Common Core Skill Alignment

6TH GRADE: GRADE 6

6.RP Ratios and Proportional Relationships

6.RP.A Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

- [ ] **S.1** Write a ratio
- [ ] **S.3** Write a ratio: word problems
- [ ] **S.4** Which model represents the ratio?

6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio a:b with b is not equal to 0, and use rate language in the context of a ratio relationship.

- [ ] **S.9** Unit rates

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

6.RP.A.3a Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

- [ ] **S.5** Identify equivalent ratios
- [ ] **S.6** Write an equivalent ratio
- [ ] **S.7** Ratio tables
- [ ] **S.8** Equivalent ratios: word problems
- [ ] **S.11** Ratios and rates: complete a table and make a graph

6.RP.A.3b Solve unit rate problems including those involving unit pricing and constant speed.

- [ ] **S.14** Compare rates: word problems
- [ ] **S.15** Ratios and rates: word problems

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- [ ] **X.2** Unit prices

6.RP.A.3c 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 percent.

- [ ] **U.1** What percentage is illustrated?
- [ ] **U.2** Understanding percents: strip models
- [ ] **U.3** Convert fractions to percents using grid models
- [ ] **U.4** Convert between percents, fractions, and decimals
- [ ] **U.5** Convert between percents, fractions, and decimals: word problems
- [ ] **V.2** Solve percent problems using grid models
- [ ] **V.3** Solve percent problems using strip models
- [ ] **V.4** Percents of numbers and money amounts
- [ ] **V.5** Percents of numbers: word problems
- [ ] **V.6** Percents of numbers: fractional and decimal percents
- [ ] **V.7** Find what percent one number is of another
- [ ] **V.8** Find what percent one number is of another: word problems
- [ ] **V.9** Find the total given a part and a percent
- [ ] **V.10** Solve percent problems
- [ ] **V.11** Solve percent word problems

6.RP.A.3d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

- [ ] **W.3** Convert and compare customary units
- [ ] **W.4** Convert, compare, add, and subtract mixed customary units
- [ ] **W.6** Customary unit conversions involving fractions and mixed numbers
- [ ] **W.7** Convert and compare metric units
- [ ] **W.9** Convert between customary and metric systems

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6.NS The Number System

6.NS.A Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

6.NS.A.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

- **M.2** Reciprocals
- **M.4** Divide whole numbers and fractions using models
- **M.5** Divide fractions by whole numbers in recipes
- **M.6** Divide fractions using models
- **M.7** Divide fractions
- **M.9** Divide fractions and mixed numbers using models
- **M.10** Divide fractions and mixed numbers
- **M.11** Divide fractions and mixed numbers using models: word problems
- **M.12** Divide fractions and mixed numbers: word problems

6.NS.B Compute fluently with multi-digit numbers and find common factors and multiples.

6.NS.B.2 Fluently divide multi-digit numbers using the standard algorithm.

- **C.2** Division patterns with zeros
- **C.3** Divide numbers ending in zeros: word problems
- **C.5** Divide whole numbers - 2-digit divisors
- **C.6** Divide whole numbers - 3-digit divisors

6.NS.B.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

- **H.1** Add and subtract decimal numbers
- **H.2** Add and subtract decimals: word problems
- **H.4** Complete the decimal addition or subtraction sentence

- [ ] **H.6** Maps with decimal distances
- [ ] **I.3** Multiply decimals
- [ ] **I.5** Divide decimals by whole numbers
- [ ] **I.6** Divide decimals by whole numbers: word problems
- [ ] **I.7** Multiply and divide decimals by powers of ten
- [ ] **I.9** Division with decimal divisors
- [ ] **J.1** Add, subtract, multiply, or divide two decimals
- [ ] **J.2** Add, subtract, multiply, or divide two decimals: word problems

6.NS.B.4 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. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

- [ ] **F.2** Identify factors
- [ ] **F.3** Find all the factor pairs of a number
- [ ] **F.6** Greatest common factor
- [ ] **F.8** Least common multiple
- [ ] **F.10** GCF and LCM: word problems
- [ ] **Z.6** Factor numerical expressions using the distributive property

6.NS.C Apply and extend previous understandings of numbers to the system of rational numbers.

