South Dakota Mathematics

8th Grade

Numbers Concepts and Computations

Rational and Irrational Numbers

1. Understand that a real number is any number that can be represented on a number line. 8.NC.1
2. Classify numbers as rational or irrational and explain how both sets together form the set of real numbers 8.NC.2
3. Understand an irrational number to be a non-terminating, non-repeating decimal that cannot be expressed as a fraction of two integers (rational number). 8.NC.3
4. Compare the value of irrational numbers and locate them on a number line by finding the rational approximations. 8.NC.4

Rational Number Operations

5. Explain how the properties of integer exponents work by using patterns and reasoning to generate and justify equivalent expressions. 8.NC.5
6. Understand the root index to be the number placed above the radical symbol indicating which root to find and recognize that if the root index is not specified, it is assumed to be 2 8.NC.6
7. Understand a square root of a number to be the number that when multiplied by itself produces the original number. 8.NC.7
8. Understand the cube root of a number to be a number that when cubed produces the original number. 8.NC.8
9. 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 (up to 100) and cube roots of small perfect cubes (up to 125). 8.NC.9
10. Write numbers in scientific notation using positive and negative exponents. 8.NC.10
11. Perform operations (add, subtract, multiply, divide) with numbers in scientific notation 8.NC.11

Relationships and Functions

Proportional and Linear Relationships

1. Graph proportional relationships, interpreting the rate of change as the slope of the graph. 8.RF.1
2. Construct a function to model a linear relationship between two quantities. 8.RF.2
3. Compare two different proportional relationships represented in different ways. 8.RF.3
4. Explain how the slope m of a line is the same between any two points on a line. Types of slope include: positive, negative, zero (horizontal), and undefined (vertical) 8.RF.4

Functions

5. Define a function as a rule where each input has exactly one output. 8.RF.5
6. Understand the domain as the set of inputs allowed by the function. 8.RF.6
7. Understand the range as the set of outputs produced by the function 8.RF.7
8. Determine whether a relationship is a function given a table, graph, equation, or verbal description. 8.RF.8
9. Compare properties of two functions represented in different ways including tables, graphs, equations, and verbal descriptions. 8.RF.9
10. Determine whether a relationship is linear or nonlinear given a table, graph, equation, or verbal description. 8.RF.10
11. Understand a linear function to be a relationship between two variables with a constant rate of change whose graph is a straight line on the coordinate plane and to have the equation y = mx + b, give examples of functions that are not linear. 8.RF.11
12. Explain how the rate of change and y-intercept describe the relationship between two quantities, using multiple representations to justify interpretations. 8.RF.12
13. Explain how the rate of change (slope) and y-intercept (initial value) describe the relationship between two quantities, using multiple representations to justify interpretations 8.RF.13
14. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). 8.RF.14

Algebra

Equations and Inequalities

1. Identify linear equations in one variable with one solution, infinitely many solutions, or no solution. 8.A.1
2. Solve linear equations with rational number coefficients using the distributive property and combining like terms. 8.A.2
3. Analyze and solve one-variable linear inequalities with rational coefficients. 8.A.3

System of Equations

4. Understand a system of linear equations to be a set of two or more equations 8.A.4
5. Determine whether an ordered pair is a solution to a system of two linear equations by substituting the values into both equations and explaining why the pair satisfies both. 8.A.5
6. Analyze a system of two linear equations to determine whether it has one solution, infinitely many solutions, or no solution, and explain what each case means in terms of the graphs or equations. 8.A.6
7. Analyze and solve systems of linear equations algebraically and estimate solutions by graphing the equation. 8.A.7
8. Solve real-world and mathematical problems involving leading to two linear equations in one and/or two variables. 8.A.8

Geometry

Area, Volume, and Surface Area

1. Explain the formulas for the volumes of cones, cylinders, and spheres and apply them to solve real-world and mathematical problems. 8.G.1

Triangles and Angles

2. Understand properties of interior and exterior angles in triangles (triangle sum theorem, exterior angle theorem). 8.G.2
3. Understand and explain the relationships between angles when parallel lines are intersected by a transversal. 8.G.3

Pythagorean Theorem

4. Identify, describe, and draw elements of triangles including base, height, leg, and hypotenuse. 8.G.4
5. Explain the Pythagorean theorem and apply it to find unknown side lengths in right triangles. 8.G.5
6. Explain the converse of the Pythagorean theorem and apply it to determine if a triangle is a right triangle. 8.G.6
7. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. 8.G.7

Transformation, Similarity, and Congruency

8. Understand congruent figures to be geometric objects that have exactly the same size and shape. 8.G.8
9. Understand similar figures to be geometric objects that have the same shape (congruent angles), but different sizes (proportional) sizes. 8.G.9
10. Understand a rigid transformation to be a change in location or orientation that generates a congruent shape by preserving distances between vertices. 8.G.10
11. Identify, draw, and describe the three types of rigid transformations on two-dimensional figures: rotations, reflections, and translations. 8.G.11
12. Identify, draw, and describe mathematical dilations on, two-dimensional figures, as non-rigid transformations that generate a similar shape 8.G.12
13. Describe a sequence of rigid transformations that moves and aligns one congruent shape onto another. 8.G.13
14. Understand and explain the angle-angle criterion for determining the similarity of triangles. 8.G.14

Statistics and Probability

Bivariate Data

1. Construct and interpret scatter plots using bivariate data; determine if the data displays a linear or nonlinear pattern and describe the patterns as clustering, outliers, positive, negative, or no association. 8.SP.1
2. Construct a line of fit to approximately fit data displaying a linear association when presented in scatter plot. 8.SP.2
3. Construct and interpret a relative frequency table. 8.SP.3