Focus Topic: RP – Ration & Proportional Relationships

TSW = The Student Will

Objective(s)	Common Core Alignment	Essential Questions	Understandings	Suggested Assessments
• TSW compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units (*For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction $^{1/2}/_{1/4}$ miles per hour, equivalently 2 miles per hour)*	7.NBT.1	How are square roots used to solve quadratic equations?	Non-linear functions have non-constant rates of change.	Ongoing observation & questioning during class discussions
• TSW recognize and represent proportional relationships between quantities	7.NBT.2	How are quadratic functions graphed?	Ratios, proportions, and percents are used to represent relationships between quantities and measures.	Performance Tasks
• TSW 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	7.NBT.2	How do operations with decimals compare to operations with fractions and whole numbers?	Fractions, decimals, and percents can be used interchangeably.	Short Constructed Response
• TSW identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships	7.NBT.2	When is it more appropriate to use a fraction than a decimal or a percent?		Extended Constructed Response
• TSW represent proportional relationships by equations (*For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn)*	7.NBT.2			Self-Assessment
• TSW explain what a point (*x*, *y*) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r*) where r is the unit rate	7.NBT.2			Multiple Choice
• TSW use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error	7.NBT.3			Literature Connections

Focus Topic: G –Geometry

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Objective(s)	Common Core Alignment	Essential Questions	Understandings	Suggested Assessments
• TSW verify experimentally the properties of rotations, reflections, and translations: - Lines are taken to lines, and line segments to line segments of the same length. - Angles are taken to angles of the same measure. - Parallel lines are taken to parallel lines.	8.G.1	Why do we study geometry?	• Points, lines, and planes are the foundations of geometry.	Ongoing observation & questioning during class discussions
• TSW 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; given two congruent figures, describe a sequence that exhibits the congruence between them	8.G.2	Where do we see patterns?	All geometric figures have properties that make them unique.	Performance Tasks
• TSW describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates	8.G.3	How do patterns help us interpret the world around us?	Understanding these properties can help us solve problems in the real world.	Short Constructed Response
• TSW 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; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them	8.G.4	How does geometry relate to everyday life?		Extended Constructed Response
• TSW 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)*	8.G.5			Self-Assessment

• TSW explain a proof of the Pythagorean Theorem and its converse	8.G.6			Multiple Choice
• TSW apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions	8.G.7			Literature Connections
• TSW apply the Pythagorean Theorem to find the distance between two points in a coordinate system	8.G.8			
• TSW know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems	8.G.9			

Focus Topic: NS –The Number System

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Objective(s)	Common Core Alignment	Essential Questions	Understandings	Suggested Assessments
• TSW know that numbers that are not rational are called irrational	8.NS.1	Where do we use different categories of real numbers in real life? (natural, whole, integers)	A number line represents the various categories of real numbers.	Ongoing observation & questioning during class discussions
• TSW understand informally that every number has a decimal expansion	8.NS.1	How can algebraic expressions be transformed?	Integers have magnitude and direction.	Performance Tasks
• TSW show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number	8.NS.1		Absolute value gives the magnitude of a number.	Short Constructed Response
• TSW 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 truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations)*	8.NS.2			Extended Constructed Response Self-Assessment Multiple Choice

