PA Core Critical Concepts 1

Standard	Assessment Anchor	Learning Goals/Concepts	Eligible Content	Student Performance Objectives	Resources/Activities	Terminology
2.1.6.E.1	M06.A-N.1	Apply and extend previous understandings of multiplication and division to divide fractions by fractions.	Interpret and compute quotients of fractions (including mixed numbers), and solve word problems involving division of fractions by fractions. Ex. Given a story context for (2/3) ÷ (3/4) explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (in general, (a/b)÷ (c/d) = (a/b) x (d/c) = ad/bc). Ex. How wide is a rectangular strip of land with length 3/4 mile and area 1/2 square mile? Ex. How many 2 1/4 foot pieces can be cut from a 15 1/2 foot board?	Students will be able to compute all operations with multi-digit numbers. Students will be able to apply reasoning through a variety of formulated ways to problem solve and prove solutions to mathematical situations. Students will be able to find common factors and multiples and use appropriate calculations based on each situation.	Big Ideas Math	prime factorization least common multiple common factor greatest common factor terminating decimal
2.1.6.E.2	M06.A-N.2	Identify and choose appropriate processes to compute fluently with multi-digit numbers.	Solve problems involving operations (+, -, x and ÷) with whole numbers, decimals (through thousandths), straight computation or word problems.	Students will be able to apply and extend previous number patterns, relationships, and representations to the system of rational numbers.		repeating decimal reciprocal
2.1.6.E.3	M06.A-N.2	Develop and/or apply number theory concepts to find common factors and and multiples.	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Apply the distributive property to express a sum of two whole numbers, 1 through 100, with a common factor as a multiple of a sum of two whole numbers with no common factor. Ex. Express 36 + 8 as 4(9 + 2).	Students will be able to communicate, apply, and connect understanding of rational numbers into a physical representation on the coordinate plane.		multiplicative inverse integers opposites rational number

PA Core Critical Concepts 1

Standard	Assessment Anchor	Learning Goals/Concepts	Eligible Content	Student Performance Objectives	Resources/Activities	Terminology
2.1.6.E.4	M06.A-N.3	Apply and extend previous understandings of numbers to the system of rational numbers.	Represent quantities in real-world contexts using positive and negative numbers, explaining the meaning of 0 in each situation (e.g. temperature above or below 0, elevation above or below sea level, credits/debits, positive or negative electric charge). Determine the opposite of a number and recognize that the opposite of the opposite of a number is the number itself (e.g. -(-3) = 3; 0 is its own opposite. Locate and plot integers and other rational numbers on a horizontal or vertical number line; locate and plot pairs of integers and other rational numbers on a coordinate plane. Write, interpret, and explain statements of order for rational numbers in real-world contexts. Ex. Write -3 ˚ C > -7˚ C to express the fact that -3 ˚ C is warmer than -7˚ C. Interpret the absolute value of a rational number as its distance from 0 on the number line and as a magnitude for a positive or negative quantity in a real-world situation. Ex. For an account balance of \-30\ = 30 to describe the size of the debt in dollars, and recognize that an account balance less than 30 dollars. Solve real-world and mathematical problems by plotting points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	Students will be able to make sense of and persevere in solving complex and novel mathematical problems. Students will be able to communicate and apply appropriate mathematical vocabulary in daily calculations and problem solving. Students will be able to recite from memory and with fluency, basic multiplication facts. **Recommended Time Frame = 60 days**	Big Ideas Math	absolute value coordinate plane x-axis y-axis origin ordered pair x-coordinate y-coordinate quadrants line of symmetry rational number integer

