ARLINGTON COMMUNITY SCHOOLS

Empowered and Inspired Today… Leading Our Community Tomorrow

8th Grade Math Pacing Guide

			TN Standards	Lesson Focus	Additional Notes
			8.NS.A	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, and convert a decimal expansion, which repeats eventually into a rational number.	Write a fraction a/b as a repeating decimal by showing, filling in, or otherwise producing the steps of a long division a÷b. Write a given repeating decimal as a fraction. Example: Change 0.22222… to fraction • Let x = 0.22222… • Multiply both sides so that the repeating digits will be in front of the decimal. In this example, one digit repeats so both sides are multiplied by 10, giving $10x = 2.2222....$ • Subtract the original equation from the new equation. $10x = 2.2222....$ $-x = \underline{0.22222....}$ $9x = 2$ • Solve to get 2/9 **Resource: Holt-McDougal Course 3, Lesson 2-1** (8.NS.A.2 will not be taught until 2nd semester)

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			8.EE.A	8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form *x2 = p* and *x3 = p*, where *p* is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. 8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions.	Students recognize perfect squares and cubes, understanding that non- perfect squares and non-perfect cubes are irrational. Students recognize that squaring a number and taking the square root √ of a number are inverse operations; likewise, cubing a number and taking ∛ are inverse operations. Example: $3^2 = 9$ and $\sqrt{9} = \pm 3$ NOTE: $(-3)^2 = 9$ while $-3^2 = -9$ since the negative is not being squared. This difference should be emphasized with the students and the proper way to enter each into a calculator should be demonstrated. $(\frac{1}{4})^3 = \frac{1^3}{4^3} = \frac{1}{64}$ --- Students understand: Bases must be the same before exponents can be added, subtracted or multiplied. *Exponents are subtracted when like bases are being divided *A number raised to the zero (0) power is equal to one. *Exponents are added when like bases are being multiplied *Exponents are multiplied when an exponents is raised to an exponent *Several properties may be used to simplify an expression **Resources: Holt-McDougal Course 3, Chapter 4**
			8.EE.A	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.	For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger. Compare 8×10^7 to 4×10^5. The first number is about 200 times larger because 8 is ***two*** times as large as 4 and 10^7 is ***100*** times larger than 10^5. 2 x 100 = 200

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				Begin 8.EE.A.4 (description follows)	Which is larger? 5 x 10^7 or 3 x 10^9? 3 x 10^9 is larger because the exponent is larger **Resources: Holt-McDougal Course 3, Chapter 4**
			8.EE.A	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.	*Students convert numbers from standard form to scientific notation form and vice versa *Students ADD and SUBTRACT numbers in Scientific Notation *Students use the laws of exponents to MULTIPLY or DIVIDE numbers written in scientific notation Students understand scientific notation as generated on various calculators or other technology. Students enter scientific notation using E or EE (scientific notation), * (multiplication), and ^ (exponent) symbols. 3.25E +14 is 3.25×10^{14} and 2.6E-5 is 2.6×10^{-5} Students understand the magnitude of the number being expressed in scientific notation and choose an appropriate corresponding unit. Example: 3 x 10^8 is equivalent to 300 million, which represents a large quantity, affecting the unit chosen **Resources: Holt-McDougal Course 3, Chapter 4**
			8.EE.B	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. *For example, compare a distance-time graph to a distance time equation to determine which of two moving objects has greater speed*	Students find the slope given two points, a table of coordinate points, a graph, or a linear equation (y = mx + b). Students identify the unit rate (or slope) in graphs, tables and equations to compare two proportional relationships represented in different ways. **Resources: Holt-McDougal Course 3, Chapter 12**

