the number of observations. b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. We have learned to/that… ▪ summarize numerical data sets in relation to their context, such as by reporting the number of observations and describing how it was measured and the units for the measurement ▪ describe overall patterns and any striking deviations from a data set by giving the measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation) with reference	*Emphasize using linear functions to model association in bivariate measurement data that suggest a linear association, using functions to answer questions about the data (8.SP.A.3).* *Combine lessons for 8.SP.A.1, 8.SP.A.2 and 8.SP.A.4 to address key statistical concepts in order to reduce the amount of time on this topic.* *Limit the amount of required student practice.*

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
	to the context with which the data was collected **6.NS.C.6** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. We have learned to/that… ▪ find and plot pairs of integers and other rational numbers on the coordinate plane	
8.SP.A.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g., line of best fit) by judging the closeness of the data points to the line. We are learning to/that…	n/a	*Emphasize using linear functions to model association in bivariate measurement data that suggest a linear association, using functions to answer questions about the data (8.SP.A.3).* *Combine lessons for 8.SP.A.1, 8.SP.A.2 and 8.SP.A.4 to address key statistical concepts to reduce the amount of time on this topic.* *Limit the amount of required student practice.*

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
▪ straight lines are used to model relationships between two quantitative variables ▪ informally fit a straight line for scatter plots that suggest a linear association ▪ informally assess the fit of the line for a scatter plot by judging the closeness of the data points to the line		
8.SP.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height. We are learning to/that… ▪ interpret the slope and intercept in the context of bivariate measurement data using the equation of a linear model	n/a	*Emphasize using linear functions to model association in bivariate measurement data that suggest a linear association, using functions to answer questions about the data (8.SP.A.3).* *Combine lessons for 8.SP.A.1, 8.SP.A.2, and 8.SP.A.4 to address key statistical concepts in order to reduce the amount of time on this topic.* *Limit the amount of required student practice.*
8.SP.A.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical	n/a	*Emphasize using linear functions to model association in bivariate measurement data that suggest a linear association, using functions to answer questions about the data (8.SP.A.3).* *Combine lessons for 8.SP.A.1, 8.SP.A.2, and 8.SP.A.4 to address key statistical*

Standard and Student Learning Objectives	Previous Grade(s) Standards and Student Learning Objectives	Instructional Considerations SAP recommendation to preserve or reduce time in 20-21 as compared to a typical year
variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores? We are learning to/that… ▪ two-way tables can be used to show patterns of association in categorical data ▪ construct a two-way table summarizing data on two categorical variables collected from the same subjects ▪ interpret a two-way table by identifying joint frequencies and calculating marginal frequencies ▪ use relative frequencies calculated for rows or columns to describe possible association between the two variables		*concepts in order to reduce the amount of time on this topic.* *Limit the amount of required student practice.*