

# Grade 8 Mathematics

**A. NUMBER:** Students use numbers in everyday and mathematical contexts to quantify or describe phenomena, develop concepts of operations with different types of numbers, use the structure and properties of numbers with operations to *solve* problems, and perform mathematical computations. Students develop number sense related to magnitude, estimation, and the effects of mathematical operations on different types of numbers. It is expected that students use numbers flexibly, using forms of numbers that best match a situation. Students compute efficiently and *accurately*. *Estimation* should always be used when computing with numbers or solving problems.

## Whole Number

No performance indicator.

It is expected that students continue to use prior concepts and skills in new and familiar contexts.

## Rational Number

**1** Students express or *interpret* numbers using scientific notation from real-life contexts.

- a. Use positive and negative integer exponents for powers of ten.
- b. Convert between standard and scientific notation forms and compare the relative size of numbers including the *interpretation* of numbers as displayed on calculators and computers.

## Real Number

**1** Students *understand* the set of real numbers as containing the rational numbers and the irrational numbers.

- a. Know that there are real numbers that are not rational numbers.
- b. Know some common examples of irrational numbers including pi or those arising from square roots.
- c. Use square roots.
- d. Be able to *estimate* the value of the square roots of whole numbers and place them on the number line.

**B. DATA:** Students make measurements and collect, display, evaluate, analyze, and compute with data to describe or *model* phenomena and to make decisions based on data. Students compute statistics to summarize data sets and use concepts of probability to make predictions and describe the uncertainty inherent in data collection and measurement. It is expected that when working with measurements students:

- *understand* that most measurements are approximations and that taking repeated measurements reveals this variability;

- *understand* that a number without a *unit* is not a measurement, and that an appropriate *unit* must always be attached to a number to provide a measurement;
- *understand* that the *precision* and *accuracy* of a measurement depends on selecting the appropriate tools and *units*; and
- use *estimation* comparing measures to *benchmarks* appropriate to the type of measure and *units*.

## Measurement and Approximation

**1** Students *understand* and use *derived measures* (measurements expressed as rates).

- Calculate measures using multiple attributes including speed (distance per time).
- Solve* for an unknown component of a measure including finding time given average speed and distance.

**2** Students convert across measurement systems and within a system for different *units* in *derived measures*.

- Approximate metric and customary equivalents given a conversion factor.
- Convert *derived measures*, including feet per second to miles per hour.

## Data Analysis

**3** Students use the mean, median, mode, range, and quartiles to *solve* problems involving raw data and information from data displays.

## Probability

**4** Students *understand* and apply concepts of probability.

- Use appropriate terminology to describe complementary and mutually exclusive events.
- Use an *understanding* of relative frequency to make and test conjectures about results of experiments and simulations.
- Compute probabilities for compound events, using such methods as organized lists, tree diagrams, and area models.

**C. GEOMETRY:** Students use measurement and observation to describe objects based on their sizes and shapes; *model* or construct two-dimensional and three-dimensional objects; *solve* problems involving geometric properties; compute areas and volumes based on object properties and dimensions; and perform transformations on geometric figures. When making or calculating measures students use *estimation* to check the reasonableness of results.

## Geometric Figures

**1** Students know and use properties of polygons.

- Apply the triangle inequality.
- Find the sum of the measures of the interior angles of a polygon.

- c. Apply the property that the sum of the measures of the exterior angles of a polygon is 360 degrees.

**2 Students know and use angle properties of parallel lines to *solve* problems and determine geometric relationships.**

- a. Know and use properties of angles created when parallel lines are cut by a transversal.  
b. Use angle properties to determine whether lines are parallel.  
c. Know and use properties of angles created by parallel lines and transversals to determine the angle properties of trapezoids and parallelograms, and apply these properties in problem situations.

**3 Students know and use the Pythagorean Theorem.**

**Geometric Measurement**

**4 Students find the volume and surface area of prisms, pyramids, cylinders, and other figures *composed* of these solids.**

- a. Apply the *understanding* that the volume of prisms and cylinders can be found by multiplying the area of a base by the height of the solid.  
b. Apply the *understanding* that the volume of pyramids can be found by multiplying the area of a base by  $\frac{1}{3}$  the height of the solid.  
c. Apply the *understanding* that the surface area of a figure is the sum of the areas of its faces and find the surface areas of cylinders.

**Transformations**

**No performance indicator.**

Although no performance indicators are stated, students are expected to continue to use prior concepts and skills in new and familiar contexts.

**D. ALGEBRA:** Students use symbols to represent or *model* quantities, patterns, and relationships and use symbolic manipulation to *evaluate* expressions and *solve* equations. Students *solve* problems using symbols, tables, graphs, and verbal rules choosing the most effective representation and converting among representations.

**Symbols and Expressions**

**1 Students *create*, *evaluate*, and manipulate expressions.**

- a. Create and evaluate expressions using real numbers.  
b. Add and subtract linear expressions.  
c. Apply the properties of the real number system, including distributive and associative laws, to create equivalent expressions.

**Equations and Inequalities**

**2 Students *understand* and *solve* problems involving linear equations.**

- a. *Solve* any linear equation including linear equations of the form  $ax + b = cx + d$ .
- b. Recognize that, in general, linear equations have just one solution—but know also that some linear equations can have no solution and those linear equations that are identities have every value of  $x$  as a solution.
- c. Use graphs to *estimate* solutions to equations and systems of equations, check algebraic approaches, provide alternative solution paths, and communicate the solution to a problem.

### 3 Students *understand* and *solve* linear inequalities in one unknown.

- a. Represent problem situations as inequalities.
- b. *Solve* linear inequalities.
- c. *Interpret* the solutions to linear inequalities.

## Functions And Relations

### 4 Students *understand* and use the basic properties of linear relationships,

$$y = kx + b.$$

- a. *Understand* that linear relationships are characterized by a constant rate of change,  $k$ .
- b. *Understand* that the graph of a linear relationship  $y = kx + b$  is a line where the slope is  $k$  and  $b$  is the  $y$ -coordinate of the point where the graph crosses the  $y$ -axis (i.e., value of  $y$  when  $x = 0$ ).
- c. Translate common linear phenomena into symbolic statements and graphs, and interpret the slope and  $y$ -intercept of the graph of  $y = kx + b$  in terms of the original situation.