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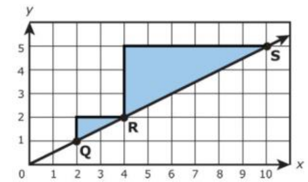
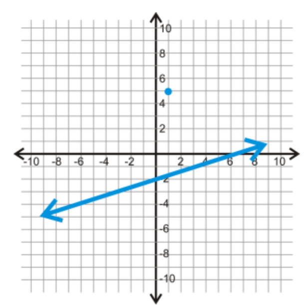
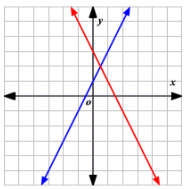
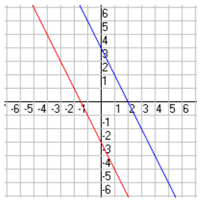
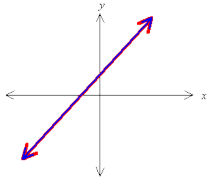
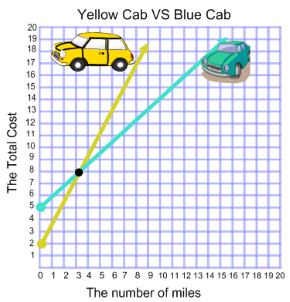
			8.EE.B	8.EE.B.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane	Triangles are similar when there is a constant rate of proportionality between them. Using a graph, students construct triangles between two points on a line and compare the sides to understand that the slope (ratio of rise to run) is the same between any two points on a line.  The triangle between Q and R has a vertical height of 1 and horizontal height of 2, resulting in a slope of ½. The triangle between R and S has a vertical height of 3 and horizontal height of 6, resulting in a slope of ½ as well, indicating that the two triangles are similar. **Resources: Holt-McDougal Course 3, Chapter 12**
			8.EE.B	8.EE.B.6, con't 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	Given an equation in slope-intercept form, students graph the line represented. Students write equations in the form $y = mx$ for lines going through the origin, recognizing that m represents the slope of the line.  Students recognize the y-intercept as −2 and the slope as 1/3, resulting in an equation of $y= \frac{1}{3}x-2$ **Resources: Holt-McDougal Course 3, Chapter 12**
			8.EE.C	8.EE.C.7 a Solve linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively	ONE Solution: Equations have one solution when the variables do not cancel out. For example, $5x - 20 = 46 - 6x$ can be solved to $x = 6$. This means that when the value of x is 6, both sides will be equal. If each side of the equation were treated as a linear equation and graphed, the solution of the equation represents the coordinates of the point where the two lines would intersect. In this

				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)	example, the ordered pair would be (6,10). 5x -20 = 46 – 6x 5(6) – 20 = 46 – 6(6) 30 – 20 = 46 – 36 10 = 10 NO Solution: Equations having no solution have variables that will cancel out and constants that are not equal. This means that there is not a value that can be substituted for *x* that will make the sides equal. -*x* + 4 – 7*x* = 10 – 8*x* *When solving for x, variable terms cancel out with result of:* 4 ≠ 10 INFINITELY MANY Solutions: Equations have infinitely many solutions when the variable terms cancel out and the resulting values on each side of the equation are the same. 6a + 4 = 10 - 6 + 6a 4 = 10 - 6 4 = 4 **Resources: Holt-McDougal Course 3, Chapters 11, 12**
				Review & Benchmark Assessment	
			District Benchmark Assessment		
			TN Standards	**Lesson Focus**	**Additional Notes**
			8.EE.C	8.EE.C.7 b Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	½ x + 25 = .25(x – 16) + 29.5 ½ x + 25 = .25x – 4 + 29.5 ½ x + 25 = .25x + 25.5 ¼ x = .5 x = 2 **Resources: Holt-McDougal Course 3, Chapter 11**
			8.EE.C	8.EE.C.8	Students graph a system of two linear equations, recognizing that the ordered pair for the

				Analyze and solve pairs of simultaneous linear equations. 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. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example,* *3x + 2y = 5 and 3x + 2y = 6 have no solution because* *3x + 2y* *cannot simultaneously be 5 and 6.*	point of intersection is the *x*-value that will generate the given *y*-value for both equations. Students recognize that graphed lines with one point of intersection (different slopes) will have one solution, parallel lines (same slope, different *y*-intercepts) have no solutions, and lines that are the same (same slope, same *y*-intercept) will have infinitely many solutions.    By making connections between algebraic and graphical solutions and the context of the system of linear equations, students are able to make sense of their solutions. Students need opportunities to work with equations and context that include whole number and/or decimals/fractions. Students define variables and create a system of linear equations in two variables  The above graph indicates that at 3 miles the cost is $8 for both cabs. **Resources: Holt-McDougal Course 3, Chapters 11, 12**
			8.EE.C	8.EE.C.8, con't c. Solve real- world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for*	Let m = number of miles Blue Cab cost: $5 + m Yellow Cab cost: $2 + 2m 5 + m = 2 + 2m 3 = m So at 3 miles, the cost for both cabs will be the same.

