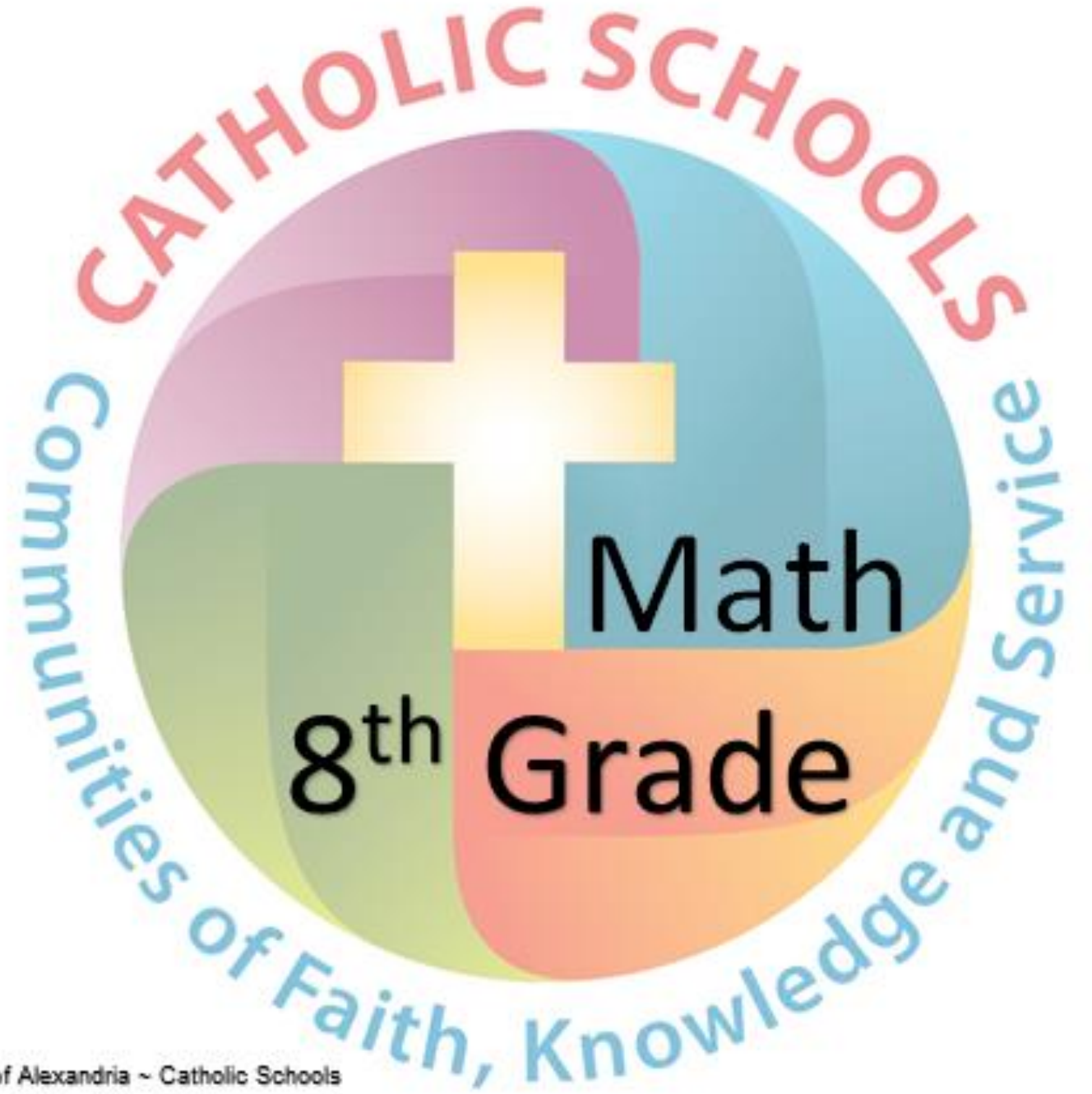

Diocese of Alexandria ~ Catholic Schools

Where faith and knowledge grow

DIOCESE OF ALEXANDRIA

As the Diocese of Alexandria seeks to provide a comprehensive learning environment, we are charged to "Teach More" by showing how all learning flows from and relates to our Creator. In this way, we will give our teaching a deeper meaning and purpose than simply the content itself. With this as our goal, the Catholic Schools Office has intertwined our selected curricular standards with the Catholic Standards developed by the Cardinal Newman Society. Through the merging of these two curricula, English Language Arts, Mathematics, Science, and Social Studies, teachers will be provided a roadmap to guide student's understanding and recognition of the relationship between learning and the connection to our God.

