Iowa Mathematics

Grade 7

Ratios and Proportional Relationships 7.RP

1 Analyze proportional relationships and use them to solve real-world and mathematical problems. 7.RP.A

1 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. Give a reason it is a better value to buy a supply of an item at a cost of $22.50 for ten pounds than at a cost of $1.50 for 1 2 pound. 7.RP.A.1

2 Recognize and represent proportional relationships between quantities. 7.RP.A.2

a Decide whether two quantities are in a proportional relationship. For example, 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.RP.A.2.A

b Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. 7.RP.A.2.B

c Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items bought at a constant price p, the relationship between the total cost and the number of items can be expressed as $tt = pppp$. 7.RP.A.2.C

d Explain what a point (xx, yy) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0,0) and (1, rr) where rr is the unit rate. 7.RP.A.2.D

3 Use proportional relationships to solve multistep ratio and percent problems. For example: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error. 7.RP.A.3

The Number System 7.NS

1 Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. 7.NS.A

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1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. 7.NS.A.1

a Describe situations in which opposite quantities combine to make 0. For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged. 7.NS.A.1.A

b Use a model to describe $pp + qq$ as a number located a distance $|qq|$ from pp, in the positive or negative direction depending on whether qq is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. 7.NS.A.1.B

c Use a model to describe subtraction of rational numbers as adding the additive inverse, $pp - qq = pp + (-qq)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference and apply this principle in real-world contexts. 7.NS.A.1.C

d Apply properties of operations as strategies to add and subtract rational numbers. 7.NS.A.1.D

2 Apply and extend earlier understandings of multiplication and division and of fractions to multiply and divide rational numbers. 7.NS.A.2

a Use properties of operations, particularly the distributive property, leading to generalizations for products such as $(-1)(-1) = 1$ for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. 7.NS.A.2.A

b Use properties of operations, particularly the distributive property, leading to generalizations for quotients of integers (provided that the divisor is not zero). If pp and qq are integers, then $-\left(\frac{pp}{qq}\right) = \left(\frac{-pp}{qq}\right) = \left(\frac{pp}{-qq}\right)$. Interpret quotients of rational numbers by describing real-world contexts. 7.NS.A.2.B

c Multiply and divide rational numbers. 7.NS.A.2.C

d Convert a rational number to a decimal; know that the decimal form of a rational number terminates in 0s or eventually repeats. 7.NS.A.2.D

3 Solve real-world and mathematical problems involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions, a fraction within a fraction. 7.NS.A.3

Expressions and Equations 7.EE

1 Use properties of operations to generate equivalent expressions. 7.EE.A

1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. 7.EE.A.1

2 Describe how rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, $aa + 0.05aa = 1.05aa$ means that "increase by 5%" is the same as "multiply by 1.05." 7.EE.A.2

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olve real-life and mathematical problems using numerical and algebraic expressions and equations. 7.EE.B

1 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. For example, If someone making $25 an hour gets a 10% raise, that is an additional 1 10 of their salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3 4 inches long in the center of a door that is 27 1 2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. 7.EE.B.3

2 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. 7.EE.B.4

a Solve word problems leading to equations of the form $pppp + qq = rr$ and $pp(xx + qq) = rr$, where pp, qq, and rr 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? 7.EE.B.4.A

b Solve word problems leading to inequalities of the form $pppp + qq > rr$ or $pppp + qq < rr$, where pp, qq, and rr are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example, as a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make and describe the solutions. $pppp + qq >$ 7.EE.B.4.B

Geometry 7.G

1 Draw, construct, and describe geometrical figures and describe the relationships between them. 7.G.A

1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. 7.G.A.1

2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. 7.G.A.2

3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. 7.G.A.3

2 Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. 7.G.B

1 Choose the formula needed and use it to solve problems involving the area and circumference of a circle. For example, a 15.1 in long wire is bent into the shape of a circle to make a wreath with 2.9 in left over. To the nearest 0.1 in, what is the diameter of the circle? 7.G.B.4

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2 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. 7.G.B.5

3 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. 7.G.B.6

Statistics and Probability 7.SP

1 Use random sampling to draw inferences about a population. 7.SP.A

1 Describe how statistics can be used to gain information about a population by examining a sample of the population, recognizing that generalizations about a population from a sample are valid only if the sample is representative of that population. Explain that random sampling tends to produce representative samples and support valid inferences. 7.SP.A.1

2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data and observe the variation in predictions across multiple surveys. 7.SP.A.2

2 Draw informal comparative inferences about two populations. 7.SP.B

1 Informally assess the degree of visual overlap of two numerical data distributions with similar variability, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable. 7.SP.B.3

2 Use measures of center (for example, mode, median, mean) and measures of variability (for example, range, interquartile range, mean absolute deviation) for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourthgrade science book. 7.SP.B.4

3 Investigate and model chance processes. 7.SP.C

1 Describe the probability of a chance event as a number between 0 and 1 that expresses the likelihood of the event occurring. (for example, larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1 2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event). 7.SP.C.5

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2 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency. Given the probability of a chance event, predict the approximate relative frequency that will be observed, and collect data to assess the agreement between the probability and the observed frequency. For example, collect data to approximate the probability that a tossed paper cup will land open-end down. Your friend calculated that the probability of "rolling double sixes" with a pair of number cubes is 1 6 (which is the wrong answer) collect data to see how well this probability agrees with the observation frequency. 7.SP.C.6

3 Calculate probabilities of simple events under an assumption of equal probability for all outcomes. For example, suppose that one student in seventh grade will be chosen to speak at a school assembly. On the assumption that every student is equally likely to be chosen, calculate the probability that the youngest seventh grader will be chosen and the probability that a member of Homeroom 701 will be chosen. Calculate the probability of a spinner landing on a certain color, assuming that all of the colors are equally likely outcomes. 7.SP.C.7

4 Calculate probabilities of compound events using organized lists, tables, tree diagrams, and simulation. For example, Calculate the probability of "rolling double sixes." Use a simulation to approximate the answer to the question. For example, if 40% of blood donors have type A blood, what is the probability that it will take at least 4 blood donors to find one with type A blood? 7.SP.C.8