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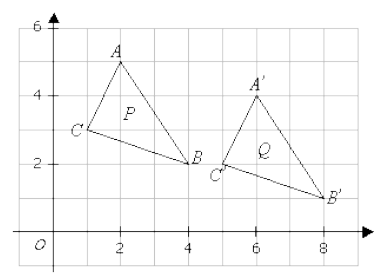
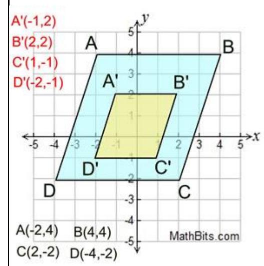
				two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.	Substituting 3 into one of the original equations indicates the cost is \$8 5 + (3)= cost \$8 = cost **Resources: Holt-McDougal Course 3, Chapter 12**
			8.G.A.	8.G.A.1 Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure. c. Parallel lines are taken to parallel lines. 8.G.A.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.	Students use compasses, protractors and rulers or technology to explore figures created from translations, reflections and rotations. Characteristics of figures, such as lengths of line segments, angle measures and parallel lines, are explored before the transformation (pre-image) and after the transformation (image). Students understand that these transformations produce images of exactly the same size and shape as the pre-image and are known as rigid transformations. 8.G.A.2 This standard is the students' introduction to congruency. Congruent figures have the same shape and size. Translations, reflections and rotations are examples of rigid transformations. A rigid transformation is one in which the pre-image and the image both have exactly the same size and shape since the measures of the corresponding angles and corresponding line segments remain equal (are congruent). Students examine two figures to determine congruency by identifying the rigid transformation(s) that produced the figures. Students recognize the symbol for congruency (≅) and write statements of congruency.  The figures at the left are congruent since the image was produced by translating each point 4 units to the right and 1 unit down.

			8.G.A.	8.G.A. 3 Describe the effect of dilations, translations, rotations, and reflections on two- dimensional figures using coordinates. 8.G.A. 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 two-dimensional figures, describe a sequence that exhibits the similarity between them.	Students identify the transformation based on given coordinates. For example, the pre-image coordinates of a triangle are A(4, 5), B(3, 7), and C(5, 7). The image coordinates are A(-4, 5), B(-3, 7), and C(-5, 7). What transformation occurred? (The coordinates indicate that the transformation is a reflection across the y-axis since the y-coordinate does not change and the x-coordinate becomes its opposite.)  The image at the left was created by dilating the original figure by ½ , since each original coordinate was multiplied by a scale factor of ½ and a similar figure was created. **Resources: Holt-McDougal Course 3, Chapter 7**
			8.G.A.	8.G.A. 4, con't	
			8.G.A.	8.G.A. 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. *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.*	Students construct various triangles and find the measures of the interior and exterior angles. Students make conjectures about the relationship between the measure of an exterior angle and the other two angles of a triangle. (the measure of an exterior angle of a triangle is equal to the sum of the measures of the other two interior angles) and the sum of the exterior angles (360o). Using these relationships, students use deductive reasoning to find the measure of missing angles. Students construct parallel lines and a transversal to examine the relationships between the created angles. Students recognize vertical angles, adjacent angles and supplementary angles and build on these relationships to identify other pairs of congruent angles. Using these relationships, students use deductive reasoning to find the measure of missing angles. **Resources: Holt-McDougal Course 3, Chapter 7**
				8.G.A.5, con't	
				Review & Benchmark Assessment	
			District Benchmark Assessment		

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8^{th} Grade Math Pacing Guide

<table>
<tr><th></th><th></th><th></th><th>TN Standards</th><th>Lesson Focus</th><th>Additional Notes</th></tr>
<tr>
<td>TNReady Part I Testing Window
February 8 - March 4</td>
<td></td>
<td></td>
<td>8.F.A.</td>
<td>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.1

1Function notation is not required in Grade 8.