Thomas E. Roque, Sr.
Superintendent of Catholic Schools

DIOCESE OF ALEXANDRIA

Through comprehensive review of curricula from high performing districts throughout the United States in combination with parochial schools and Newman Cardinal Standards, the Curriculum Team for the Diocese of Alexandria has generated curricula for English Language Arts, Mathematics, Science, and Social Studies. The development of this framework is designed to guide the instructional path of teachers as they focus on the formation of their students in the areas of faith, academic excellence, responsible citizenry, and effective communication and collaboration. This process is a continuous improvement process with no defined beginning or end.

Barbara Forest, M.A..
Courtney Gistorb, M.Ed.

Denese Carter, M.Ed.
Tracy Bock, Ed.S.

Frameworks

THE DIOCESE of ALEXANDRIA

HOW TO USE

The frameworks are guides to instruction. The frameworks assist teachers in planning and pacing instruction. Specific dates or weeks that may be included in this document are for reference. Each school and teacher must consider the make-up of their students, focusing on the needs and strengths of each child when pacing and planning instruction.

The cycles for the year help pace instruction and ensure students have consistent coverage of the content. The duration (the suggested amount of time to spend on each cycle) does not accommodate for the scheduling of special events, inclement weather or school events. Teachers, with principal guidance, should adjust pacing as needed to accommodate for these events.

RESEARCH-BASED HIGH-YIELD PRACTICES FOR INSTRUCTION

These strategies have proven effective in affecting student learning and achievement gains. As you plan daily instruction, consider how and where to integrate these strategies into the instructional sequence. Effect size is in parentheses. Please refer to the works of John Hattie for a complete description of instructional effect size.

- Classroom Discussion/Discourse (.82)
- Teacher Clarity/making the learning visible with expectations for learning (.75)
- Reciprocal Teaching (.74)
- Feedback (.73)
- Metacognitive Strategies (.69)

Student focus Areas

Essential Questions
• *How does mathematics help us understand God's creation?* • *How does the use of math help us to understand the importance of clarity, reality and goodness?* • *How do we solve addition and subtraction sentences to solve real world problems with and without concrete objects?* • *What are the ethical, moral, and legal implications of Internet use?* • *How does the study of mathematics enable us to understand, communicate, and live Gospel values?*

Catholic School – Mathematic Standards (CS.GS)	
CS.M.712.GS.1	Demonstrate the mental habits of precise, determined, careful and accurate questioning, inquiry, and reasoning in pursuit of transcendent truths.
CS.M.712.GS.2	Develop lines of inquiry (as developmentally appropriate) to understand why things are true and why they are false.
CS.M.712.GS.3	Have faith in the glory and dignity of human reason as both a gift from God and a reflection of Him in whose image and likeness we are made.
CS.M.712.GS.4	Explain how mathematics in its reflection of the good, true, and beautiful reveals qualities of being and the presence of God.

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Overview

Standards for Mathematical Content	Unit Focus	Standards for Mathematical Practice for ALL Units
Unit 1 Exponents, Expressions, and Equations 8.EE.A.1 8.G.C.9 8.EE.A.3 8.EE.A.4 8.NS.A.1 8.NS.A.2 8.EE.B.5 8.EE.B.6	• Work with integer exponents • Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres • Know that there are numbers that are not rational, and approximate them by rational numbers • Understand the connections between proportional relationships, lines, and linear equations	• MP.1 Make sense of problems and persevere in solving them. • MP.2 Reason abstractly and quantitatively. • MP.3 Construct viable arguments & critique the reasoning. of others. • MP.4 Model with mathematics. • MP.5 Use appropriate tools strategically.. • MP.6 Attend to precision. • MP.7 Look for and make use of structure. • MP.8 Look for and express regularity in repeated reasoning.

