Arizona Mathematic Standards

Mathematics Curriculum Map

Eighth Grade

ARIZONA DEPARTMENT OF EDUCATION
HIGH ACADEMIC STANDARDS

Chandler Unified School District Standards

Eighth Grade – At a Glance

Curriculum Map

Semester 1 Statistics and Probability (SP) Expressions and Equations (EE-Clusters A and B) Functions (F)				Semester 2 The Number System (NS) Expressions and Equations (EE-Cluster C) Geometry (G)				
Chapter 2 Equations in One Variables	**Chapter 3 Equations in Two Variables**	**Chapter 4 Functions**	**Chapter 9 Scatter Plots, Data Analysis and Probability**	**Chapter 1 Real Numbers**	**Chapter 5 Triangles and the Pythagorean Theorem**	**Chapter 6 Transformations**	**Chapter 7 Congruence and Similarity**	**Chapter 8 Volume and Surface Area**
8.EE.7 **8.EE.7a** **8.EE.7b**	**8.EE.5** **8.EE.6** **8.EE.8a** **8.EE.8b** **8.EE.8c** **8.F.2** **8.F.3** **8.F.4** **8.F.5**	**8.F.1** **8.F.2** **8.F.3** **8.F.4** **8.F.5**	**8.SP.1** **8.SP.2** **8.SP.3** **8.SP.4** **8.SP.5**	**8.NS.1** **8.NS.2** **8.EE.1** **8.EE.2** **8.EE.3** **8.EE.4**	**8.G.5** **8.G.6** **8.G.7** **8.G.8** **8.EE.2**	**8.G.1** **8.G.1a** **8.G.1b** **8.G.1c** **8.G.3**	**8.G.1** **8.G.1a** **8.G.1b** **8.G.2** **8.G.4** **8.G.5** **8.EE.6**	**8.G.9**

Mathematical Practices

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.

All units will include the Mathematical Practices

NOTE: Mathematical standards are interwoven and should be addressed throughout the year in as many different units and tasks as possible in order to stress the natural connections that exist among mathematical topics.

Grade 8 Key: NS = The Number System, EE = Expressions and Equations, F = Functions, SP = Statistics and Probability, G = Geometry

Eighth Grade Overview

The Number System (NS)

- Understand that there are irrational numbers, and approximate them using rational numbers.

Expressions and Equations (EE)

- Work with radicals and integer exponents.
- Understand the connections between proportional relationships, lines, and linear equations.
- Analyze and solve linear equations, inequalities, and pairs of simultaneous linear equations.

Functions (F)

- Define, evaluate, and compare functions.
- Use functions to model relationships between quantities.

Geometry (G)

- Understand congruence and similarity.
- Understand and apply the Pythagorean Theorem.
- Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

Statistics and Probability (SP)

- Investigate patterns of association in bivariate data.
- Investigate chance processes and develop, use, and evaluate probability models.

Standards for Mathematical Practices (MP)

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.

Eighth Grade Content Emphasis

Eighth Grade Content Emphasis	
The Number System (NS)	
●	Understand that there are irrational numbers, and approximate them using rational numbers.
Expressions and Equations (EE)	
●	Work with radicals and integer exponents.
●	Understand the connections between proportional relationships, lines, and linear equations.
●	Analyze and solve linear equations and pairs of simultaneous linear equations.
Functions (F)	
●	Define, evaluate, and compare functions.
●	Use functions to model relationships between quantities.
Geometry (G)	
▲	Understand congruence and similarity.
▲	Understand and apply the Pythagorean Theorem.
▲	Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.
Statistics and Probability (SP)	
▲	Investigate patterns of association in bivariate data.
▲	Investigate chance processes and develop, use, and evaluate probability models.
● -Major Content ▲ -Supporting Content	
Major content (●) from the content emphasis section should account for approximately 70% of instructional time.	

Table 3. Fluency Expectations Across All Grade Levels.