PA Core Critical Concepts 2

Standard	Assessment Anchor	Learning Goals/Concepts	Eligible Content	Student Performance Objectives	Resources/Activities	Terminology
2.1.6.D.1	M06.A-R.1	Understand ratio concepts and use ratio reasoning to solve problems.	Use ratio language and notation (such as 3 to 4, 3:4, 3/4) to describe a ratio relationship between two quantities. Ex. The ratio of girls to boys in a math class is 2:3 because for every 2 girls there are 3 boys. Ex. For every 5 votes candidate A received, candidate B received 4 votes. Find unit rate a/b associated with a ratio a:b (with b not equal to 0) and use rate language in the context of a ratio relationship. Ex. This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar. Ex. We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger. Construct tables of equivalent ratios relating quantities with whole-number measurements, find missing values in tables, and/or plot the pairs of values on a coordinate plane. Use tables to compare ratios. Solve unit rate problems including those involving unit pricing and constant speed. Ex. If it took 7 hours to mow the lawn, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?	Students will be able to compare quantities in a variety of modeled representations. Students will be able to identify and apply relationships between quantities from one representation to another. Students will be able to write rational numbers in a variety of ways: fraction decimal, percent, and drawings. Students will be able to apply and communicate inverse operations to find/problem solve the value of an unknown and to substitute the values for the unknown. Students will be able to write algebraic expressions and equations to represent a situation. They will use appropriate operational symbols, variables, and coefficients from a situation. Students will be able to apply and extend previous understandings of arithmetic to algebraic expressions to solve and communicate reasoning of inverse operations. Students will be able to represent and analyze quantitative relationships between dependent and independent variables.	Big Ideas Math	ratio rate unit rate equivalent ratios percent exponent base numerical expression evaluate odder of operations PEMDAS algebraic expression

PA Core Critical Concepts 2

Standard	Assessment Anchor	Learning Goals/Concepts	Eligible Content	Student Performance Objectives	Resources/Activities	Terminology
2.2.6.B.1	M06.B-E.1	Apply and extend previous understandings of arithmetic to algebraic expressions.	Find a percent of a quantity as a rate per 100 (e.g. 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percentage. Write and evaluate numerical expressions involving whole-number exponents. Write algebraic expressions from verbal descriptions. Ex. Express the description "five less than twice a number" as 2y - 5. Identify parts of an expression using mathematical terms (e.g. sum, term, product, factor, quotient, coefficient, quantity). Ex. Describe the expression 2(8+7) as a product of two factors. Evaluate expressions at specific values of their variables, including expressions that arise from formulas used in real-world problems. Ex. Evaluate the expression $b^2 - 5$ when b = 4.	Students will be able to apply a formula (y=kx) to represent the relationship in an input/output and describe the items each represent. Students will be able to make sense of and persevere in solving complex and novel mathematical problems. Students will be able to communicate and apply appropriate mathematical vocabulary in daily calculations and problem solving. Students will be able to recite from memory and with fluency, basic multiplication facts. Students will be able to make sense of and persevere in solving complex and novel mathematical problems. Students will be able to communicate and apply appropriate mathematical vocabulary in daily calculations and problem solving.	Big Ideas Math	variable terms coefficient like terms equivalent expressions properties of addition properties of multiplication Distributive Commutative Associative Identity equation inverse operation inequality solution of an equation solution of an inequality

PA Core Critical Concepts 2

Standard	Assessment Anchor	Learning Goals/Concepts	Eligible Content	Student Performance Objectives	Resources/Activities	Terminology
2.2.6.B.2	M06.B-E.2	Understand the process of solving a one-variable equation or inequality and apply it to real-world and mathematical problems.	Apply the properties of operations to generate equivalent expressions. Ex. Apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x. Ex. Apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6(4x + 3y). Ex. Apply properties of operations to y + y + y to produce the equivalent expression 3y. Use substitution to determine whether a given number in a specified set makes an equation or inequality true. Write algebraic expressions to represent real-world or mathematical problems. Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q, and x are all non-negative rational numbers. Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem and/or represent solutions of such inequalities on number lines.	Students will be able to recite from memory and with fluency, basic multiplication facts. Students will be able to make sense of and persevere in solving complex and novel mathematical problems. Students will be able to communicate and apply appropriate mathematical vocabulary in daily calculations and problem solving.	Big Ideas Math	independent variables dependent variables linear equation

