

Teaching Unit: **Geometry**

Essential Understandings

1. Geometric structures and shapes, their characteristics and relationships are useful in representing and solving questions of mathematics and design in real world problems and situations.
2. Geometry utilizes a specific vocabulary that classifies and identifies structures and shapes by characteristics and relationships.
3. Polygons are classified by number and measure of sides and angles.
4. Specific tools of measurement are used to construct shapes both simple and complex.
5. The Pythagorean Theorem is used to solve problems involving right triangles.
6. The longest side of a triangle is opposite the largest angle.
7. In a triangle, the measure of an angle and the lengths of adjacent sides determine the length of the side opposite the angle.
8. Congruent figures are determined by their equal lengths and angles.
9. Congruence and similarity do not depend on the position of the triangle.
10. Congruence and similarity have applications to a number of areas such as architecture, art and the sciences.
11. Congruent figures are similar, but similar figures are not necessarily congruent.
12. Two-dimensional drawings / blueprints using appropriate tools can be used to solve real-life situations.
13. Shapes can have different types of symmetry.

Sub Topic: **Lines, Angles and Polygons**

Knowledge and Skills

- Define and use terms - angles (acute, right, obtuse, straight, vertical, adjacent, complementary, supplementary), perpendicular and parallel lines, transversal (alternate interior, alternate exterior and corresponding angles), triangles (acute, obtuse, right, scalene, isosceles and equilateral), quadrilateral, trapezoid, parallelogram, rectangle, rhombus, square, line symmetry, line of symmetry, rotational symmetry, angle of rotation, reflection, line of reflection, transformation, translation, rotation and center of rotation.
- Find missing angles in triangles and quadrilaterals and classify them by their angles and sides.
- Identify and draw two-dimensional figures.
- Identify congruent polygons making sure that all corresponding angles and sides are congruent..
- Identify line symmetry and rotational symmetry.
- Recognize, create and graph reflections, translations, and rotations on a coordinate plane.
- Review the informal experiences with geometry from the elementary grades and develop a solid foundation for the exploration of geometry at a higher level.
- Learn geometric relationships by visualizing, comparing, constructing, measuring, transforming and classifying geometric figures.
- Classify Triangles by their angle measures and number of congruent sides.
- Define and use terms - perfect square, square root, radical sign, principal square root, irrational number, non-terminating decimal, real number, right triangle, legs, hypotenuse, Pythagorean Theorem and converse, Pythagorean Triple, coordinate plane, origin, y-axis, x-axis, quadrants, ordered pair, x-coordinate or abscissa, y-coordinate or ordinate
- Given the length of two sides of a right triangle use the Pythagorean Theorem to find the length of the 3rd side.
- Use the Pythagorean Theorem and solve problems using it.
- Find the distance between points on a coordinate plane using unit distance of vertical and horizontal lines and unit distance of diagonal lines using the Pythagorean Theorem.
- Solve for missing lengths in special right triangles of 30° , 60° , 90° or 45° , 45° , 90° .

14. Shapes can be plotted on a coordinate plane.

Finding missing angles in triangles and quadrilaterals and classify them by their angles and sides.

Teaching Unit: ***Algebra***

Essential Understandings

1. Algebra is a tool for describing and representing patterns and relationships.
2. There are a number of different ways to evaluate the value of a numerical expression or solve an algebraic equation.
3. The square root of a perfect square is an integer, and the square root of a non-perfect square lies between two consecutive integers.
4. The inverse of squaring a number is a square root.
5. A set of data can be characterized by patterns, and algebra is a tool for describing those patterns, generalizations or relationships between numbers.
6. Algebraic expressions are evaluated by replacing the variables with numbers and using the order of operations to simplify the parts of the expressions.
7. Equations and inequalities, where the equal or inequality sign indicates that the value on the left and right side of the sign have the same value, requires that any operation done to one side must also be done to the other.
8. Equations may be solved in a variety of ways: concrete, pictorial, graph or symbolic representations.
9. When both sides of an inequality are multiplied or divided by a negative number, the inequality sign reverses.

Sub Topic: ***Integers, Expressions & 1 Step***

Knowledge and Skills

Define and use terms: variable, term, coefficient, positive and negative exponents, square root, algebraic and numerical expressions, evaluate, order of operations, powers, equation, inequality, domain (whole numbers, integers, rational numbers, real numbers), open sentence, property, counterexample, integer, coordinate, absolute value, opposites, additive inverse, rational numbers, terminating and non-terminating decimal, repeating decimal, bar notation, greatest common factor, multiplicative inverse, reciprocal, like and unlike fractions, least common denominator, base, power and scientific notation.

Recognition of integers and write integers for real life situations. Recognize integer use in real life situations (ie. temperature, banking, sports, etc).

Compare and order integers.