6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

- [ ] **O.1** Understanding integers

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.

6.NS.C.6a Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., -(-3) = 3, and that 0 is its own opposite.

- [ ] **O.4** Understanding opposite integers
- [ ] **Q.7** Opposites of rational numbers
- [ ] **Q.9** Rational numbers: find the sign

6.NS.C.6b Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

- [ ] **R.4** Quadrants
- [ ] **R.5** Reflect a point over an axis

6.NS.C.6c 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.

- [ ] **O.2** Integers on number lines
- [ ] **O.3** Graph integers on horizontal and vertical number lines
- [ ] **Q.1** Rational numbers on number lines
- [ ] **R.2** Objects on a coordinate plane
- [ ] **R.3** Graph points on a coordinate plane

6.NS.C.7 Understand ordering and absolute value of rational numbers.

6.NS.C.7a Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.

- [ ] **O.7** Compare integers

6.NS.C.7b Write, interpret, and explain statements of order for rational numbers in real-world contexts.

- [ ] **Q.3** Compare and order rational numbers using number lines
- [ ] **Q.4** Compare rational numbers
- [ ] **Q.5** Put rational numbers in order
- [ ] **Q.6** Compare and order rational numbers: word problems
- [ ] **W.10** Compare temperatures above and below zero

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6.NS.C.7c Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.

- **O.5** Understanding absolute value
- **O.6** Absolute value
- **O.10** Absolute value and integers: word problems
- **Q.8** Absolute value of rational numbers

6.NS.C.7d Distinguish comparisons of absolute value from statements about order.

- **O.9** Integer inequalities with absolute values
- **Q.5** Put rational numbers in order
- **Q.8** Absolute value of rational numbers

6.NS.C.8 Solve real-world and mathematical problems by graphing 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.

- **R.6** Coordinate planes as maps
- **R.7** Distance between two points
- **R.8** Follow directions on a coordinate plane

6.EE Expressions and Equations

6.EE.A Apply and extend previous understandings of arithmetic to algebraic expressions.

6.EE.A.1 Write and evaluate numerical expressions involving whole-number exponents.

- **D.1** Write multiplication expressions using exponents
- **D.2** Evaluate powers
- **D.3** Write powers of ten with exponents
- **D.4** Find the missing exponent or base

- [ ] **D.5** Powers with decimal bases
- [ ] **D.6** Powers with fractional bases

6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers.

6.EE.A.2a Write expressions that record operations with numbers and with letters standing for numbers.

- [ ] **Y.1** Write variable expressions: one operation
- [ ] **Y.2** Write variable expressions: two operations

6.EE.A.2b Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.

- [ ] **Y.8** Identify terms and coefficients
- [ ] **Y.9** Sort factors of variable expressions

6.EE.A.2c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

- [ ] **E.6** Evaluate numerical expressions one step at a time
- [ ] **E.7** Evaluate numerical expressions involving whole numbers
- [ ] **E.8** Identify mistakes involving the order of operations
- [ ] **J.3** Evaluate numerical expressions involving decimals
- [ ] **N.3** Evaluate numerical expressions involving fractions
- [ ] **W.11** Convert between Celsius and Fahrenheit
- [ ] **Y.4** Evaluate variable expressions with whole numbers
- [ ] **Y.5** Evaluate multi-variable expressions
- [ ] **Y.6** Evaluate variable expressions with decimals, fractions, and mixed numbers
- [ ] **Y.7** Evaluate variable expressions: word problems

6.EE.A.3 Apply the properties of operations to generate equivalent expressions.