PA Core Critical Concepts 2

Standard	Assessment Anchor	Learning Goals/Concepts	Eligible Content	Student Performance Objectives	Resources/Activities	Terminology
2.2.6.B.3	M06.B-E.3	Represent and analyze quantitative relationships between dependent and independent variables.	Write an equation to express the relationship between the dependent and independent variables. Ex. In a problem involving motion at a constant speed of 65 units, write the equation d = 65t to represent the relationship between distance and time. Analyze the relationship between the dependent and independent variables using graphs and tables and/or relate these to an equation.	Students will be able to recite from memory and with fluency, basic multiplication facts. **Recommended Time Frame = 60 days**	Big Ideas Math	

PA Core Critical Concepts 3

Standard	Assessment Anchor	Learning Goals/Concepts	Eligible Content	Student Performance Objectives	Resources/Activities	Terminology
2.3.6.A.1	M06.C-G.1	Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.	Determine the areas of triangles and special quadrilaterals (i.e. square, rectangle, parallelogram, rhombus, and trapezoid). **Formulas will be provided.** Determine the area of irregular or compound polygons. Ex. Find the area of a room in the shape of an irregular polygon by composing and/or decomposing. Determine the volume of right rectangular prisms with fractional edge lengths. **Formulas will be provided.** Given coordinates for the vertices of a polygon in the plane, use the coordinates to find side lengths and area of the polygon (limited to triangles and special quadrilaterals). **Formulas will be provided.** Represent three-dimensional figures using nets made of rectangles and triangles. Determine the surface area of triangular and rectangular prisms (including cubes) **Formulas will be provided.**	Students will be able to develop an understanding of statistical variability and appropriate vocabulary to communicate statistics effectively. Students will be able to summarize and describe data distributions from a variety of data representations. Students will be able to choose appropriate data displays based on the data set and situation, histograms bar graphs, line graphs. Students will be able to analyze, calculate, and describe relationships and measures of center to describe data sets. Students will solve and reason real world and mathematical problems involving area, surface area, and volume. Students will be able to use patterns to find how changing dimensions affect area.	Big Ideas Math	data statistical question dot plot frequency frequency table relative frequency table histogram measure of center mean median mode outlier lower quartile
2.4.6.B.1	M06.D-S.1	Demonstrate an understanding of statistical variability by displaying, analyzing, and summarizing distributions.	Display numerical data in plots on a number line, including line plots, histograms, and box-and-whisker plots. Determine quantitative measures of center (e.g. median, mean, mode) and variability (e.g. range, interquartile range, mean absolute deviation).	Students will be able to explain how to use nets to describe three dimensional figures and the relationships of surface areas. Students will be able to describe and solve how to find surface area of a variety of objects using formulas and variable replacement.		upper quartile box plot mean absolute deviation measure of variability

PA Core Critical Concepts 3

Standard	Assessment Anchor	Learning Goals/Concepts	Eligible Content	Student Performance Objectives	Resources/Activities	Terminology
2.1.7.D.1	M07.A-R.1	Analyze, recognize, and represent proportional relationships and use them to solve real-world and mathematical problems.	Describe any overall pattern and any deviations from the overall pattern with reference to the context in which the data were gathered. Relate the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. Compute unit rates associated with ratio of fractions, including ratios of lengths, areas, and other quantities measured in like or different units. 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. Determine whether two quantities are proportionally related (e.g., by testing for equivalent ratios in a table, graphing on a coordinate plane and observing whether the graph is a straight line through the origin). Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.	Make sense of and persevere in solving complex and novel mathematical problems. Students will be able to communicate and apply appropriate mathematical vocabulary in daily calculations and problem solving. Students will be able to recite from memory and with fluency, basic multiplication facts. Students will be able to make sense of and persevere in solving complex and novel mathematical problems. Students will be able to communicate and apply appropriate mathematical vocabulary in daily calculations and problem solving. Students will be able to recite from memory and with fluency, basic multiplication facts.	Big Ideas Math	range interquartile area congruent trapezoid regular polygon composite figure solid figure net surface area lateral area integer complex fraction proportional relationship constant of proportionality discount sales tax

