

GRADE 8 MATHEMATICS

Performance Criteria

Overview

In 8th grade, students focus on connecting their understanding of unit rates and proportional relationships to points on a line, using linear equations and functions to represent, analyze, and solve a variety of problems, and learning about the Pythagorean Theorem and congruence and similarity of geometric shapes.

NUMBERS:

Rational and Irrational Numbers

Understand rational and irrational numbers. Know that a rational number can be written as a fraction or decimal (for example: $\frac{1}{2}$, 0.5, 2, or -2), but that an irrational number – for example, the square root of 2, or $\sqrt{2}$ – cannot be written as a fraction. When written in decimal form, an irrational number does not repeat or end.

EXPRESSIONS & EQUATIONS:

Working With Radicals

Work with radicals – mathematical expressions including square roots (symbol: $\sqrt{\quad}$), cube roots (symbol: $\sqrt[3]{\quad}$), etc.

Determine the square roots of small perfect squares – for example: $\sqrt{49} = 7$ ($7 \times 7 = 49$).

Determine the cube roots of small perfect cubes – for example: $\sqrt[3]{64} = 4$ ($4 \times 4 \times 4 = 64$).

Equations With Exponents

Solve simple equations involving exponents, including exponents with negative bases and exponents with decimal and fraction bases.

Scientific Notation

Understand scientific notation as a way of writing numbers that are too big or too small to be easily written and read in decimal form – for example, convert 7,120,000,000 (standard decimal notation) to 7.12×10^9 (scientific notation). Add, subtract, multiply, and divide with numbers expressed in scientific notation.

Proportional Relationships

Compare different proportional relationships, expressed in different forms: equations, graphs, verbal expressions, tables, etc.

Graph Proportional Relationships

Graph proportional relationships. Interpret the unit rate as the slope of the graph – how steep or flat the line is.

Slope-Intercept

Work with the slope-intercept (or y-intercept) form of linear equations (equations that make a straight line when graphed): $y = mx + b$.

- Understand that the values of x and y on the graph are the solutions of the equation, and m is the slope of the line.
- Understand slope (m) as the change in y over the change in x (called rise over run): if the x -coordinate changes by A , the y -coordinate changes by $m \times A$.

Linear Equations

Solve single-variable linear equations (both one-step and two-step).

Simultaneous Linear Equations

Solve simultaneous linear equations (linear equations involving the same set of variables). Find the point of intersection of two lines.

FUNCTIONS:

Functions as Rules

Understand functions as rules assigning to each value of x exactly one value of y (to each input exactly one output). Use functions to describe relationships between numbers (quantities) and situations where one quantity determines another. For example, $y = 2x$ is a way to express the relationship between the numbers 3 and 6, or 4 and 8, or -2 and -4.

Comparing Function Properties

Using function tables, graphs, equations, or descriptions, compare the properties of two functions. Understand that linear equations are functions.

GEOMETRY:

Congruence and Similarity

For two-dimensional figures (including lines and angles), understand and determine congruence (objects of equal size and shape) and similarity (objects of the same shape but different sizes).

The Pythagorean Theorem

Understand the Pythagorean Theorem, a relationship unique to right triangles. The Pythagorean Theorem can be expressed as an equation to determine unknown side lengths in right triangles: $a^2 + b^2 = c^2$. In a right-angled triangle, the square of the hypotenuse (the longest side of the triangle, c) is equal to the sum of the squares of the other two sides (a and b).

Distance Between Two Points

Use the Pythagorean Theorem to find the distance between two points in a coordinate system.

Pythagorean Theorem Problems

Use the Pythagorean Theorem to solve real-world and mathematical problems.

Transformations

Recognize and identify transformations of two-dimensional figures

- translations – a sliding movement of the figure in any direction.
- dilations – shrinking or expanding the figure.
- rotations – turning the figure.
- reflections – mirror images of the figure.