Washington Mathematics

Grade 8

Standards for Mathematical Practice

1 **Make sense of problems and persevere in solving them.** 1

2 **Reason abstractly and quantitatively.** 2

3 **Construct viable arguments and critique the reasoning of others.** 3

4 **Model with mathematics.** 4

5 **Use appropriate tools strategically.** 5

6 **Attend to precision.** 6

7 **Look for and make use of structure.** 7

8 **Look for and express regularity in repeated reasoning.** 8

The Number System

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

1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers flexibly, efficiently, and accurately show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. 8.NS.A.1

2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g. π2). 8.NS.A.2

Expressions and Equations

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

1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. 8.EE.A.1

2 Use square roots and cube roots where p is a positive rational number. Use square root symbols to represent solutions to equations of the form x2 = p. Evaluate square roots of small perfect squares. Use cube root symbols to represent solutions to equations of the form x3 = p and evaluate cube roots of small perfect cubes. Know that √2 is irrational. 8.EE.A.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.A.3

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4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. 8.EE.A.4

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

5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. 8.EE.B.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.B.6

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

7 Flexibly, efficiently, and accurately solve linear equations in one variable with one solution, infinitely many solutions, or no solutions and solve linear equations with rational number coefficients where solution paths may require using the distributive property and combining like terms. 8.EE.C.7

8 Analyze and flexibly, efficiently, and accurately solve pairs of simultaneous linear equations, understanding the solution to a system of linear equations is the point of intersection, solve systems of linear equations using a variety of strategies (algebraically, graphically, numerically in tables, verbally, etc.) in mathematical problems and real world contexts. 8.EE.C.8

Functions

A Apply and extend previous understandings of arithmetic to algebraic expressions.

1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. 8.F.A.1

2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). 8.F.A.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.A.3

B 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.B.4

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5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. 8.F.B.5

Geometry

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

1 Verify experimentally the properties of rotations, reflections, and translations. 8.G.A.1

2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. 8.G.A.2

3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. 8.G.A.3

4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar twodimensional figures, describe a sequence that exhibits the similarity between them. 8.G.A.4

5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. 8.G.A.5

B Understand and apply the Pythagorean Theorem.

6 Flexibly, efficiently, and accurately explain a proof of the Pythagorean Theorem and its converse. 8.G.B.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.B.7

8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. 8.G.B.8

C Solve real-world and mathematical problems involving area, surface area, and volume.

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

Statistics and Probability

A 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.A.1

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2 Know that 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.A.2

3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. 8.SP.A.3

4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. 8.SP.A.4

Data Science

Formulate statistical investigative questions.

1 Formulate statistical investigative questions to articulate research topics and uncover patterns of association seen in bivariate categorical data, that multiple investigative questions may exist for a research topic and must take into account context. 8.DS.1

Collect data/ consider data.

2 Understand how to interrogate the data to determine how the data were collected, from whom they were collected, what types of variables are in the data, how the variables were measured, and possible outcomes for the variables. 8.DS.2

Analyze the data.

3 Create data visualizations about a data set. Organize and present the data in appropriate ways, including in tables and scatter plots, and incorporate other relevant information that helps to tell a story and support a claim about the data. 8.DS.3

Interpret results.

4 Generalize beyond the sample providing statistical evidence for the conclusion, being sure to address limitations of the sample, evidenced in the data. Consider the reasonableness of the results. 8.DS.4