Unit 1:
Suggested Open Educational Resources

8.EE.A.1 Extending the Definitions of Exponents
8.G.C.9 A Canister of Tennis Balls
8.EE.A.3 Ant and Elephant
8.EE.A.4 Giant burgers
8.NS.A.1 Converting Decimal Representations of Rational Numbers to Fraction Representations
8.NS.A.2 Irrational Numbers on the Number Line
8.EE.B.5 Who Has the Best Job?
8.EE.B.6 Slopes Between Points on a Line

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Overview

Standards for Mathematical Content	Unit Focus
Unit 2 Functions, Equations, and Solutions 8.F.A.1 8.F.A.2 8.F.A.3 8.F.B.4 8.F.B.5 8.EE.C.7 8.EE.C.8	• Define, evaluate, and compare functions • Use functions to model relationships between quantities • Analyze and solve linear equations and simultaneous linear equations

Unit 2:
Suggested Open Educational Resources

8.F.A.1 Function Rules
8.F.A.2 Battery Charging
8.F.A.3 Introduction to Linear Functions
8.F.B.4 Chicken and Steak, Variation 1
8.F.B.4 Baseball Cards
8.EE.C.7 The Sign of Solutions
8.EE.C.7 Coupon versus discount
8.EE.C.8a Intersection of Two Lines
8.EE.C.8 How Many Solutions

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Overview

Standards for Mathematical Content	Unit Focus
Unit 3 Geometry: Pythagorean Theorem, Congruence and Similarity Transformations ■ 8.EE.A.2 ◉ 8.G.C.9 ■ 8.G.B.6 ■ 8.G.B.7 ■ 8.G.B.8 ■ 8.G.A.1 ■ 8.G.A.2 ■ 8.G.A.3 ■ 8.G.A.4 ■ 8.G.A.5	• Work with radicals and integer exponents • Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres • Understand and apply the Pythagorean Theorem • Understand congruence and similarity using physical models, transparencies, or geometry software

Unit 3:
Suggested Open Educational Resources

8.G.B.6 Converse of the Pythagorean Theorem
8.G.B.7 Running on the Football Field
8.G.B.8 Finding isosceles triangles
8.G.A.1 Reflections, Rotations, and Translations
8.G.A.2 Congruent Triangles
8.G.A.3 Effects of Dilations on Length, Area, and Angles
8.G.A.4 Are They Similar
8.G.A.5 Street Intersections
8.G.A.5 Similar Triangles II
8.G.A.5 Triangle's Interior Angles

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Overview

Standards for Mathematical Content	Unit Focus
Unit 4 Statistics and Probability: Scatterplots and Association ☐ 8.SP.A.1 ☐ 8.SP.A.2 ☐ 8.SP.A.3 ☐ 8.SP.A.4 ■ 8.F.B.4 ■ 8.G.B.8 ■ 8.EE.C.8c	• Investigate patterns of association in bivariate data • Use functions to model relationships between quantities • Understand and apply the Pythagorean Theorem • Analyze and solve linear equations and simultaneous linear equations

Unit 4:
Suggested Open Educational Resources

8.SP.A.1 Texting and Grades 1
8.SP.A.2 Animal Brains
8.SP.A.3 US Airports
8.SP.A.4 What's Your Favorite Subject
8.SP.A.4 Music and Sports
8.F.B.4 Delivering the Mail
8.G.B.8 Finding the distance between points
8.EE.C.8 Kimi and Jordan

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Unit 1 Grade 8 — **1st 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
8.EE.A.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.* 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.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): • Exponents as simplified representation of repeated multiplication. Students are able to: • apply properties of exponents to numerical expressions. • generate equivalent numerical expressions using positive and negative integer exponents. • find volume of cones, cylinders and spheres using to solve real world problems. Learning Goal 1: Apply the properties of integer exponents to write equivalent numerical expressions; apply formulas to find the volume of a cone, a cylinder, or a sphere when solving real-world and mathematical problems.
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.*	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): • Very large and very small quantities can be approximated with numbers expressed in the form of a single digit times an integer power of 10. Students are able to: • estimate very large and very small quantities with numbers expressed in the form of a single digit times an integer power of 10. • compare numbers written in the form of a single digit times an integer power of 10 and express how many times as much one is than the other.

