

Grade 6 Math

Understand and use negative numbers.

- Measure and compare integer temperatures in degrees, both Celsius and Fahrenheit.
- Understand that 0 is an integer that is neither negative nor positive.
- Locate negative rational numbers (including integers) on the number line; know that numbers and their negatives add to 0 and are on opposite sides and at equal distance from 0 on a number line.
- Know that the absolute value of a number is the value of the number, ignoring the sign, or is the distance of the number from 0.
- Understand integer subtraction as the inverse of integer addition. Understand integer division as the inverse of integer multiplication.
- Add and multiply integers between -10 and 10; subtract and divide integers using the related facts. Use the number line and chip models for addition and subtraction.

Multiply and divide any two fractions fluently to solve applied problems.

- Understand that a fraction or a negative fraction is a quotient of two integers, e.g., $-8/3$ is -8 divided by 3.
- Find the product of two unit fractions with small denominators using an area model.
- Solve for the unknown in equations such as: $1/4 \div _ = 1$, $3/4 \div _ = 1/4$ and $1/2 = 1 \cdot _$.
- Divide a fraction by a whole number and a whole number by a fraction, using simple unit fractions.
- Understand division of fractions as the inverse of multiplication, e.g., if $4/5 \div 2/3 = _$, then $2/3 \cdot _ = 4/5$, so $_ = 4/5 \cdot 3/2 = 12/10$.
- Given an applied situation involving dividing fractions, write a mathematical statement to represent the situation.
- Multiply and divide any two fractions fluently.

Solve applied problems that use the four operations with appropriate decimal numbers and percentages.

- Represent rational numbers as fractions or terminating decimals when possible and translate between these representations. Order rational numbers and place them on the number line.
- Multiply one- and two-digit whole numbers by decimals up to two decimal places. For applied situations, estimate the answers to calculations involving operations with rational numbers.
- Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage.
- Express fractions and decimals as percentages and vice versa.
- Calculate part of a number given the percentage and the number.
- Solve contextual problems involving percentages such as sales taxes and tips.

Use ratios and rates in problem situations.

- Express ratios in several ways given applied situations, e.g., 3 cups to 5 people, 3:5, $3/5$ cups per person; recognize and find equivalent ratios.
- Find equivalent ratios by scaling up or scaling down.
- Solve applied problems involving rates including speed, e.g., if a car is going 50 mph, how far will it go in $3 \frac{1}{2}$ hours?

Represent situations using algebraic expressions and solve simple equations.

Students have represented addition and subtraction situations using equations for many years, both with whole numbers and with fractions, equations such as $13 - _ = 7$ or $1/4 + x = 7/12$.)

- Use letters, with units, to represent quantities in a variety of contexts, e.g., y lbs., k minutes, x cookies.
- Use standard conventions for writing algebraic expressions, e.g., $2x + 1$ means “two times x, plus 1” and $2(x + 1)$ means “two times the quantity (x + 1).”
- Represent information given in words using algebraic expressions and equations.
- Distinguish between an algebraic expression and an equation.
- Simplify expressions of the first degree by combining like terms, and evaluate using specific values.
- Relate simple linear equations with integer coefficients, e.g., $3x = 8$ or $x + 5 = 10$, to particular contexts and solve.
- Understand that adding or subtracting the same number to both sides of an equation creates a new equation that has the same solution.
- Understand that multiplying or dividing both sides of an equation by the same non-zero number creates a new equation that has the same solutions.
- Solve equations of the form $ax + b = c$, e.g., $3x + 8 = 15$ by hand for positive integer coefficients less than 20, using calculators otherwise, and interpret the results.

Represent linear relationships using verbal descriptions, tables, graphs, and formulas; be able to translate among the representations.

- Plot ordered pair of integers and use ordered pairs of integers to identify points in all four quadrants of the coordinate plane.
- Understand that relationships between quantities can be suggested by graphs and tables.
- Solve problems involving linear functions whose input values are integers; write the equation; graph the resulting ordered pairs of integers, e.g., given c chairs, the “leg function” is $4c$; if you have 5 chairs, how many legs?; if you have 12 legs, how many chairs?
- Represent simple relationships between quantities using verbal descriptions, formulas or equations, tables, and graphs, e.g., perimeter-side relationship for a square, distance-time graphs, conversions such as feet to inches.

Understand and apply properties of lines, angles, and triangles.

- Use paper folding to perform basic geometric constructions of perpendicular lines, midpoints of line segments and angle bisectors; justify informally.
- Understand and apply basic properties of lines, angles, and triangles, including:
 - triangle inequality
 - relationships of vertical angles, complementary angles, supplementary angles
 - congruence of corresponding and alternate interior angles when parallel lines are cut by a transversal, and that such congruences imply parallel lines
 - locate interior and exterior angles of any triangle, and use the property that an exterior angle of a triangle is equal to the sum of the remote (opposite) interior angles
 - know that the sum of the exterior angles of a convex polygon is 360° .
- Understand that for polygons, congruence means corresponding sides and angles have equal measures.

Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides using formulas.

- Draw patterns (of faces) for a cube and rectangular prism that, when cut, will cover the solid exactly (nets).

Also in 6th grade:

- Integer exponents. Students studied the use of exponents in 5th grade for representing the prime factorization of composite numbers. They should learn about scientific notation when they study the decimal place value system. This can be their first introduction to negative exponents, to represent 0.1, 0.01, etc. This is an abstract representation with little meaning for 6th graders, and therefore not directly related to any power standard.
- Convert between basic units of measurement within a single measurement system, e.g., square inches to square feet. This is a continuation of work on units of measurement from earlier grades.
- Express probabilities as fractions, decimals or percentages between 0 and 1; know that 0 probability means an event will not occur and that probability 1 means an event will occur. Compute probabilities of events from simple experiments with equally likely outcomes, e.g., tossing dice, flipping coins, spinning spinners, by listing all possibilities and finding the fraction that meets given conditions.