Mathematics

The mathematics standards in middle school build on students' understanding of number and quantity. Students apply more formal statistics, probability, and algebra to model phenomena in the world around them. Students gain a deeper understanding of geometry and its application. Students also persevere in solving problems as they use strategies to apply their new tools and techniques.

Expectations for 6th Grade Students:

- **Number and Quantity**: Compare quantities using ratios and unit rates (such as miles per hour); fluently add, subtract, multiply, and divide fractions and decimals; understand the concept of negative numbers and absolute value; extend the number line and coordinate grids to include negative numbers.
- **Algebra and Functions**: Analyze relationships between variables using tables, graphs, and equations; solve one-variable equations and inequalities; apply the order of operations to find the value of an algebraic expression.
- **Data, Statistics, and Probability**: Create graphs including dotplots, boxplots, and histograms; describe data by examining the center (averages) and spread (variability) of a distribution.
- **Geometry**: Apply formulas for the area of triangles and quadrilaterals, including parallelograms and trapezoids; find the volume of rectangular boxes; calculate the surface area of three-dimensional figures.

Throughout 6th Grade You May Find Students:

- Finding a cyclist's speed in miles per hour by creating ratio tables, graphs, and number lines.
- Calculating a better deal (buying a gallon or four quarts of milk) using unit prices or ratios.
- Explaining the connection between latitude and longitude on a map and the horizontal and vertical axes on a coordinate grid.
- Recognizing situations involving negative numbers such as temperature, sea level, and bank account balances.
- Designing packaging by creating two-dimensional cutouts and folding them into three-dimensional boxes.
- Describing the difference between the independent and dependent variables for a phone plan.
- Collecting and using data to answer the question: how many hours does the typical sixth-grade student sleep?
- Explaining why average home prices are reported as medians instead of means.

Expectations for 7th Grade Students:

- **Number and Quantity**: Fluently add, subtract, multiply and divide with both positive and negative numbers, including fractions and decimals; solve problems involving percentages and proportions; explain operations with positive and negative numbers; change fractions to decimals and explain when a fraction will be a decimal that end or repeats; recognize and analyze proportional relationships in tables, graphs, and equations; connect ratios to the concept of slope.
- **Algebra and Functions**: Create equations and inequalities for real-life situations.
- **Data, Statistics, and Probability**: Find the probability of an event and connect probability to sampling; explore the importance of randomness when creating a sample; describe a population based on data from a random sample; compare two different populations using averages and measures of variability.
- **Geometry**: Create drawings to scale; find the measures of angles formed by the intersection of lines; explain how to tell if two triangles are congruent; explore shapes created when slicing a three-dimensional object; calculate the area and circumference of circles.

Throughout 7th Grade You May Find Students:

- Finding the wholesale price of a shirt with a 12% markup.
- Determining a 20% tip for dinner at a restaurant.
- Exploring when a $20 discount is better than a 20% discount.
- Calculating the temperature after a 7 degree drop from -15 degrees.
- Explaining why negative two multiplied by negative six equals positive twelve.
- Creating scale models of a zoo to connect the concept of scale to proportions.
- Conducting a study to determine if the average height of seventh-grade boys is different from the average height of seventh-grade girls.
- Calculating the probability of getting heads when flipping a coin or getting the sum of seven when tossing number cubes.
- Explaining the meaning of a weather forecast with a 50% chance of rain.
- Describing shapes formed when slicing a variety of fruit.
- Using the unit price of apples to determine the cost of purchasing 4 pounds of apples using either a table or graph.
- Solving a variety of equations and inequalities for "x", such as $-5x + 18 = 43$.

Expectations for 8th Grade Students:

- **Number and Quantity**: Calculate using radicals ($\sqrt{2}$, $\sqrt[3]{27}$) and exponents (7^2, 5^6); explain the difference between rational and irrational numbers and locate each on a number line.
- **Algebra and Functions**: Use scientific notation to write very large or small numbers (6.02×10^{23}); fluently solve linear equations and systems of linear equations; explain

Throughout 8th Grade You May Find Students:

- Measuring classmates' height and arm-span, and making a graph to show how height and arm-span are related.
- Solving a variety of algebra equations for "x" such as $3x + 28 = 8x - 34$.
- Using graphs and tables of data to determine if the relationship between the height of a plant and the amount it is watered each day is a function.

the meaning of a function in mathematics; distinguish between functions whose graphs are linear (make a straight line) and those which are not linear; use tables, graphs, and equations to show linear relationships; describe the meaning of the slope (steepness) and y-intercept of a linear relationship; identify if two variables have a relationship by informally examining graphs and tables.

- **Data, Statistics, and Probability**: Apply statistical techniques to compare how the change in one set of numbers relates to changes in a second set of numbers.
- **Geometry**: Calculate distances and areas using the Pythagorean Theorem; calculate the volume of cones, cylinders, and spheres; describe how rotating, stretching, shrinking, reflecting or sliding a shape impacts its shape and size; understand the difference between congruence and similarity; explain the concept of similarity and make connections between slope and similar triangles.

- Renting a truck with a flat rate of $20 and a $0.70 per mile and identifying the y-intercept as the flat fee and slope as the per-mile charge.
- Proving why the sum of the angles in a triangle is always 180 degrees.
- Comparing the steepness of stairs and ramps for a variety of buildings (rise to run).
- Calculating the height of a kite using 150 feet of string that is directly above a pool 60 feet away from where you are standing.
- Computing the shortest distance between two points.
- Finding the height of a flag pole using shadows and similar triangles.
- Comparing when the cost of a cell phone data plan is greater than, equal to, or less than the cost of another cell phone data plan.
- Explaining why 1/7 is rational but $\sqrt{2}$ is irrational.