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Unit 1 Grade 8 — **1st 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
		Learning Goal 2: Estimate and express the values of very large or very small numbers with numbers expressed in the form of a single digit times an integer power of 10. Compare numbers expressed in this form, expressing how many times larger or smaller one is than the other.
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.	MP. 2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): No new concept(s) introduced Students are able to: • multiply and divide numbers expressed in scientific notation, including problems in which one number is in decimal form and one is in scientific notation. • add and subtract numbers expressed in scientific notation, including problems in which one number is in decimal form and one is in scientific notation. • use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. • interpret scientific notation that has been generated by technology (e.g. 4.1E-2 and 4.1e-2 as 4.1×10^{-2}). Learning Goal 3: Perform operations using numbers expressed in scientific notation, including problems where both decimals and scientific notation are used. In real-world problem-solving situations, choose units of appropriate size for measurement of very small and very large quantities and interpret scientific notation generated when technology has been used for calculations.

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Unit 1 Grade 8 — **1st 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
☐ 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.	MP. 2 Reason abstractly and quantitatively.	Concept(s): • Numbers that are not rational are irrational. • Every number has a decimal expansion. Students are able to: • compare decimal expansions of rational and irrational numbers. • represent a rational number with its decimal expansion, showing that it repeats eventually. • convert a decimal expansion (which repeats eventually) into a rational number. Learning Goal 4: Represent a rational number with its decimal expansion, showing that it eventually repeats, and convert such decimal expansions into rational numbers.
☐ 8.NS.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., π^2). *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.*	MP.1 Make sense of problems and persevere in solving them. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically.	Concept(s): • Rational approximation of irrational numbers Students are able to: • compare irrational numbers by replacing each with its rational approximation. • locate rational approximations on a number line. • estimate the value of expressions containing irrational numbers. Learning Goal 5: Use rational numbers to approximate irrational numbers, locate irrational numbers on a number line, and estimate the value of expressions containing irrational numbers.

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Unit 1 Grade 8 — **1st 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
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.*	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): • Quantitative relationships can be represented in different ways. Students are able to: • graph proportional relationships. • interpret unit rate as the slope of a graph. • compare two different proportional relationships that are represented indifferent ways (table of values, equation, graph, verbal description). Learning Goal 6: Graph proportional relationships, interpreting slope as unit rate, and compare two proportional relationships, each 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; 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.	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): No new concept(s) introduced Students are able to: • show, using similar triangles, and explain why the slope, m, is the same between any two distinct points on a non-vertical line. • derive, from two points, the equation $y = mx$ for a line through the origin. • derive, from two points, the equation $y = mx + b$ for a line intercepting the vertical axis at b. Learning Goal 7: Derive the equation of a line ($y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b) and use similar triangles to explain why the slope (m) is the same between any two points on a non-vertical line in the coordinate plane.

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Unit 2 Grade 8 — **2nd 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
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.	MP.2 Reason abstractly and quantitatively. MP.5 Use appropriate tools strategically.	Concept(s): • A function is a rule. • If a rule is a function, then for each input there is exactly one output. Students are able to: • use function language. • describe a function as providing a single output for each input. • determine whether non-numerical relationships are functions. • describe a function as a set of ordered pairs. • read inputs and outputs from a graph. • describe the ordered pairs as containing an input, and the corresponding output. Learning Goal 1: Define a function as a rule that assigns one output to each input and determine if data represented as a graph or in a table is a function.
8.F.A.2. Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*	MP.5 Use appropriate tools strategically. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): • Functions (quantitative relationships) can be represented in different ways. • Functions have properties; properties of linear functions. Students are able to: • analyze functions represented algebraically, as a table of values, and as a graph. • interpret functions represented by a verbal description. • given two functions, each represented in a different way, compare their properties. Learning Goal 2: Compare two functions each represented in a different way (numerically, verbally, graphically, and algebraically) and draw conclusions about their properties (rate of change and intercepts).

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THE DIOCESE of ALEXANDRIA

Unit 2 Grade 8 — **2nd 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
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. *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.*	MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning of others. MP.5 Use appropriate tools strategically.	Concept(s): • A linear function is defined by the equation $y = mx + b$. • The graph of a linear function is a straight line. Students are able to: • analyze tables of values, graphs, and equations in order to classify a function as linear or non-linear. • determine if equations presented in forms other than y = mx + b (for example 3y – 2x = 7) define a linear function. • give examples of equations that are non-linear functions. • show that a function is not linear using pairs of points. Learning Goal 3: Classify functions as linear or non-linear by analyzing equations, graphs, and tables of values; interpret the equation $y = mx + b$ as defining a linear function.
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	MP.6 Attend to precision. MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure.	Concept(s): • As with equations, two (x, y) values can be used to construct a function. Students are able to: • determine the rate of change and initial value of a function from a description of a relationship. • determine the rate of change and initial value of a function from two (x, y) values by reading from a table of values. • determine the rate of change and initial value of a function from two (x, y) values by reading these from a graph. • construct a function in order to model a linear relationship.