- [ ] **Z.4** Multiply using the distributive property: area models

- [ ] **Z.5** Multiply using the distributive property
- [ ] **Z.7** Factor variable expressions: area models
- [ ] **Z.8** Factor variable expressions using the distributive property
- [ ] **Z.10** Write equivalent expressions using properties

6.EE.A.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).

- [ ] **Z.1** Identify equivalent expressions using strip models
- [ ] **Z.12** Identify equivalent expressions I
- [ ] **Z.13** Identify equivalent expressions II

6.EE.B Reason about and solve one-variable equations and inequalities.

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.

- [ ] **AA.1** Does x satisfy an equation?
- [ ] **AA.2** Which x satisfies an equation?
- [ ] **BB.1** Solutions to inequalities

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

- [ ] **Y.3** Write variable expressions: word problems

6.EE.B.7 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 nonnegative rational numbers.

- [ ] **AA.5** Model and solve equations using algebra tiles
- [ ] **AA.6** Model and solve equations using diagrams
- [ ] **AA.7** Write and solve equations that represent diagrams
- [ ] **AA.8** Solve one-step addition and subtraction equations with whole numbers

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- [ ] **AA.9** Solve one-step multiplication and division equations with whole numbers
- [ ] **AA.10** Solve one-step equations with whole numbers
- [ ] **AA.11** Solve one-step addition and subtraction equations with decimals and fractions
- [ ] **AA.12** Solve one-step multiplication and division equations with decimals and fractions
- [ ] **AA.13** Solve one-step addition and subtraction equations: word problems
- [ ] **AA.14** Solve one-step multiplication and division equations: word problems
- [ ] **AA.15** Write a one-step equation: word problems
- [ ] **AA.16** Solve one-step equations: word problems

6.EE.B.8 Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

- [ ] **BB.2** Graph inequalities on number lines
- [ ] **BB.3** Write inequalities from number lines
- [ ] **BB.4** Write and graph inequalities: word problems

6.EE.C Represent and analyze quantitative relationships between dependent and independent variables.

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.

- [ ] **CC.2** Identify independent and dependent variables in tables and graphs
- [ ] **CC.3** Write an equation from a graph using a table
- [ ] **CC.4** Identify independent and dependent variables: word problems
- [ ] **CC.5** Find a value using two-variable equations
- [ ] **CC.6** Find a value using two-variable equations: word problems
- [ ] **CC.7** Solve word problems by finding two-variable equations
- [ ] **CC.8** Complete a table for a two-variable relationship
- [ ] **CC.9** Write a two-variable equation from a table
- [ ] **CC.10** Write a two-variable equation

- [ ] **CC.11** Identify the graph of an equation
- [ ] **CC.12** Complete a table and graph a two-variable equation
- [ ] **CC.13** Graph a two-variable equation
- [ ] **CC.14** Interpret a graph: word problems

6.G Geometry

6.G.A Solve real-world and mathematical problems involving area, surface area, and volume.

6.G.A.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

- [ ] **GG.3** Understanding area of a parallelogram
- [ ] **GG.4** Area of parallelograms
- [ ] **GG.5** Understanding area of a triangle
- [ ] **GG.6** Area of triangles
- [ ] **GG.7** Understanding area of a trapezoid
- [ ] **GG.8** Area of trapezoids
- [ ] **GG.9** Area of rhombuses
- [ ] **GG.10** Area of quadrilaterals
- [ ] **GG.11** Area of compound figures
- [ ] **GG.12** Area of compound figures with triangles

6.G.A.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

- [ ] **HH.1** Volume of cubes and rectangular prisms
- [ ] **HH.2** Volume of cubes and rectangular prisms with fractional side lengths
- [ ] **HH.3** Volume of cubes and rectangular prisms: word problems

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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.

- **R.9** Area and perimeter of squares and rectangles on the coordinate plane
- **EE.6** Graph triangles and quadrilaterals

6.G.A.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

- **FF.3** Nets of three-dimensional figures
- **HH.4** Surface area of cubes and rectangular prisms
- **HH.6** Surface area of triangular prisms
- **HH.7** Surface area of pyramids

6.SP Statistics and Probability

6.SP.A Develop understanding of statistical variability.

