## 2021 - 2022, Eighth Grade, Mathematics

The following Practice Standards and Literacy Skills will be used throughout the course:

Standards for Mathematical Practice

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

Literacy Skills for Mathematical Proficiency

1. Use multiple reading strategies.
2. Understand and use correct mathematical vocabulary.
3. Discuss and articulate mathematical ideas.
4. Write mathematical arguments.

## Quarter 1

| Standards | Evidence of Learning Statements from Instructional Focus Document |
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| **8.NS.A.1** Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually or terminates and convert a decimal expansion which repeats eventually or terminates into a rational number. | Explain how irrational numbers differ from rational numbers.<br><br>Determine when the decimal expansion of a fraction will terminate or repeat.<br><br>Show that the decimal expansion of rational numbers eventually repeats or terminates. |
| **8.EE.A.1** Know and apply the properties of integer exponents to generate equivalent numerical expressions.<br><br>*For example,* $3^2 \times 3^{-5} = 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$. | Use properties of integer exponents to generate equivalent numerical expressions (e.g., product rule, quotient rule, power rule, power of a product rule, zero exponent rule, and negative exponent rule).<br><br>Rewrite numerical expressions with fractional bases raised to a power. |
| **8.EE.A.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.<br><br>*For example, estimate the population of the United States as 3 x* $10^8$ *and the population of the world as 7 x* $10^9$*, and determine that the world population is more than 20 times larger.* | Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities.<br><br>Indicate how many times larger one number represented in scientific notation is than a second number also expressed in scientific notation. |

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| **8.EE.A.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. | Choose units of appropriate size expressed in scientific notation to represent measurements of very large or very small quantities.<br><br>Perform operations with numbers expressed in scientific notation including problems where both decimal and scientific notation are used. |
| **8.NS.A.2** Use rational approximations of irrational numbers to compare the size of irrational numbers locating them approximately on a number line diagram. Estimate the value of irrational expressions such as $\pi^2$.<br><br>*For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.* | Estimate the value of irrational numbers using rational approximations.<br><br>Compare real numbers using the number line.<br><br>Plot real numbers on the number line using their estimated values.<br><br>Order real numbers using the number line.<br><br>Make comparative statements about the size of irrational numbers.<br><br>Estimate the value of irrational expressions. |
| **8.EE.A.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. | Identify the square root of a non-perfect square as irrational.<br><br>Identify the cube root of a non-perfect cube as irrational.<br><br>Evaluate square roots of small perfect square numbers.<br><br>Evaluate cube roots of small, perfect cube numbers.<br><br>Solve equations that require finding the square root of a number of the form, $x^2 = p$, where $p$ is a positive rational small perfect square number.<br><br>Solve equations that require finding the cube root of a number of the form, $x^3 = p$, where $p$ is a positive rational small perfect cube number. |

## Quarter 2

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| **8.EE.C.7** Solve linear equations in one variable.<br><br>**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).<br><br>**b.** Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. | Give examples of linear equations in one variable having one solution, infinitely many solutions, or no solution.<br><br>Solve linear equations with rational coefficients whose solutions require expanding expressions using the distributive property and collecting like terms. |
| **8.EE.B.5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.<br><br>*For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.* | Graph a given proportional relationship<br><br>Identify the slope from a provided graph of a proportional relationship and connect it to the unit rate.<br><br>Compare two different proportional relationships represented in different ways. |
| **8.EE.B.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; know and 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.* | Give an equation in the form y = mx + b or y = mx to represent a line graphed on a coordinate plane.<br><br>Choose a representation demonstrating that the slope is the same between any two points on a line using similar triangles. |
| **8.EE.C.8** Analyze and solve systems of two linear equations.<br><br>**a.** Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. | Analyze a system of linear equations to determine if there is one solution, no solution or infinitely many solutions.<br><br>Write pairs of simultaneous equations to represent a real-world problem.<br><br>Solve a system of linear equations graphically. |

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| **b.** Solve systems of two linear equations in two variables algebraically and estimate solutions by graphing the equations. Solve simple cases by inspection.<br><br>*For example, 3x+2y=5 and 3x+2y=6 have no solution because 3x+2y cannot simultaneously be 5 and 6.*<br><br>**c.** Solve real-world and mathematical problems leading to two linear equations in two variables.<br><br>*For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.* | Solve a system of linear equations algebraically.<br><br>Interpret the solution for systems of linear equations in terms of a given context.<br><br>Determine the solution to the system they represent when given two pairs of coordinates. |

## Quarter 3

| Standards | Evidence of Learning Statements from Instructional Focus Document |
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| **8.F.B.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. | Construct a function to model a linear relationship between two quantities.<br><br>Determine the rate of change and initial value of a linear function when given a table.<br><br>Determine the rate of change and initial value of a linear function when given a graph.<br><br>Determine the rate of change and initial value of a linear function when given two (x, y) values.<br><br>Interpret the rate of change and initial value of a function in terms of the situation it models. |
| **8.F.A.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. | Explain that a function is a rule that assigns to each input exactly one output and justify their thinking using a set of ordered pairs, a table of values, and a graph.<br><br>Determine that a relation is a function or not a function. |
| **8.F.A.3** Know and 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.<br><br>*For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.* | Distinguish between a linear function in the form y = mx + b and a non-linear function.<br><br>Provide examples of linear and nonlinear functions. |
| **8.F.A.2** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). | Compare properties of two functions, each represented in different ways algebraically, graphically, numerically in tables, or by verbal descriptions. |