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
terms of the situation it models, and in terms of its graph or a table of values.		• interpret the rate of change and initial value of a linear function in context. Learning Goal 4: Model a linear relationship by constructing a function from two (x,y) values. Interpret the rate of change and initial value of the linear function in terms of the situation it models, and in terms of its graph or a table of values.
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.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically.	Concept(s): No new concept(s) introduced Students are able to: • analyze a graph. • provide qualitative descriptions of graphs (e.g. where increasing or decreasing, linear or non-linear). • given a verbal description, sketch a graph of a function based on the qualitative features described. Learning Goal 5: Sketch a graph of a function from a qualitative description and give a qualitative description of a graph of a function.
8.EE.C.7. Solve linear equations in one variable. 8EE.C.7a. 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	MP.5 Use appropriate tools strategically. MP.6 Attend to precision.	Concept(s): • Linear equations may have an infinite number of solutions. • Linear equations may have no solution or a single solution. Students are able to: • give examples of linear equations in one variable with one solution *(x = a)*, infinitely many solutions *(a = a)*, or no solutions *(a = b.)* • transform a given equation, using the properties of

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Unit 2 Grade 8 — **2nd 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
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). 8.EE.C.7b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.		equality, into simpler forms. • transform a given equation until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results *(a and b are different numbers).* • solve linear equations that have fractional coefficients; include equations requiring use of the distributive property and collecting like terms. Learning Goal 6: Apply the distributive property and collect like terms to solve linear equations in one variable that contain rational numbers as coefficients. Use an equivalent equation of the form $x = a$, $a = a$, or $a = b$ (where a and b are different numbers) to describe the number of solutions.
8.EE.C.8. Analyze and solve pairs of simultaneous linear equations. 8.EE.C.8a. 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.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.6 Attend to precision. MP.7 Look for and make use of structure.	Concept(s): • Simultaneous linear equations may have an infinite number of solutions. • Simultaneous linear equations may have no solution or a single solution. • Solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs. Students will be able to: • solve systems of two linear equations in two variables algebraically. • estimate solutions of a linear system of two equations by graphing. • solve simple cases of a linear system of two equations by inspection.

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Unit 2 Grade 8 — **2nd 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
8.EE.C.8b. 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.* 8.EE.C.8c. Solve real-world and mathematical problems leading to two linear equations in two variables. *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 real-world and mathematical problems leading to two linear equations in two variables. Learning Goal 7: Solve systems of linear equations in two variables algebraically and by inspection. Estimate solutions by graphing, explain that points of intersection satisfy both equations simultaneously, and interpret solutions in context.

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Unit 3 Grade 8 — **3rd 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
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. 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.	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): • Square root and cube roots; perfect squares and perfect cubes • Inverse relationship between powers and square roots Students are able to: • give the value of square roots of small perfect squares. • solve equations of the form $x^2 = p$, where p is a positive rational number. • use the square root symbol to represent solutions to equations of the form $x^2 = p$. • give the value of cube roots of small perfect cubes. • solve equations of the form $x^3 = p$, where p is a positive rational number. • use the cube root symbol to represent solutions to equations of the form $x^3 = p$. • show or explain that $\sqrt{2}$ is an irrational number. • use volume formulas to find a single unknown dimension of cones, cylinders and spheres when solving real world problems. Learning Goal 1: Evaluate square roots and cubic roots of small perfect squares and cubes respectively and use square 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; identify $\sqrt{2}$ as irrational. Learning Goal 2: Apply the formula for the volume of a cone, a cylinder, or a sphere to find a single unknown dimension when solving real-world and mathematical problems.

