

Grade 8 Math

Solve problems involving everyday arithmetic calculations, including percent increases and decreases, weighted averages, and problems involving ratio units (e.g. miles per hour, dollars per pound, etc.)

- Understand percent increase and percent decrease in both sum and product form, e.g., 3% increase of a quantity x is $x + .03x = 1.03x$.
- Solve problems involving compounded interest or multiple discounts. This is an extension of percent increase or decrease

Set up and solve applied problems involving linear inequalities, linear equations, quadratic equations, and simultaneous equations (system of equations) in two variables.

- Understand that to solve the equation $f(x) = g(x)$ means to find all values of x for which the equation is true. (A.FO.08.10) –In solving equations that result in rational numbers, students also need to understand rational numbers either terminate or eventually repeat and that calculators truncate or round repeating decimals; they need to locate rational numbers on the number line; and know fraction forms of common repeating decimals, e.g., $0.111\dots = 1/9$; $0.333\dots = 1/3$.
- Set up and solve applied problems involving simultaneous linear equations in two variables by graphing, by substitution, and by linear combination; estimate solutions using graphs; include examples with no solutions and infinitely many solutions.
- Set up and solve applied problems involving linear inequalities in one and two variables, and graph the solution sets.
- Recognize and apply the common formulas: $(a + b)^2 = a^2 + 2ab + b^2$, $(a-b)^2 = a^2 - 2ab + b^2$, $(a + b)(a - b) = a^2 - b^2$, and represent these geometrically.
- Factor simple quadratic expressions with integer coefficients; solve simple quadratic equations; verify solutions by evaluation.
- Solve applied problems involving simple quadratic equations.

Identify and represent families of functions using tables, graphs, and equations; describe how changes in one variable affect the other.

- Identify and represent linear functions, quadratic functions, and other simple functions including inversely proportional relationships; cubics; roots; and exponentials; using tables, graphs, and equations.
- For basic functions, e.g., simple quadratics, direct and indirect variation, and population growth, describe how changes in one variable affect the others.
- Recognize basic functions in problem context; e.g., area of a circle is πr^2 , volume of a sphere is $4/3\pi r^3$, and represent them using tables, graphs, and formulas.
- Relate quadratic functions in factored form and vertex form to their graphs and vice versa; in particular, note that solutions of a quadratic equation are the x -intercepts of the corresponding quadratic function.
- Graph factorable quadratic functions, finding where the graph intersects the x axis and the coordinates of the vertex; use words “parabola” and “roots”; include functions in vertex form and those with leading coefficient -1 .

Solve problems involving area of triangles, quadrilaterals and complex figures; area and circumference of circles; surface area and volume.

- Use the Pythagorean Theorem and its converse to solve applied problems including perimeter, area, and volume problems. In solving these problems, students need to 1. understand at least one proof of the Pythagorean Theorem; 2. understand the meaning of a square root of a number

and its connection to the square whose area is the number; 3. understand the meaning of a cube root and its connection to the volume of a cube; 4. estimate and solve problems with square roots and cube roots using calculators; 5. find square roots of perfect squares and approximate the square roots of non-perfect squares by locating between consecutive integers, e.g., is between 11 and 12; and 6. understand that irrational numbers are those that cannot be expressed as the quotient of two integers, and cannot be represented by terminating or repeating decimals; approximate the position of familiar irrational numbers, e.g., $\sqrt{2}$, $\sqrt{3}$, π on the number line.

- Find the distance between two points on the coordinate plane using the distance formula; recognize that the distance formula is an application of the Pythagorean Theorem.
- Understand the definition of a circle; know and use the formulas for circumference and area of a circle to solve problems.
- Find area and perimeter of complex figures by sub-dividing them into basic shapes (quadrilaterals, triangles, circles).
- Solve applied problems involving areas of triangles, quadrilaterals, and circles.
- Sketch a variety of two-dimensional representations of three dimensional solids including orthogonal views (top, front, and side), picture views (projective or isometric), and nets, use such two-dimensional representations to help solve problems.
- Know the volume formulas for generalized cylinders (bh), generalized cones and pyramids ($1/3bh$) and spheres ($4/3\pi r^3$) and apply them to solve problems.
- Understand the concept of surface area, and find the surface area of prisms, cones, spheres, pyramids, and cylinders.

Also in 8th grade:

- meanings for zero and negative integer exponents – used primarily to express scientific notation
- the vertical line test – part of the theory of functions that is addressed more completely in high school
- dilations from a point in the plane – an extension of the 7th grade power standard about similar figures and proportions
- reflective and rotational symmetries of two-dimensional shapes, and how they relate to transformations – extensions of work done in earlier grades
- measures of central tendency (mean, median, mode) that best represent a data set, e.g., salaries, home prices; justify the choice made; practices of collecting and displaying data which may bias the presentation or analysis – these are extensions of the 7th grade power standard on representing and interpreting data
- relative frequencies from a table of experimental results for a repeated event; theoretical probability; the Basic Counting Principle; the difference between independent and dependent events; and common misconceptions involving probability – these are extensions of the 6th grade power standard on probability