8.F.A.2

Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).</td>
<td>
Function
<table>
<tr><th>X</th><th>Y</th></tr>
<tr><td>1</td><td>2</td></tr>
<tr><td>2</td><td>4</td></tr>
<tr><td>3</td><td>6</td></tr>
<tr><td>4</td><td>8</td></tr>
<tr><td>5</td><td>10</td></tr>
<tr><td>6</td><td>12</td></tr>
</table>
Not a Function
<table>
<tr><th>X</th><th>Y</th></tr>
<tr><td>1</td><td>2</td></tr>
<tr><td>2</td><td>4</td></tr>
<tr><td>1</td><td>5</td></tr>
<tr><td>3</td><td>8</td></tr>
<tr><td>4</td><td>4</td></tr>
<tr><td>5</td><td>10</td></tr>
</table>
The table at the right is not a function because it is impossible to input ‘1’ into a function, and get two different output results (2 and 5)

Compare the function table below and the algebraic function to determine which has the greater rate of change.
<table>
<tr><th>x</th><th>$f(x)$</th></tr>
<tr><td>1</td><td>5</td></tr>
<tr><td>2</td><td>8</td></tr>
<tr><td>3</td><td>11</td></tr>
<tr><td>4</td><td>14</td></tr>
</table>
Algebraic function: $y = 2x + 12$

The function table shows a rate of change of ‘3’ (change in y values over change in x values) while the algebraic function shows a rate of change of 2 (slope), so the function table has a greater rate of change.
</td>
</tr>
</table>

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			8.F.A.	8.F.A.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.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.	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. (continued below)

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.

Linear Equations: $y = 6x + 4$
$y = 5x$
$y = 6(x - 12) + 10.5$

Linear Table: the rate of change
(Δ y values over Δ x values) is consistently 3/1 or 3.

X	Y
-2	2
-1	6
0	18
1	54
2	162

+1 +1 +1 +1 ; x 3 x 3 x 3 x 3

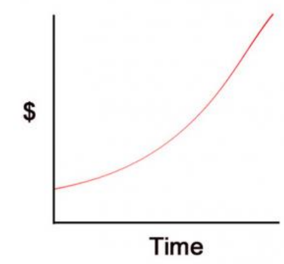
Non-linear equations: $y = 3x^4 + 2$
$A = \pi r^2$

Non-linear table: the rate of change
(Δy values over Δx values) is not consistent, so the rate of change is not consistent.

X	Y
-2	7
-1	14
0	20
1	28
2	34

+1 +1 +1 +1 ; +7 +6 +8 +6

Non-linear graph:



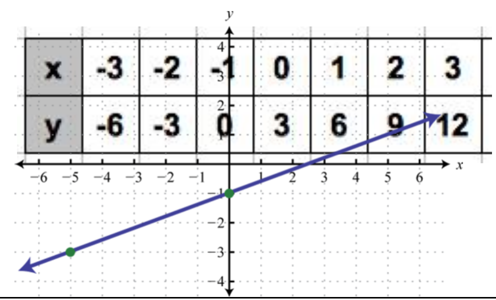
Students should be able to construct a function given:

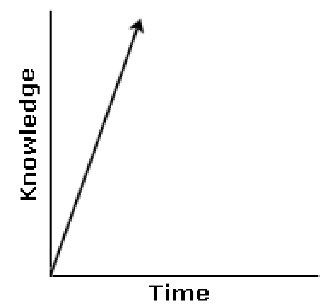
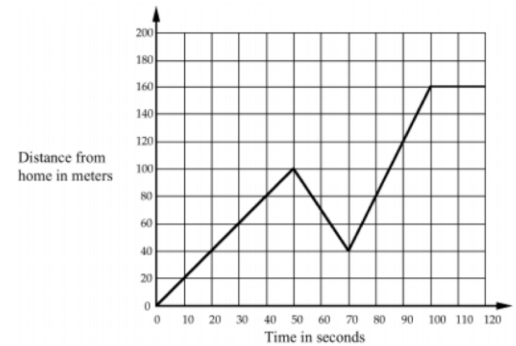
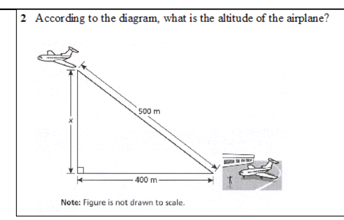
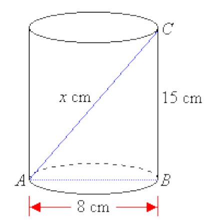
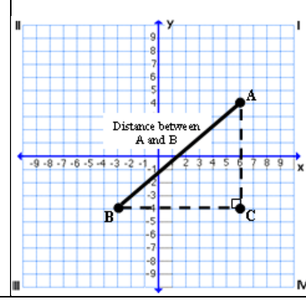
a) Two coordinate points e.g., (4,5) and (1,3)