6.SP.A.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.

- **JJ.1** Identify statistical questions

6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

- **II.2** Create line plots
- **II.19** Interpret stem-and-leaf plots
- **II.20** Create stem-and-leaf plots
- **II.21** Box plots
- **JJ.7** Calculate quartiles and interquartile range
- **JJ.11** Describe distributions in line plots

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6.SP.A.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

- [ ] **JJ.4** Mean, median, mode, and range: find the missing number
- [ ] **JJ.10** Interpret measures of center and variability

6.SP.B Summarize and describe distributions.

6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

- [ ] **II.2** Create line plots
- [ ] **II.13** Create histograms
- [ ] **II.21** Box plots

6.SP.B.5 Summarize numerical data sets in relation to their context, such as by:

6.SP.B.5a Reporting the number of observations.

- [ ] **II.1** Interpret line plots
- [ ] **II.12** Interpret histograms

6.SP.B.5b Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

- [ ] **JJ.13** Identify representative, random, and biased samples

6.SP.B.5c 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.

- [ ] **JJ.2** Calculate mean, median, mode, and range
- [ ] **JJ.3** Interpret charts and graphs to find mean, median, mode, and range
- [ ] **JJ.6** Calculate mean absolute deviation
- [ ] **JJ.7** Calculate quartiles and interquartile range
- [ ] **JJ.9** Identify an outlier and describe the effect of removing it

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JJ.11 Describe distributions in line plots

6.SP.B.5d Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

JJ.12 Choose appropriate measures of center and variation

Common Core Skill Alignment

6TH GRADE: MATHEMATICAL PRACTICES

MP1 Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

- [ ] **C.3** Divide numbers ending in zeros: word problems
- [ ] **F.10** GCF and LCM: word problems
- [ ] **J.2** Add, subtract, multiply, or divide two decimals: word problems
- [ ] **M.12** Divide fractions and mixed numbers: word problems
- [ ] **S.8** Equivalent ratios: word problems
- [ ] **S.15** Ratios and rates: word problems
- [ ] **V.5** Percents of numbers: word problems
- [ ] **X.1** Which is the better coupon?
- [ ] **X.5** Sale prices
- [ ] **AA.16** Solve one-step equations: word problems
- [ ] **CC.14** Interpret a graph: word problems
- [ ] **GG.11** Area of compound figures

MP2 Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize-to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents-and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

- ☐ - Decimal number lines
- ☐ **D.1** Write multiplication expressions using exponents
- ☐ **J.2** Add, subtract, multiply, or divide two decimals: word problems
- ☐ **O.1** Understanding integers
- ☐ **Q.4** Compare rational numbers
- ☐ **Q.5** Put rational numbers in order
- ☐ **Q.9** Rational numbers: find the sign
- ☐ **S.9** Unit rates
- ☐ **W.5** Multiply and divide mixed customary units
- ☐ **W.10** Compare temperatures above and below zero
- ☐ **X.4** Unit prices with customary unit conversions
- ☐ **Y.2** Write variable expressions: two operations
- ☐ **Y.3** Write variable expressions: word problems
- ☐ **Y.4** Evaluate variable expressions with whole numbers
- ☐ **Y.5** Evaluate multi-variable expressions
- ☐ **Y.6** Evaluate variable expressions with decimals, fractions, and mixed numbers
- ☐ **AA.16** Solve one-step equations: word problems
- ☐ **CC.3** Write an equation from a graph using a table
- ☐ **CC.8** Complete a table for a two-variable relationship
- ☐ **CC.10** Write a two-variable equation

MP3 Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and-if there is a flaw in an argument-explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

- **C.1** Divisibility rules
- **Z.10** Write equivalent expressions using properties
- **AA.1** Does x satisfy an equation?
- **JJ.9** Identify an outlier and describe the effect of removing it
- **JJ.13** Identify representative, random, and biased samples