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| *For example, given a linear function represented by a table of values and another linear function represented by an algebraic expression, determine which function has the greater rate of change.* | |
| **8.F.B.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. | Qualitatively describe the functional relationship existing between two quantities when given a linear or non-linear graph.<br><br>Sketch a graph that represents a function that has been described verbally and label the axes appropriately. |
| **8.G.A.3** 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.<br><br>*For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.* | Informally explain the triangle sum theory using three copies of a triangle.<br><br>Give informal arguments to establish facts about the angle sum of triangles.<br><br>Give informal arguments to establish facts about exterior angles of triangles.<br><br>Informally explain the relationship of angles created by parallel lines cut by a transversal.<br><br>Apply transformations to informally generate arguments for similarity of triangles.<br><br>Justify missing interior and exterior angle measures of a triangle using facts about angle relationships. |
| **8.G.B.4** Explain a proof of the Pythagorean Theorem and its converse. | Use a model to explain the Pythagorean Theorem.<br><br>Justify a triangle as a right triangle using the converse of the Pythagorean Theorem. |
| **8.G.B.5** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. | Apply the Pythagorean Theorem to solve real-world or mathematical problems in two dimensions.<br><br>Apply the Pythagorean Theorem to solve real-world or mathematical problems in three-dimensions when a visual representation is provided. |
| **8.G.B.6** Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. | Find the distance between two points on a coordinate plane using the Pythagorean Theorem. |

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| | Apply the Pythagorean Theorem to right triangles on a coordinate plane. |

## Quarter 4

| Standards | Evidence of Learning Statements from Instructional Focus Document |
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| **8.G.A.1** Verify experimentally the properties of rotations, reflections, and translations:<br><br>**a.** Lines are taken to lines, and line segments to line segments of the same length.<br><br>**b.** Angles are taken to angles of the same measure.<br><br>**c.** Parallel lines are taken to parallel lines. | Transform figures on the coordinate plane using rotations, reflections, and translations.<br><br>Use the correct notation when labeling or describing a transformed figure.<br><br>Verify the transformations used when transforming one figure onto another using manipulatives or on the coordinate plane.<br><br>Verify that angle measures and lengths of line segments remain the same after translations, rotations, and reflections.<br><br>Verify that parallel lines remain parallel after translations, rotations, and reflections. |
| **8.G.A.2** Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates. | Describe how reflections affect the coordinates of any image.<br><br>Describe how the rotation affects the coordinates of an image when given a degree of rotation.<br><br>Use coordinate notation to describe the transformation when given an image and its pre-image.<br><br>Identify images that undergo translations, reflections, and/or rotations as congruent figures.<br><br>Identify images that are dilated as similar figures.<br><br>Use coordinates of figures dilated from the origin to identify the scale factor between the image and the pre-image. |

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| | Describe the effect a dilation will have on an image and its coordinates when given the scale factor. |
| **8.G.C.7** Know and understand the formulas for the volumes of cones, cylinders, and spheres, and use them to solve real-world and mathematical problems. | Apply volume formulas to solve real-world or mathematical problems involving cones, cylinders, and spheres. |
| **8.SP.A.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. | Construct scatter plots using two-variable data sets.<br><br>Describe patterns of association for two-variable data sets represented in scatter plots (ex. positive and negative correlations, clusters, outliers, gaps in data, and linear and non-linear trends).<br><br>Identify the relationship of the two quantities being represented by a scatter plot in context. |
| **8.SP.A.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. | Construct a table of values, plot points, and connect points to model linear relationships in context.<br><br>Determine which line best models the association of the data when given a scatter plot with various possible lines of fit.<br><br>Determine the accuracy of a line of fit based on the closeness of the data points to the line. |
| **8.SP.A.3** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.<br><br>*For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.* | Use a linear model to solve contextual problems.<br>Interpret the slope of a linear model in context of bivariate measurement data.<br><br>Interpret the y-intercept of a linear model in context of bivariate measurement data. |
| **8.SP.B.4** Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. Represent sample | Determine the sample space of a compound event.<br><br>Use probabilities to make decisions in real-world situations. |

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| spaces for compound events using methods such as organized lists, tables, and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event. | Recognize that the number of possible outcomes for a compound event is determined by multiplying the number of outcomes for each individual event.<br><br>Determine the probability of compound events using lists, tables, tree diagrams, and simulations.<br><br>Compare compound probabilities that are based on theoretical models with experimental probability simulations.<br><br>Express the probability of a compound event as a fraction, decimal, and/or percent. |

Embedded K-8 TN Science Standards are found in the Resource Column
FCO.6 Select and use appropriate word processing, spreadsheets, and multimedia applications.
AIT.3 Determine the best technology and appropriate tool to address a variety of tasks and problems.
AIT.4 Use multiple processes and diverse perspectives to explore alternative solutions.
AIT.8 Identify that various algorithms can achieve the same result and determine the most efficient sequence.
ISA.8 Describe the rationale for various security measures when using technology.