Pre-Algebra Examples

Utah Pre-Algebra Core	Examples
Standard I: Students will expand number sense to understand, perform operations, and solve problems with rational numbers. **Objective 1: Compute fluently with understanding and make reasonable estimates with rational numbers.** a. Compute fluently using all four operations with integers, and explain why the corresponding algorithms work. b. Compute fluently using all four operations with rational numbers, including negative fractions and decimals, and explain why the corresponding algorithms work. c. Check the reasonableness of results using estimation.	• (-3)(2)(-5) = • Demonstrate -4(3) using a number line. • A pearl diver from Japan dives off a cliff that is 538 ft. above sea level. She retrieves the oysters that are at 137 ft. below sea level. What is the distance the diver dove from the top of the cliff to the oysters? • Explain why $\left(-\frac{1}{2}\right)\left(-\frac{2}{3}\right)$ is a positive fraction less than one.
Objective 2: Analyze relationships among rational numbers, including negative rational numbers, and operations involving these numbers. a. Order rational numbers in various forms, including scientific notation (positive and negative exponents), and place numbers on a number line. b. Predict the effect of operating with fractions, decimals, percents, and integers as an increase or a decrease of the original value. c. Recognize and use the identity properties of addition and multiplication, the multiplicative property of zero, the commutative and associative properties of addition and multiplication, and the distributive property of multiplication over addition. d. Recognize and use the inverse operations of adding and subtracting a fixed number, multiplying and dividing by a fixed number, and computing squares of whole numbers and taking square roots of perfect squares.	• Write 0.000324 using scientific notation. • Put the numbers 4.2×10^{1}, 4.2×10^{-4}, 4.2×10^{3} , 4.2×10^{-7} in order. • Use the associative property of addition to simplify 26 + (74 + 69). • If the manager of a clothing store multiplied all the prices of the belts by 130%, how will the new prices compare to the original prices? • What is $\sqrt{5^2}$?
Objective 3: Solve problems involving rational numbers using addition, subtraction, multiplication, and division. a. Recognize the absolute value of a rational number as its distance from zero. b. Simplify numerical expressions, including those with whole	• Simplify: (2 + -3) + (14 + -5) = • Simplify $\frac{4-2}{2-2}$.

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number exponents and absolute values, using the order of operations. c. Solve problems involving rational numbers, percents, and proportions.	• What is $\lvert 5 \rvert$? • Terri's Treasures is having its holiday sale. Lamont found a handmade wreath he wants to buy for his mother. The wreath was originally priced at $44.95 and is on sale for 20% off. Lamont has a coupon for an additional 10% off the discounted sale price. How much will Lamont pay for the wreath?
Standard II: Students will use proportion and similarity to solve problems. **Objective 1: Model and illustrate meanings of ratios, percents, and decimals.** a. Compare ratios to determine if they are equivalent. b. Compare ratios using the unit rate. c. Represent percents as ratios based on 100 and decimals as ratios based on powers of ten. d. Graph proportional relationships and identify the unit rate as the slope of the related line.	• Sandy ran100m in 15 seconds. Kim ran 250 m in 35 seconds. Who ran faster? • What is 4.2×10^{-3} ? • Javier saves $10 a week for 15 weeks. Draw a graph that shows the balance of his bank account if he started with nothing. What is the rate of the growth of his savings account? What if he started with $25 in his account? What would be the rate of savings then?
Objective 2: Solve a wide variety of problems using ratios and proportional reasoning. a. Set up and solve problems involving proportional reasoning using variables. b. Solve percent problems, including problems involving discounts, interest, taxes, tips, and percent increase or decrease. c. Solve ratio and rate problems using informal methods.	• Solve $\frac{x}{15} = \frac{2}{10}$. • What is the final price of an item on sale for $32.55 after 6% tax is added?
Objective 3: Recognize similar polygons and use properties of similar triangles to solve problems and define the slope of a line. a. Define similar polygons as polygons with corresponding angles congruent and corresponding sides that are proportional. b. Identify pairs of similar triangles using two pairs of congruent angles, or two pairs of proportional sides with congruent included angles. c. Find missing lengths of similar triangles, including inaccessible	• The length of the shadow of a flagpole is 42 feet, and the shadow of a yardstick is 2.3 feet. What is the height of the flagpole? • Are all right triangles similar? Why or why not? • Find the missing measures in the triangle below.

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<table>
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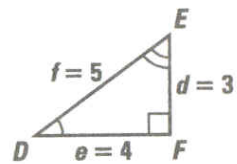
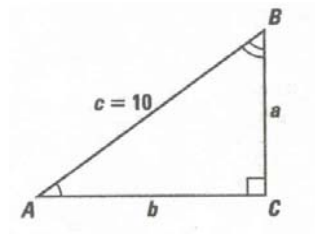
<td>lengths, using proportions.
d. Define the slope of a line as the ratio of the vertical change to the horizontal change between two points, and show that the slope is constant using similarity of right triangles.</td>
<td> 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<td>Standard III: Students will develop fluency with the language and operations of algebra to analyze and represent relationships.