PA Core Critical Concepts 3

Standard	Assessment Anchor	Learning Goals/Concepts	Eligible Content	Student Performance Objectives	Resources/Activities	Terminology
			Represent proportional relationships by equations. 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* .		Big Ideas Math	percent of change percent of increase percent of decrease
			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. Use proportional relationships to solve multi-step ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities, and commissions, fees, percent increase and decrease.	Students will be able to make sense of and persevere in solving complex and novel mathematical problems. Students will be able to communicate and apply appropriate mathematical vocabulary in daily calculations and problem solving. Students will be able to recite from memory and with fluency, basic multiplication facts.		survey sample experiment outcome sample space event
2.1.7.E.1	M07.A-N.1	Apply and extend previous understandings of operations with fractions to operations with rational numbers.	Apply properties of operations to add and subtract rational numbers, including real-world contexts. Represent addition and subtraction on a horizontal or vertical number line. Apply properties of operations to multiply and divide rational numbers, including real-world contexts; demonstrate that the decimal form of a rational number terminates or eventually repeats.	Students will be able to use a number line to model addition, subtraction, and multiplication of integers. Students will be able to solve percent problems involving discounts and sales tax and find a percent of change.		probability trial experimental probability
2.2.7.B.1	M07.B-E.1	Use properties of operations to generate equivalent expressions.	Apply properties of operations to add, subtract, factor and expand linear expressions with rational coefficients.	Students will be able to add algebraic expressions.		

PA Core Critical Concepts 3

Standard	Assessment Anchor	Learning Goals/Concepts	Eligible Content	Student Performance Objectives	Resources/Activities	Terminology
			Example: The expression 1/2 * (x + 6) is equivalent to 1/2 * x + 3 Example: The expression 5.3 - y + 4.2 is equivalent to 9.5 - y (or -y + 9.5) Example: The expression 4w - 10 is equivalent to 2(2w - 5).	Students will be able to make sense of and persevere in solving complex and novel mathematical problems. Students will be able to communicate and apply appropriate mathematical vocabulary in daily calculations and problem solving. Students will be able to recite from memory and with fluency, basic multiplication facts.	Big Ideas Math	
2.4.7.B.1	M07.D-S.1	Draw inferences about populations based on random sampling concepts.	Determine whether a sample is a random sample given a real-world situation. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Example: Estimate the mean word length in a book by randomly sampling words from the book. Example: Predict the winner of a school election based on randomly sampled survey data.			
2.4.7.B.3	M07.D-S.3	Investigate chance processes and develop, use, and evaluate probability models.	Determine the probability of a chance event given relative frequency. Predict the approximate relative frequency given the probability. Example: When rolling a number cube 600 times, predict that a 3 or a 6 would be rolled roughly 200 times but probably not exactly 200 times.	Students will be able to determine and use probability to describe the likelihood of an event. Students will be able to use a sample to make a prediction on population.		

PA Core Critical Concepts 3

Standard	Assessment Anchor	Learning Goals/Concepts	Eligible Content	Student Performance Objectives	Resources/Activities	Terminology
			Find the probability of a simple event, including the probability of a simple event **not** occurring. Example: What is the probability of **not** rolling a 1 on a number cube? Find probabilities of independent compound events using organized lists, tables, tree diagrams, and simulation.	Students will be able to make sense of and persevere in solving complex and novel mathematical problems. Students will be able to communicate and apply appropriate mathematical vocabulary in daily calculations and problem solving. Students will be able to recite from memory and with fluency, basic multiplication facts.	Big Ideas Math	
				Recommended Time Frame = 60 days		