Alaska Mathematics

Grade 8

Adopted 2012

Standards for Mathematical Practice

1. **Make sense of problems and persevere in solving them.** MP.1
2. **Reason abstractly and quantitatively.** MP.2
3. **Construct viable arguments and critique the reasoning of others.** MP.3
4. **Model with mathematics.** MP.4
5. **Use appropriate tools strategically.** MP.5
6. **Attend to precision.** MP.6
7. **Look for and make use of structure.** MP.7
8. **Look for and express regularity in repeated reasoning.** MP.8

Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software.

1. Through experimentation, verify the properties of rotations, reflections, and translations (transformations) to figures on a coordinate plane). 8.G.1
   a. Lines are taken to lines, and line segments to line segments of the same length. 8.G.1.A
   b. Angles are taken to angles of the same measure. 8.G.1.B
   c. Parallel lines are taken to parallel lines. 8.G.1.C
2. Demonstrate understanding of congruence by applying a sequence of translations, reflections, and rotations on two-dimensional figures. Given two congruent figures, describe a sequence that exhibits the congruence between them. 8.G.2
3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 8.G.3
4. Demonstrate understanding of similarity, by applying a sequence of translations, reflections, rotations, and dilations on two-dimensional figures. Describe a sequence that exhibits the similarity between them. 8.G.4
5. Justify using informal arguments to establish facts about
the angle sum of triangles (sum of the interior angles of a triangle is 180°),
measures of exterior angles of triangles,
angles created when parallel lines are cut be a transversal (e.g., alternate interior angles), and
angle-angle criterion for similarity of triangles. 8.G.5

Understand and apply the Pythagorean Theorem.

6. Explain the Pythagorean Theorem and its converse. 8.G.6
7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. 8.G.7
8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. 8.G.8

Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

9. Identify and apply the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. 8.G.9

The Number System

Know that there are numbers that are not rational, and approximate them by rational numbers.

1. Classify real numbers as either rational (the ratio of two integers, a terminating decimal number, or a repeating decimal number) or irrational. 8.NS.1
2. Order real numbers, using approximations of irrational numbers, locating them on a number line. 8.NS.2
3. Identify or write the prime factorization of a number using exponents. (L) 8.NS.3

Expressions and Equations

Work with radicals and integer exponents.

1. Apply the properties (product, quotient, power, zero, negative exponents, and rational exponents) of integer exponents to generate equivalent numerical expressions. 8.EE.1
2. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. 8.EE.2
3. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. 8.EE.3
4. Perform operations with numbers expressed in scientific notation, including problems where both standard notation and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology. 8.EE.4

Understand the connections between proportional relationships, lines, and linear equations.

5. Graph linear equations such as $y = mx + b$, interpreting m as the slope or rate of change of the graph and b as the y-intercept or starting value. Compare two different proportional relationships represented in different ways. 8.EE.5
6. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b. 8.EE.6

Analyze and solve linear equations and pairs of simultaneous linear equations.

7. Solve linear equations in one variable. 8.EE.7
    a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). 8.EE.7.A
    b. Solve linear equations with rational coefficients, including equations whose solutions require expanding expressions using the distributive property and combining like terms. 8.EE.7.B
8. Analyze and solve systems of linear equations. 8.EE.8
    a. Show that the solution to a system of two linear equations in two variables is the intersection of the graphs of those equations because points of intersection satisfy both equations simultaneously. 8.EE.8.A
    b. Solve systems of two linear equations in two variables and estimate solutions by graphing the equations. Simple cases may be done by inspection. 8.EE.8.B
    c. Solve real-world and mathematical problems leading to two linear equations in two variables. 8.EE.8.C

Functions

Define, evaluate, and compare functions.

1. Understand that a function is a rule that assigns to each input (the domain) exactly one output (the range). The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. 8.F.1
2. Compare properties of two functions, each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). 8.F.2
3. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. 8.F.3

Use functions to model relationships between quantities.

4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. 8.F.4
5. Given a verbal description between two quantities, sketch a graph. Conversely, given a graph, describe a possible real-world example. 8.F.5

Statistics and Probability

Investigate patterns of association in bivariate data.

1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. 8.SP.1
2. Explain why straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. 8.SP.2
3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and y-intercept. 8.SP.3
4. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects and use relative frequencies to describe possible association between the two variables. 8.SP.4