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Unit 3 Grade 8 — **3rd 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
8.G.B.6. Explain a proof of the Pythagorean Theorem and its converse.	MP.2 Reason abstractly and quantitatively.	Concept(s): • Pythagorean Theorem • If the square of one side of a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right triangle (Pythagorean theorem converse). Students are able to: • given a proof of the Pythagorean theorem, explain the proof. • given a proof of the converse of the Pythagorean theorem, explain the proof. Learning Goal 3: Explain a proof of the Pythagorean Theorem and its converse.
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.	MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure.	Concept(s): No new concept(s) introduced Students are able to: • determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving two dimensional spaces. • determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving three dimensional spaces. Learning Goal 4: Apply the Pythagorean Theorem to determine unknown side lengths of right triangles in two and three dimensional cases when solving real-world and mathematical problems.

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Unit 3 Grade 8 — **3rd 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system	MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure.	Concept(s): No new concept(s) introduced Students are able to: • determine the distance between two points in a coordinate plane by drawing a right triangle and applying the Pythagorean Theorem. Learning Goal 5: Use the Pythagorean Theorem to determine the distance between two points in the coordinate plane.
8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations: 8.G.A.1a. Lines are transformed to lines, and line segments to line segments of the same length. 8.G.A.1b. Angles are transformed to angles of the same measure. 8.G.A.1c. Parallel lines are transformed to parallel lines.	MP.3 Construct viable arguments and critique the reasoning of others. MP.5 Use appropriate tools strategically. MP.8 Look for and express regularity in repeated reasoning.	Concept(s): • A property of rigid motion transformations (rotation, reflection, and translation) is that the measure of a two-dimensional object under the transformation remains unchanged. Students are able to: • show and explain that performing rotations, reflections, and translations on lines results in a line. • show and explain that performing rotations, reflections, and translations on line segments results in a line segment and does not alter the length of the line segment. • show and explain that performing rotations, reflections, and translations on angles results in an angle and does not alter the measure of the angle. • show and explain that performing rotations, reflections, and translations on parallel lines results in parallel lines. • explain that a property of rigid motion transformations (rotation, reflection, and translation) is that the measure of a two-dimensional object under the transformation remains unchanged.

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Unit 3 Grade 8 — **3rd 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
		Learning Goal 6: Explain and model the properties of rotations, reflections, and translations with physical representations and/or geometry software using pre-images and resultant images of lines, line segments, and angles.
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.	MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure.	Concept(s): • 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. Students are able to: • given two congruent figures, describe a transformation or sequence of transformations that shows the congruence between them. Learning Goal 7: Describe and perform a sequence of rotations, reflections, and/or translations on a two dimensional figure in order to prove that two figures are congruent.
8.G.A.3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning. of others. MP.5 Use appropriate tools strategically.	Concept(s): No new concept(s) introduced Students are able to: • describe, using coordinates, the resulting two-dimensional figure after applying dilations with scale factor greater than, less than, and equal to 1. • describe, using coordinates, the resulting two-dimensional figure after applying translation, rotation, and reflection. Learning Goal 8: Use the coordinate plane to locate images or pre-images of two-dimensional figures and determine the coordinates of a resultant image after applying dilations, rotations, reflections, and translations.

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Unit 3 Grade 8 — **3rd 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
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.	MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure.	Concept(s): • 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. • Congruent figures are also similar. Students are able to: • describe a transformation or sequence of transformations that show the similarity between them given two similar two-dimensional figures. Learning Goal 9: Apply an effective sequence of transformations to determine that figures are similar when corresponding angles are congruent and corresponding sides are proportional. Write similarity statements based on such transformations.
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.*	MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments and critique the reasoning. of others.	Concept(s): No new concept(s) introduced Students are able to: • give informal arguments to establish facts about the angle sum of triangles. • give informal arguments to establish facts about exterior angles of triangles. • give informal arguments to establish facts about the angles created when parallel lines are cut by a transversal. • give informal arguments to establish the angle-angle criterion for similarity of triangles.

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THE DIOCESE of ALEXANDRIA

Unit 3 Grade 8 — **3rd 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
		Learning Goal 10: Give informal arguments to justify facts about the exterior angles of a triangle, the sum of the measures of the interior angles of a triangle, the angle-angle relationship used to determine similar triangles, and the angles created when parallel lines are cut by a transversal.