Focus Topic: EE –Expressions & Equations

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Objective(s)	Common Core Alignment	Essential Questions	Understandings	Suggested Assessments
• TSW know and apply the properties of integer exponents to generate equivalent numerical expressions. *(For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$)*	8.EE.1	What different information is obtained from equivalent forms of algebraic expressions?	Equivalent forms of algebraic expressions provide different information for solving problems.	Ongoing observation & questioning during class discussions
• TSW 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	8.EE.2	What is the purpose of exponents?	Exponential and scientific notation are efficient ways of expressing numbers.	Performance Tasks
• TSW evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational	8.EE.2	How can a function be identified?	Functional relationships can be represented graphically and symbolically.	Short Constructed Response
• TSW use numbers expressed in the form of a single digit times a whole-number 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 times 10^8 and the population of the world as 7 times 10^9, and determine that the world population is more than 20 times larger)*	8.EE.3	How are graphs, tables and symbols used to represent relationships?	Systems are used to model and solve real-life problems that involve more than one variable.	Extended Constructed Response
• TSW perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used	8.EE.4	Are you able to solve a linear inequality by graphing?		Self-Assessment
• TSW use scientific notation and choose units of appropriate size for measurements of very large or very small quantities *(For example: use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology)*	8.EE.4	What is the best method to solve a system of equations and inequalities in problem solving?		Multiple Choice

• TSW graph proportional relationships, interpreting the unit rate as the slope of the graph	8.EE.5			Literature Connections
• TSW 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)*	8.EE.			
• TSW 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	8.EE.6			
• TSW 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*	8.EE.6			
• TSW solve linear equations in one variable				
• TSW 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)	8.EE.7			
• TSW solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms	8.EE.7			
• TSW analyze and solve pairs of simultaneous linear equations	8.EE.8			
• TSW 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	8.EE.8			

• TSW solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. (*For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6)*	8.EE.8			
• TSW 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*	8.EE.8			

Focus Topic:SP – Statistics & Probability

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Objective(s)	Common Core Alignment	Essential Questions	Understandings	Suggested Assessments
• TSW construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities	8.SP.1	What are some ways to organize data?	Data representation is not always accurate.	Ongoing observation & questioning during class discussions
• TSW describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association	8.SP.1	Are there advantages and disadvantages in ways that data is presented?	Statistical measures provide a numeric picture of the shape of the data.	Performance Tasks
• TSW 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 by judging the closeness of the data points to the line	8.SP.2	Does changing the scale affect how data is communicated?	The probability is the mathematics of chance.	Short Constructed Response

• TSW 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)*	8.SP.3	How is the probability of an event determined and described?	Statistical measures provide a numeric picture of the shape of the data.	Extended Constructed Response
• TSW understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table	8.SP.4	Why make predictions?		Self-Assessment
• TSW construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects	8.SP.4			Multiple Choice
• TSW 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?)*	8.SP.4			Literature Connections

Focus Topic:F - Functions

TSW = The Student Will

Objective(s)	Common Core Alignment	Essential Questions	Understandings	Suggested Assessments
• TSW understand that a function is a rule that assigns to each input exactly one output	8.F.1	Can the given geometric concept be modeled algebraically?	Functions express a special kind of relationship between two quantities.	Ongoing observation & questioning during class discussions
• TSW understand that the graph of a function is the set of ordered pairs consisting of an input and the corresponding output	8.F.1	How do linear and non-linear functions compare?	Non-linear functions have non-constant rates of change.	Performance Tasks

• TSW compare properties 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)*	8.F.2	How is the quadratic formula used to solve quadratic equations?		Short Constructed Response
• TSW 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)*	8.F.3			Extended Constructed Response
• TSW construct a function to model a linear relationship between two quantities	8.F.4			Self-Assessment
• TSW 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	8.F.4			Multiple Choice
• TSW 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	8.F.4			Literature Connections
• TSW describe qualitatively the functional relationship between two quantities by analyzing a graph (*For example: where the function is increasing or decreasing, linear or nonlinear)*	8.F.5			
• TSW sketch a graph that exhibits the qualitative features of a function that has been described verbally	8.F.5			

Focus Topic: Mathematical Practices

TSW = The Student Will

Objective(s)
• TSW make sense of problems and persevere in solving them.
• TSW reason abstractly and quantitatively.
• TSW construct viable arguments and critique the reasoning of others.
• TSW model with mathematics.
• TSW use appropriate tools strategically.
• TSW attend to precision.
• TSW look for and make use of structure
• TSW look for and express regularity in repeated reasoning.