Missouri Mathematics

# Grade 8

Adopted 2016

**Number Sense and Operations**

**A. Know that there are numbers that are not rational, and approximate them by rational numbers.** 8.NS.A

1. Explore the real number system. 8.NS.A.1
   a. Know the differences between rational and irrational numbers. 8.NS.A.1.A
   b. Understand that all rational numbers have a decimal expansion that terminates or repeats. 8.NS.A.1.B
   c. Convert decimals which repeat into fractions and fractions into repeating decimals. 8.NS.A.1.C
   d. Generate equivalent representations of rational numbers. 8.NS.A.1.D
2. Estimate the value and compare the size of irrational numbers and approximate their locations on a number line. 8.NS.A.2

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**Expressions, Equations and Inequalities**

**A. Work with radicals and integer exponents.** 8.EEI.A

1. Know and apply the properties of integer exponents to generate equivalent expressions. 8.EEI.A.1
2. Investigate concepts of square and cube roots. 8.EEI.A.2
   a. Solve equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. 8.EEI.A.2.A
   b. Evaluate square roots of perfect squares less than or equal to 625 and cube roots of perfect cubes less than or equal to 1000. 8.EEI.A.2.B
   c. Recognize that square roots of non-perfect squares are irrational. 8.EEI.A.2.C
3. Express very large and very small quantities in scientific notation and approximate how many times larger one is than the other. 8.EEI.A.3
4. Use scientific notation to solve problems. 8.EEI.A.4
   a. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. 8.EEI.A.4.A
   b. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. 8.EEI.A.4.B

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**B. Understand the connections between proportional relationships, lines and linear equations.** 8.EEI.B

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5. Graph proportional relationships. 8.EEI.B.5
    a. Interpret the unit rate as the slope of the graph. 8.EEI.B.5.A
    b. Compare two different proportional relationships. 8.EEI.B.5.B
6. Apply concepts of slope and y-intercept to graphs, equations and proportional relationships. 8.EEI.B.6
    a. Explain why the slope (m) is the same between any two distinct points on a non-vertical line in the Cartesian coordinate plane. 8.EEI.B.6.A
    b. 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.EEI.B.6.B

**C. Analyze and solve linear equations and inequalities and pairs of simultaneous linear equations.** 8.EEI.C

7. Solve linear equations and inequalities in one variable. 8.EEI.C.7
    a. Create and identify linear equations with one solution, infinitely many solutions or no solutions. 8.EEI.C.7.A
    b. Solve linear equations and inequalities with rational number coefficients, including equations and inequalities whose solutions require expanding expressions using the distributive property and combining like terms. 8.EEI.C.7.B
8. Analyze and solve systems of linear equations. 8.EEI.C.8
    a. Graph systems of linear equations and recognize the intersection as the solution to the system. 8.EEI.C.8.A
    b. Explain why solution(s) to a system of two linear equations in two variables correspond to point(s) of intersection of the graphs. 8.EEI.C.8.B
    c. Explain why systems of linear equations can have one solution, no solution or infinitely many solutions. 8.EEI.C.8.C
    d. Solve systems of two linear equations. 8.EEI.C.8.D

**Geometry and Measurement**

**A. Understand congruence and similarity using physical models, transparencies or geometry software.** 8.GM.A

1. Verify experimentally the congruence properties of rigid transformations. 8.GM.A.1
    a. Verify that angle measure, betweeness, collinearity and distance are preserved under rigid transformations. 8.GM.A.1.A
    b. Investigate if orientation is preserved under rigid transformations. 8.GM.A.1.B
2. Understand that two-dimensional figures are congruent if a series of rigid transformations can be performed to map the preimage to the image. 8.GM.A.2
    a. Describe a possible sequence of rigid transformations between two congruent figures. 8.GM.A.2.A
3. Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates. 8.GM.A.3

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4. Understand that two-dimensional figures are similar if a series of transformations (rotations, reflections, translations and dilations) can be performed to map the pre-image to the image. 8.GM.A.4
    a. Describe a possible sequence of transformations between two similar figures. 8.GM.A.4.A
5. Explore angle relationships and establish informal arguments. 8.GM.A.5
    a. Derive the sum of the interior angles of a triangle. 8.GM.A.5.A
    b. Explore the relationship between the interior and exterior angles of a triangle. 8.GM.A.5.B
    c. Construct and explore the angles created when parallel lines are cut by a transversal. 8.GM.A.5.C
    d. Use the properties of similar figures to solve problems. 8.GM.A.5.D

**B. Understand and apply the Pythagorean Theorem.** 8.GM.B

6. Use models to demonstrate a proof of the Pythagorean Theorem and its converse. 8.GM.B.6
7. Use the Pythagorean Theorem to determine unknown side lengths in right triangles in problems in two-and three-dimensional contexts. 8.GM.B.7
8. Use the Pythagorean Theorem to find the distance between points in a Cartesian coordinate system. 8.GM.B.8

**C. Solve problems involving volume of cones, pyramids and spheres.** 8.GM.C

9. Solve problems involving surface area and volume. 8.GM.C.9
    a. Understand the concept of surface area and find surface area of pyramids. 8.GM.C.9.A
    b. Understand the concepts of volume and find the volume of pyramids, cones and spheres. 8.GM.C.9.B

**Data Analysis, Statistics and Probability**

**A. Investigate patterns of association in bivariate data.** 8.DSP.A

1. Construct and interpret scatter plots of bivariate measurement data to investigate patterns of association between two quantities. 8.DSP.A.1
2. Generate and use a trend line for bivariate data, and informally assess the fit of the line. 8.DSP.A.2
3. Interpret the parameters of a linear model of bivariate measurement data to solve problems. 8.DSP.A.3
4. Understand the patterns of association in bivariate categorical data displayed in a two-way table. 8.DSP.A.4
    a. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. 8.DSP.A.4.A
    b. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. 8.DSP.A.4.B

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## Functions

**A. Define, evaluate and compare functions.** 8.F.A

1. Explore the concept of functions. 8.F.A.1
   a. Understand that a function assigns to each input exactly one output. 8.F.A.1.A
   b. Determine if a relation is a function. 8.F.A.1.B
   c. Graph a function. 8.F.A.1.C
2. Compare characteristics of two functions each represented in a different way. 8.F.A.2
3. Investigate the differences between linear and nonlinear functions. 8.F.A.3
   a. Interpret the equation y = mx + b as defining a linear function, whose parameters are the slope (m) and the y-intercept (b). 8.F.A.3.A
   b. Recognize that the graph of a linear function has a constant rate of change. 8.F.A.3.B
   c. Give examples of nonlinear functions. 8.F.A.3.C

**B. Use functions to model relationships between quantities.** 8.F.B

4. Use functions to model linear relationships between quantities. 8.F.B.4
   a. Explain the parameters of a linear function based on the context of a problem. 8.F.B.4.A
   b. Determine the parameters of a linear function. 8.F.B.4.B
   c. Determine the x-intercept of a linear function. 8.F.B.4.C
5. Describe the functional relationship between two quantities from a graph or a verbal description. 8.F.B.5