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Unit 4 Grade 8 — **4th 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
☐ 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.	MP.3 Construct viable arguments and critique the reasoning. of others. MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	Concept(s): • Association in data (bivariate measurement data) Students are able to: • construct and interpret scatter plots. • analyze patterns of association between the two quantities represented in a scatter plot. • describe clustering, outliers, positive or negative association, linear or non-linear association when explaining patterns of association in a scatter plot. Learning Goal 1: Construct and interpret scatter plots for bivariate measurement data and describe visual patterns of association (clusters, outliers, positive or negative association, linear association and nonlinear association, strong, weak, and no association).
☐ 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 (e.g. line of best fit) by judging the closeness of the data points to the line.	MP.2 Reason abstractly and quantitatively. MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	Concept(s): • Straight lines are used to model *approximately* linear relationships between quantitative variables. Students are able to: • informally fit a line (of best fit) to a scatter plot that suggests a linear association. • informally assess the model's fit by judging the closeness of the data points to the line (line of best fit). Learning Goal 2: For scatter plots that suggest a linear association, informally fit a straight line and informally assess the model's fit.

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Unit 4 Grade 8 — **4th 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
☐ 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.*	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.6 Attend to precision. MP.7 Look for and make use of structure.	Concept(s): No new concept(s) introduced Students are able to: • given the equation for a linear model (line of best fit), interpret the slope and intercept. • given the equation for a linear model, solve problems in the context of measurement data. Learning Goal 3: Use a linear model (equation) representing measurement data to solve problems, interpreting the slope and intercept in the context of the situation.
☐ 8.SP.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*	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.7 Look for and make use of structure.	Concept(s): • Categorical data: patterns of association can also be observed in bivariate categorical data through analyzing two-way tables containing frequencies or relative frequencies. Students are able to: • construct and interpret a two-way frequency table containing data on two categorical variables. • construct and interpret a two-way relative frequency table containing data on two categorical variables. • describe any association between the two categorical variables using relative frequencies calculated for rows or columns. Learning Goal 4: Construct two-way frequency tables and two-way relative frequency tables, and describe possible associations between two variables.

8th Grade - Math

THE DIOCESE of ALEXANDRIA

Unit 4 Grade 8 — **4th 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
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?		
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.	MP.2 Reason abstractly and quantitatively. MP.6 Attend to precision. MP.7 Look for and make use of structure.	Concept(s): • As with equations, two (x, y) values can be used to construct a function. Students are able to: • construct a function in order to model a linear relationship. • interpret the rate of change and initial value of a linear function in context. Learning Goal 5: Model a linear relationship by constructing a function from two (x, y) values. Interpret the rate of change and initial value of the linear function in terms of the situation it models, and in terms of its graph or a table of values.
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	MP.2 Reason abstractly and quantitatively. MP.7 Look for and make use of structure.	Concept(s): No new concept(s) introduced Students are able to: • determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems in two and three dimensions. • determine the distance between two points in a coordinate plane by applying the Pythagorean Theorem.

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Unit 4 Grade 8 — **4th 9 Weeks**

Content Standards	Suggested Standards for Mathematical Practice	Critical Knowledge & Skills
find the distance between two points in a coordinate system.		Learning Goal 6: Apply the Pythagorean Theorem to determine unknown side lengths of right triangles in two and three dimensions to solve real-world and mathematical problems and to determine the distance between two points in the coordinate plane.
8.EE.C.8. Analyze and solve pairs of simultaneous linear equations. 8.EE.C.8c. Solve real-world and mathematical problems leading to two linear equations in two variables. *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.*	MP.2 Reason abstractly and quantitatively. MP.6 Attend to precision. MP.1 Make sense of problems and persevere in solving them. MP.7 Look for and make use of structure.	Concept(s): • Simultaneous linear equations may have an infinite number of solutions. • Simultaneous linear equations may have no solution or a single solution. • Solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs. Students will be able to: • solve systems of two linear equations in two variables algebraically. • estimate solutions of a linear system of two equations by graphing. • solve simple cases of a linear system of two equations by inspection. • solve real-world and mathematical problems leading to two linear equations in two variables. Learning Goal 7: Solve real world and mathematical problems leading to two linear equations in two variables, interpreting solutions in context.