MP4 Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

- **H.6** Maps with decimal distances
- **M.5** Divide fractions by whole numbers in recipes
- **R.6** Coordinate planes as maps
- **S.15** Ratios and rates: word problems
- **V.5** Percents of numbers: word problems

- [ ] **X.1** Which is the better coupon?
- [ ] **X.5** Sale prices
- [ ] **Y.3** Write variable expressions: word problems
- [ ] **AA.16** Solve one-step equations: word problems
- [ ] **CC.6** Find a value using two-variable equations: word problems
- [ ] **CC.8** Complete a table for a two-variable relationship
- [ ] **CC.10** Write a two-variable equation
- [ ] **CC.11** Identify the graph of an equation
- [ ] **CC.14** Interpret a graph: word problems
- [ ] **II.1** Interpret line plots
- [ ] **II.12** Interpret histograms
- [ ] **II.21** Box plots
- [ ] **JJ.3** Interpret charts and graphs to find mean, median, mode, and range

MP5 Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

- [ ] **-** Decimal number lines
- [ ] **H.6** Maps with decimal distances
- [ ] **O.2** Integers on number lines
- [ ] **O.3** Graph integers on horizontal and vertical number lines
- [ ] **O.7** Compare integers

- [ ] **Q.9** Rational numbers: find the sign
- [ ] **R.3** Graph points on a coordinate plane
- [ ] **R.7** Distance between two points
- [ ] **AA.5** Model and solve equations using algebra tiles
- [ ] **CC.13** Graph a two-variable equation
- [ ] **EE.6** Graph triangles and quadrilaterals
- [ ] **HH.4** Surface area of cubes and rectangular prisms
- [ ] **II.2** Create line plots

MP6 Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

- [ ] **C.1** Divisibility rules
- [ ] **F.6** Greatest common factor
- [ ] **F.8** Least common multiple
- [ ] **I.7** Multiply and divide decimals by powers of ten
- [ ] **I.9** Division with decimal divisors
- [ ] **M.2** Reciprocals
- [ ] **O.6** Absolute value
- [ ] **R.2** Objects on a coordinate plane
- [ ] **R.4** Quadrants
- [ ] **S.6** Write an equivalent ratio
- [ ] **Y.2** Write variable expressions: two operations
- [ ] **Y.8** Identify terms and coefficients
- [ ] **AA.2** Which x satisfies an equation?

- [ ] **BB.1** Solutions to inequalities
- [ ] **BB.2** Graph inequalities on number lines
- [ ] **BB.3** Write inequalities from number lines
- [ ] **JJ.2** Calculate mean, median, mode, and range
- [ ] **JJ.6** Calculate mean absolute deviation
- [ ] **JJ.13** Identify representative, random, and biased samples

MP7 Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression x^2 + 9x + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3(x – y)^2 as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

- [ ] **D.4** Find the missing exponent or base
- [ ] **Z.5** Multiply using the distributive property
- [ ] **Z.8** Factor variable expressions using the distributive property
- [ ] **Z.10** Write equivalent expressions using properties
- [ ] **Z.13** Identify equivalent expressions II
- [ ] **CC.3** Write an equation from a graph using a table
- [ ] **EE.6** Graph triangles and quadrilaterals
- [ ] **GG.11** Area of compound figures
- [ ] **II.21** Box plots

MP8 Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (y – 2)/(x – 1) = 3. Noticing the regularity in the way terms cancel when expanding (x – 1)(x + 1), (x – 1)(x^2 + x + 1), and (x – 1)(x^3 + x^2 + x + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

- **C.2** Division patterns with zeros
- **D.1** Write multiplication expressions using exponents
- **D.2** Evaluate powers
- **D.5** Powers with decimal bases
- **D.6** Powers with fractional bases
- **I.7** Multiply and divide decimals by powers of ten
- **S.7** Ratio tables

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