Graph integers on a number line and perform operations of adding and subtracting. Graph integers on a number line, horizontal or vertical, and use to determine absolute values and demonstrate addition or subtraction.

Use all four operations with integers

Simplify expressions with integers and absolute values.

Define a variable and write algebraic expressions and equations from verbal phrases and sentences.

Solve and check one step equations.

Extend knowledge of patterns through life experiences by describing functional relationships.

Solve equations by using concrete material.

Demonstrate an understanding of all four operations with integers.

Evaluate expressions and identify properties. Write algebraic expressions and equations from verbal phrases and sentences.

Solve equations using the Subtraction and Addition Properties of Equality.

Solve equations by using the Division and Multiplication Properties of Equality.

Solve one and two-step inequalities with one variable.

Use numbers in a variety of equivalent and interchangeable forms (e.g., integer, fraction, decimal, percent, exponential and scientific notation) in problem-solving.

Compare and order rational numbers.

Teaching Unit: **Geometry**

Essential Understandings

1. Geometric structures and shapes, their characteristics and relationships are useful in representing and solving questions of mathematics and design in real world problems and situations.
2. Three-dimensional figures are found in everyday life.
3. Modeling three-dimensional figures can be applied to design for everyday products and structures.
4. The sum of the areas of all faces equals the surface area of a figure.
5. The volume of a three-dimensional figure is the number of unit cubes that would fill the figure.
6. A change in a dimension of a figure results in a predictable change in its area or volume.
7. The precision of a measurement is the exactness to which the measurement is made.
8. Precision depends upon the smallest unit of measure being used, or the precision unit; and a measurement is accurate to the nearest precision unit.

Sub Topic: **Perimeters, Areas and Volumes**

Knowledge and Skills

Define and use terms - base, altitude, circle, center, radius, diameter, circumference, pi, complex figures, plane, solid, polyhedron, edge, face, vertex, prism, pyramid, volume, cylinder, complex solid, cone, surface area, lateral face, slant height, lateral area, precision and significant digits.

Find the areas of parallelograms, triangles, trapezoids and complex figures.

Identify and draw three-dimensional figures.

Find the volumes and surface areas of pyramids and cones.

Analyze measurement.

Apply understanding of perimeter and area from the elementary grades to build conceptual understanding of the surface area and volume of prisms, cylinders, pyramids and cones.

Find the areas of parallelograms, triangles and trapezoids.

Find the circumference and area of circles.

Find the areas of complex figures.

Find the volumes of prisms, cylinders, pyramids and cones.

Represent three-dimensional figures as nets, and recognize that there may be multiple nets for the same figure.

Find the surface areas of prisms, cylinders, pyramids and cones.

Analyze measurement by understanding precision and significant digits.

Solve problem and complete projects using geometry.

Teaching Unit: ***Algebra***

Essential Understandings

1. Real life problems may include those related to economics, sports, science, social sciences, transportation, health, etc. (ex. amount of pay check per month, the discount price on a product, temperature, simple interest, sales tax, installment purchases, etc.)
2. A percent is a special ration in which the denominator is 100.
3. A discount is a percentage of the original price. The discount price is the original price minus the discount.
4. A proportion is a statement of equality between two ratios.
5. Proportional situations are based on multiplicative relationships. Equal ratios result from multiplication or division, not from addition or subtraction.
6. The probability of an event occurring is the ratio of the desired outcomes to the total number of possible outcomes.
7. Choices that involve chance are based on an understanding of the reasonableness of obtaining a specific outcome.
8. The probability that an event is likely to occur is close to one.
9. The probability that an event is not likely to occur is close to zero.
10. The probability that an event is likely to occur as it is not to occur is close to one-half.
11. Knowledge of probability can be used to determine the likelihood of winning such events as a prize through a raffle or lottery ticket, earning a high score in a dart game or winning a card game.

Sub Topic: ***Percent, Proportions & Probability***

Knowledge and Skills

Define and use terms - ratio, rate, unit rate, rate of change, slope, rise, run, proportion, cross products, polygon, similar, corresponding parts, congruent, scale factor, scale drawing, scale model, scale, indirect measurement and dilation.

Find ratios and rates.

Find rates of change.

Find slopes of lines on a coordinate plane.

Use proportions to solve problems.

Solve problems involving similar triangles.

Define and use terms - percent, percent proportion, part, base, compatible numbers, percent equations, percent of change, percent of increase, percent of decrease, markup, selling price, discount, interest and principle.

Write percents as fractions and decimals and vice versa.

Solve problems and compute mentally with percents.

Find and use the percent of increase and decrease.

Solve problems involving simple interest.

Define and use terms - outcome, sample space, random, simple event, probability, complimentary events, tree diagram, Find the probability of a simple event., Fundamental Counting Principle, permutation, factorial, combination, compound event, independent events, dependent events, experimental probability, theoretical probability, population, sample (unbiased, biased, simple random, stratified, convenience, voluntary response),

Find the probability of a simple event.