The Number System (DOA.8.NS)		
STANDARDS		**ACT Reporting Category** ***ACT Knowledge and Skills***
Know that there are numbers that are not rational, and approximate them by rational numbers.		
DOA.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. Convert a decimal expansion that repeats eventually into a rational number by analyzing repeating patterns.	**The Number System** **Justification and Explanation** **Modeling** Extending Operations Rational Number Concepts & Operations
DOA.8.NS.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. *For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations to the hundredths place.*	

Expressions and Equations (DOA.8.EE)		
STANDARDS		**ACT Reporting Category** ***ACT Knowledge and Skills***
Work with radicals and integer exponents		
DOA.8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example,* $3^2 \cdot 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.	**Expressions & Equations** **Justification and Explanation** **Modeling** Expressions Linear Equations
DOA.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.	
DOA.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* $3 \cdot 10^8$ *and the population of the world as* $7 \cdot 10^9$*, and determine that the world population is more than 20 times larger.*	
DOA.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.	
Understand the connections between proportional relationships, lines, and linear equations		
DOA.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.	**Expressions & Equations** **Justification and Explanation** **Modeling** Expressions Linear Equations
DOA.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; 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*.	

Expressions and Equations (DOA.8.EE) continued…		
STANDARDS		**ACT Reporting Category** ***ACT Knowledge and Skills***
Analyze and solve linear equations and pairs of simultaneous linear equations		
DOA.8.EE.C.7	Solve linear equations in one variable.	**Expressions & Equations** **Justification and Explanation** **Modeling** Expressions Linear Equations
DOA.8.EE.C.7a	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).	
DOA.8.EE.C.7b	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	
DOA.8.EE.C.8	Analyze and solve pairs of simultaneous linear equations.	
DOA.8.EE.C.8a	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.	
DOA.8.EE.C.8b	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.*	
DOA.8.EE.C.8c	Solve real-world and mathematical problems leading to two linear equations in two variables. *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.*	

Functions (DOA.8.F)		
STANDARDS		**ACT Reporting Category** ***ACT Knowledge and Skills***
Define, evaluate, and compare functions		
DOA.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. (Function notation is not required in this grade level.)	**Functions** **Justification and Explanation** **Modeling** Linear Functions
DOA.8.F.A.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*	
DOA.8.F.A.3	Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; categorize functions as linear or nonlinear when given equations, graphs, or tables. *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.*	
Use functions to model relationships between quantities		
DOA.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.	**Functions** **Justification and Explanation** **Modeling** Linear Functions
DOA.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.	

Geometry (DOA.8.G)

STANDARDS		ACT Reporting Category *ACT Knowledge and Skills*
Understand congruence and similarity using physical models, transparencies, or geometry software		
DOA.8.G.A.1	Verify experimentally the properties of rotations, reflections, and translations:	**Geometry** **Justification and Explanation** **Modeling** Figures and Their Properties Coordinate Plane
DOA.8.G.A.1a	Lines are taken to lines, and line segments to line segments of the same length.	
DOA.8.G.A.1b	Angles are taken to angles of the same measure.	
DOA.8.G.A.1c	Parallel lines are taken to parallel lines.	
DOA.8.G.A.2	Explain 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. (Rotations are only about the origin and reflections are only over the *y*- axis and *x*-axis in Grade 8.)	
DOA.8.G.A.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. (Rotations are only about the origin, dilations only use the origin as the center of dilation, and reflections are only over the *y*-axis and *x*-axis in Grade 8.)	
DOA.8.G.A.4	Explain 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. (Rotations are only about the origin, dilations only use the origin as the center of dilation, and reflections are only over the *y*-axis and *x*-axis in Grade 8.)	
DOA.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.*	
Understand and apply the Pythagorean Theorem		
DOA.8.G.B.6	Explain a proof of the Pythagorean Theorem and its converse using the area of squares.	**Geometry** **Justification and Explanation** **Modeling** Figures and Their Properties Coordinate Plane
DOA.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.	
DOA.8.G.B.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	
Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres		
DOA.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.	**Geometry** **Justification and Explanation** **Modeling** Figures and Their Properties Coordinate Plane

Statistics and Probability (DOA.8.SP)		
STANDARDS		**ACT Reporting Category** ***ACT Knowledge and Skills***
Investigate patterns of association in bivariate data.		
DOA.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.	**Statistics and Probability** **Justification and Explanation** **Modeling** Descriptive Statistics Inferential Statistics Probability
DOA.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.	
DOA.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.*	
DOA.8.SP.A4	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?*	