b) A table

c) A graph

x	-3	-2	-1	0	1	2	3
y	-6	-3	0	3	6	9	12



					d) Contextual description A car rental company charges $50 a day for the car as well as a one-time $25 fee for the car's navigation system (GPS). Write an expression for the cost in dollars, *c*, as a function of the number of days, *d*, the car was rented.
				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.	  **Resources: Holt-McDougal Course 3, Chapter 3, 13**
				8.G.B.6 Explain a proof of the Pythagorean Theorem and its Converse	Using models, students explain the Pythagorean Theorem, understanding that the sum of the squares of the legs is equal to the square of the hypotenuse in a right triangle. Students also understand that given three side lengths with this relationship forms a right triangle. **Resources: Holt-McDougal Course 3, Chapter 4**
				8.G.B.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.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	  **Resources: Holt-McDougal Course 3, Chapter 4** 

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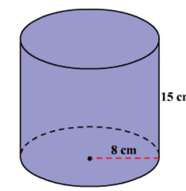
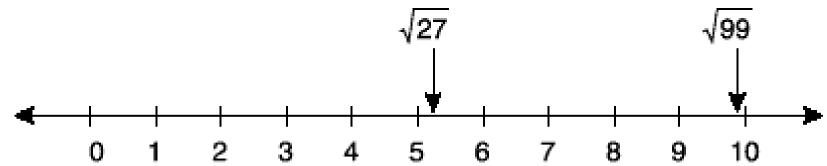
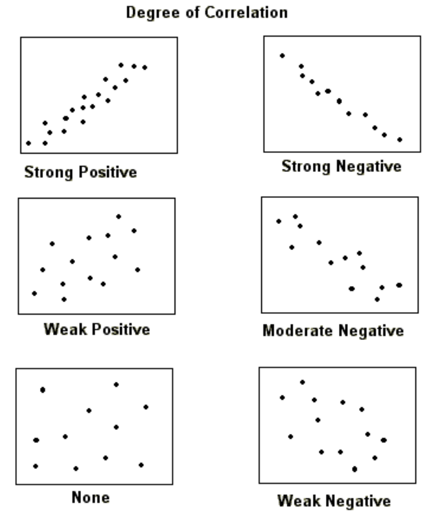
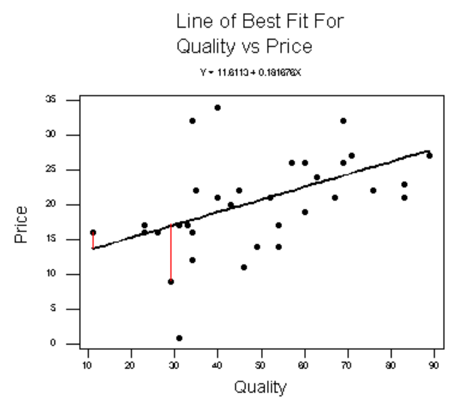
				Revisit Standards	
				8.G.C.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.	James wanted to plant pansies in his new planter. He wondered how much potting soil he should buy to fill it. Use the measurements in the diagram at the right to determine the planter's volume.  **Resources: Holt-McDougal Course 3, Chapter 8**
				8.N.S.A.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). *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.*	 $\sqrt{27}$ is a little more than 5 because $5^2 = 25$. $\sqrt{99}$ is a little less than 10 because $10^2 = 100$. Students locate rational and irrational numbers on the number line. Students compare and order rational and irrational numbers. Students also recognize that square roots may be negative and written as - √23. Find an approximation of √28 • Determine what the perfect squares 28 is between, which would be 25 and 36. • The square roots of 25 and 36 are 5 and 6 respectively, so we know that 28 is between 5 and 6. • Since 28 is closer to 25, an estimate of the square root would be closer to 5. One method to get an estimate is to divide 3 (the distance between 25 and 28) by 11 (the distance between the perfect squares of 25 and 36) to get 0.27. • The estimate of 28 would be 5.27 (the actual is 5.29). **Resources: Holt-McDougal Course 3, Chapter 4**

				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.	 **Resources: Holt-McDougal Course 3, Chapter 4**
			District Benchmark Assessment		
			TN Standards	**Lesson Focus**	**Additional Notes**
				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 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.	 *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*

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				8.S.P.A.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.	*For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*
				Revisit Standards	
				Revisit Standards	
				Standards	
					Remaining weeks of school will be used to strengthen 8th grade skills and introduce High School Algebra concepts. Topics will be determined based on student performance.

References: Tennessee Department of Education
Madison County School District

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