Find the probability of a compound event.

Find the number of permutations and combinations of objects.

Find the probability of independent and dependent events.

Predict the actions of a larger group by using a sample.

Teaching Unit: ***Statistics & Matrices***

Essential Understandings

1. Comparisons, predictions and inferences are made by examining characteristics of a data set displayed in a variety of graphical representations to draw conclusions.
2. The information displayed in different graphs may be examined to determine how data are or are not related, ascertaining differences between characteristics (comparisons), trends that suggest what new data might be like (predictions), and /or "what could happen if" (inferences).
3. Scattergrams can be used to predict trends and estimate a line of best fit.
4. Matrices are used to sort, list and organize data, such as sorting by gender the number of soccer, football, basketball and softball players in a set
5. A matrix is a rectangular array of numbers in rows and columns that are enclosed with brackets. A matrix organizes a data set visually.
6. A matrix is identified by its dimensions, rows and columns (ex. a 2 by 3 matrix has two rows and three columns).

Sub Topic: ***Data Analysis***

Knowledge and Skills

Define and use terms - histogram, bar graph, circle graph, line plot, line graph, measures of central tendency (mean, median, mode, range, outlier), measure of variation, lower and upper quartiles, box and whisker plot, matrix, row, column, element and dimensions.

Construct and interpret histograms and circle graphs.

Find mean, median, mode, range, and quartiles of a set of data.

Recognize which graphs to use for specific data and when graphs and statistics are misleading.

Use matrices to organize data.

Comparisons, predictions and inferences, given data sets of no more than 20 items that are displayed in frequency distributions; box-and-whisker plots; scattergrams; line, bar, circle and picture graphs; and histograms.

Describe the characteristics of a matrix, including designation labels for rows and columns.

Use a matrix of no more than 12 entries to organize and describe a data set.

Identify the position of an element by row and column.

Transfer data from a chart to a matrix.

Teaching Unit: ***Algebra***

Essential Understandings

1. A two-step equation is defined as an equation that requires the use of two different operations to solve (ex. $2x+3=-4$).
 2. A two-step inequality is defined as an inequality that requires the use of two different operations to solve (ex. $3x-4>9$).
 3. In an equation, the equal sign indicates that the value on the left is the same as the value on the right.
 4. To maintain equality, an operation that is performed on one side of an equation must be performed on the other side.
 5. The same procedures that work for equations work for inequalities. When both expressions of an inequality are multiplied or divided by a negative number, the inequality sign reverses.
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Sub Topic: ***Two Step Equations & Inequalities***

Knowledge and Skills

Define and use terms - two-step equation.

Solve two-step equations.

Solve equations with variables on each side.

Write and graph inequalities.

Solve inequalities by using the Addition, Subtraction, Multiplication or Division Properties of Inequality.

Teaching Unit: ***Algebra***

Essential Understandings

1. The domain is the possible set of all the input values for the independent variable in a given situation.
 2. The range is the possible set of all the output values for the dependent variable in a given situation.
 3. The independent variable is the input value.
 4. The dependent variable depends on the independent variable and is the output value.
 5. A relation is any set of ordered pairs. For each first member (domain), there may be many second members (range).
 6. A function is a relation in which there is one and only one second member (range) for each first member (domain).
 7. As a graph, a function is any curve (including straight lines) such that any vertical line would pass through the curve only once.
 8. As a table of values, a function has a unique value assigned to the second variable (range) for each value of the first variable (domain).
 9. Some relations are functions; all functions are relations.
 10. A linear equation is an equation in two variables whose graph is a line.
 11. Graphing a linear equation requires determining a table of ordered pairs by substituting into the equation values for one variable and solving for the other variable, plotting the ordered pairs in the coordinate plane and connecting the points to form a straight line.
 12. The axes of a coordinate plane are generally labeled x and y ; however, any letters may be used that are appropriate for the function.
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Sub Topic: ***Linear & Nonlinear Functions***

Knowledge and Skills

Define and use terms - sequence, term, arithmetic sequence, common difference, geometric sequence, common ratio, function, function table, independent and dependent variable, domain, linear function, x -intercept, y -intercept, ordered pair, slope-intercept form, scatterplot, best-fit line, system of equations, substitution, boundary and half plane.

Complete function tables.

Graph linear functions by using function tables.

Graph linear equations using the slope and y -intercept.

Graph linear equations using a graphing calculator.

Graph linear inequalities.

Define and use terms - nonlinear function, quadratic function, monomial and polynomial.

Determine whether a function is linear or nonlinear.

Graph quadratic functions.

Add and subtract polynomials.

Multiply monomials and polynomials.