Objective 1: Generalize and express patterns using algebraic expressions.
a. Compare representations of a relation using tables, graphs, algebraic symbols, and mathematical rules.
b. Describe simple patterns using a mathematical rule or algebraic expression.
c. Create and extend simple numerical and visual patterns.</td>
<td>• What are the next 3 numbers in this sequence? 80, 50, 20, -10, . .
• Write an algebraic expression that represents the pattern in the table.
<table>
<tr><th>Input Number</th><th>Output Number</th></tr>
<tr><td>2</td><td>3</td></tr>
<tr><td>3</td><td>5</td></tr>
<tr><td>4</td><td>7</td></tr>
<tr><td>5</td><td>9</td></tr>
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<td>Objective 2: Evaluate, simplify, and solve algebraic expressions, equations, and inequalities.
a. Evaluate algebraic expressions, including those with whole number exponents, when given values for the variable(s).
b. Simplify algebraic expressions using the order of operations, algebraic properties, and exponent rules.
c. Solve single-variable linear equations and inequalities, including those that must be simplified on one side or those with variables on both sides of an equation.</td>
<td>• Evaluate $3x^2 + y^2$ when x= -3 and y= 4
• Simplify 3(x+5)-2x
• Simplify $y^2 3y^2$
• Solve -2(x+4)=8
• Solve 3x-5=9x+2</td>
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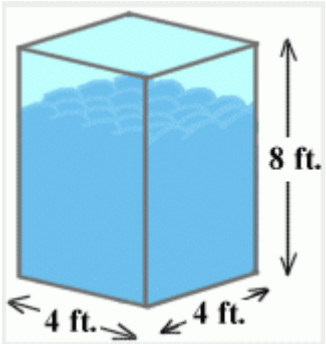
Objective 3: Represent relationships using graphs, tables, and other models. a. Identify approximate rational coordinates when given the graph of a point on a rectangular coordinate system. b. Graph ordered pairs of rational numbers on a rectangular coordinate system. c. Graph linear equations using ordered pairs or tables. d. Recognize that all first order equations produce linear graphs. e. Model real-world problems using graphs, tables, equations, manipulatives, and pictures, and identify extraneous information.	• Graph the point (-1/2, ¾) on the coordinate axes. • Graph 3x+2y=5 using a table. • For a particular region, the amount of water in the snow is 1 inch of water for every 6 inches of snow. Graph this relationship and use your graph to predict how much water is in 8 inches of snow. • Sally earns $10.00 a week plus $2.00 for every magazine subscription she sells. Write an equation that shows her income, graph it and use your equation or graph to predict her income if she sells 57 subscriptions in a week.
Standard IV: Students will use algebraic, spatial, and logical reasoning to solve geometry and measurement problems. **Objective 1: Apply the properties of proportionality of different units of measure.** a. Convert units of measure within the same system. b. Create and interpret scale drawings and approximate distance on maps using scale factors. c. Solve problems using scale factors.	• On a map of Salt Lake City, 3 centimeters on the map represent 10 city blocks. How many centimeters represent 25 city blocks? • Genny rode her bike 3168 feet in 3 minutes. What was Genny?s speed in miles per hour?
Objective 2: Derive formulas for surface areas and volume of three-dimensional figures. a. Derive formulas for and calculate surface area and volume of right prisms and cylinders using appropriate units. b. Explain that if a scale factor describes how corresponding lengths in two similar objects are related, then the square of the scale factor describes how corresponding areas are related and the cube of the scale factor describes how corresponding volumes are related. c. Find lengths, areas, and volumes of similar figures, using the scale factor. d. Select appropriate two- and three-dimensional figures to model real-world objects, and solve a variety of problems involving surface areas and volumes of cylinders and prisms.	• What is the volume of this rectangular prism?  • A blueprint of a room measures 5 cm X 8 cm where 1 cm = 1.5 m. What is the area of the floor of the

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	room? • The volume of a model swimming pool is .5 liter. What is the volume of actual swimming pool if the scale factor of the lengths of the sides of the pool is 1:45?
Standard V: Students will understand concepts from probability and statistics and apply statistical methods to solve problems. **Objective 1: Calculate probabilities of events and compare theoretical and experimental probability.** a. Solve counting problems using the Fundamental Counting Principle. b. Calculate the probability of an event or sequence of events with and without replacement using models. c. Recognize that the sum of the probability of an event and the probability of its complement is equal to one. d. Make approximate predictions using theoretical probability and proportions. e. Collect and interpret data to show that as the number of trials increases, experimental probability approaches the theoretical probability.	• Ryan observed cars at the same intersection for several hours over several days. From his observations, he determined that the proportion of cars that stop when the light is yellow is 0.68. How many of the next 500 cars are likely to stop on a yellow light? • Ivan goes to a sandwich shop where he can order ham, turkey, roast beef, or chicken with either mustard or mayonnaise. How many different sandwich options does he have? • What is the probability of drawing a green marble, replacing it, and then drawing a red marble from a bag containing 5 green, 3 red, and 2 black marbles?
Objective 2: Formulate questions and answer the questions by organizing and analyzing data. a. Formulate questions that can be answered through data collection and analysis. b. Determine the 25th and 75th percentiles (first and third quartiles) to obtain information about the spread of data. c. Graphically summarize data of a single variable using histograms and box-and-whisker plots. d. Compute the mean and median of a numerical characteristic and relate these values to the histogram of the data. e. Use graphical representations and numerical summaries to answer questions and interpret data.	• Draw a box-and whisker graph for the table below. Then find the median and the 25th and 75th percentiles. Use the graph and the statistics to describe the spread of the data.

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State	Number of Electoral Votes
Alabama	9
Arkansas	6
Florida	25
Georgia	13
Kentucky	8
Louisiana	9
Mississippi	7
North Carolina	14
South Carolina	8
Tennessee	11
Virginia	13
West Virginia	5