Grade	Coding	Fluency Expectations
K	**K.OA.A.5**	Fluently add and subtract within 5.
1	**1.OA.C.5**	Fluently add and subtract within 10.
2	**2.OA.B.2** **2.NBT.B.5**	Fluently add and subtract within 20. By the end of 2nd grade, know from memory all sums of two one-digit numbers. Fluently add and subtract within 100.
3	**3.NBT.A.2** **3.OA.C.7**	Fluently add and subtract within 1000. Fluently multiply and divide within 100. By the end of 3rd grade, know from memory all multiplication products through 10 x 10 and division quotients when both the quotient and divisor are less than or equal to 10.
4	**4.NBT.B.4**	Fluently add and subtract multi-digit whole numbers using a standard algorithm.
5	**5.NBT.B.5**	Fluently multiply multi-digit whole numbers using a standard algorithm.
6	**6.NS.B.2** **6.NS.B.3** **6.EE.A.2**	Fluently divide multi-digit numbers using a standard algorithm. Fluently add, subtract, multiply, and divide multi-digit decimals using a standard algorithm for each operation. Write, read, and evaluate algebraic expressions.
7	**7.NS.A.1.d** **7.NS.A.2.c** **7.EE.B.4.a**	Apply properties of operations as strategies to add and subtract rational numbers. Apply properties of operations as strategies to multiply and divide rational numbers. Fluently solve one-variable equations of the form $px + q = r$ and $p(x + q) = r$
8	**8.EE.C.7**	Fluently solve linear equations and inequalities in one variable.
Algebra 1	**A1.F-IF.C.7** **A1.A-SSE.A.2**	Graph functions expressed symbolically and show key features of the graph. Use structure to identify ways to rewrite numerical and polynomial expressions.
Geometry	**G.G-SRT.B.5** **G.G-GPE.B** **G.SRT.C.8**	Use congruence and similarity criteria to prove relationships in geometric figures and solve problems utilizing a real-world context. Use coordinates to prove geometric theorems algebraically. Use trigonometric ratios (including inverse trigonometric ratios) and the Pythagorean Theorem to find unknown measurements in right triangles utilizing real-world context.
Algebra 2	**A2.A-SSE.A.2** **A2.F-BF.B** **A2.A-REI.B.4**	Use the structure of an expression to identify ways to rewrite it. Build new functions from existing functions. Fluently solve quadratic equations in one variable.

Semester 1

Chapter 2: Equations in One Variable
Essential Question(s):

- **What is equivalence?**

Topic	Arizona Mathematics Standard	Mathematical Practices	Resources
Equations with rational coefficients	8.EE.C.7a: Examples of linear equations in one variable with one solution, infinitely many solutions, or no solution. 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, or a =a, or a = b (where a and b are different numbers). 8.EE.C.7b: Solve linear equations and inequalities with rational number coefficients, including solutions that require expanding expressions using the distributive property and collecting like terms.	MP 1 MP 3 MP 4 MP 7	Glencoe Course 3: 2.1
Solve Two-Step Equations	8.EE.C.7a: Examples of linear equations in one variable with one solution, infinitely many solutions, or no solution. 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, or a =a, or a = b (where a and b are different numbers). 8.EE.C.7b: Solve linear equations and inequalities with rational number coefficients, including solutions that require expanding expressions using the distributive property and collecting like terms.	MP 1 MP 2 MP 3 MP 4	Glencoe Course 3: 2.2
Write Two-Step Equations	8.EE.C.7a: Examples of linear equations in one variable with one solution, infinitely many solutions, or no solution. 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, or a =a, or a = b (where a and b are different numbers). 8.EE.C.7b: Solve linear equations and inequalities with rational number coefficients, including solutions that require expanding expressions using the distributive property and collecting like terms.	MP 1 MP 2 MP 3 MP 4	Glencoe Course 3: 2.3

Solve Equations with Variables on Both Sides	8.EE.C.7a: Examples of linear equations in one variable with one solution, infinitely many solutions, or no solution. 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, or a =a, or a = b (where a and b are different numbers). 8.EE.C.7b: Solve linear equations and inequalities with rational number coefficients, including solutions that require expanding expressions using the distributive property and collecting like terms.	MP 1 MP 3 MP 4	Glencoe Course 3: 2.4 Inquiry Lab **Additional Resources**: CPM Course 3: 2.1.2
Solve Multi-Step Equations	8.EE.C.7a: Examples of linear equations in one variable with one solution, infinitely many solutions, or no solution. 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, or a =a, or a = b (where a and b are different numbers). 8.EE.C.7b: Solve linear equations and inequalities with rational number coefficients, including solutions that require expanding expressions using the distributive property and collecting like terms.	MP 1 MP 2 MP 3 MP 4	Glencoe Course 3: 2.5

Semester 1

Chapter 3: Equations in Two Variables
Essential Question(s):

- **Why are graphs helpful?**

Topic	Arizona Mathematics Standard	Mathematical Practices	Resources
Constant Rate of Change	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 in not linear because its graph contains the points (1,1), (2,4), and (3,9) which are not on a straight line.*	MP 1 MP 3 MP 4 MP 5	Glencoe Course 3: 3.1 and 4.7
Slope	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 1 MP 3 MP 4	Glencoe Course 3: 3.2 **Additional Resources:** CPM Course 3: 7.2.2
Equations in y=mx Form	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.* 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 (0, *b).* 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.*	MP 1 MP 3 MP 4	Glencoe Course 3: 3.3 **Additional Resources:** CPM Course 3: 4.1.4

Slope-Intercept Form	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 (0, *b).* 8.F.B.4: Given a description of a situation, generate 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 a graph. Track how the values of the two quantities change together. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph, or its table of values.	MP 1 MP 3 MP 4	Glencoe Course 3: 3.4
Slope Triangles	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 (0, *b*).	MP 1 MP 3 MP 5	Glencoe Course 3: Inquiry Lab
Graph a Line Using Intercepts	8.F.B.4: Given a description of a situation, generate 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 a graph. Track how the values of the two quantities change together. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph, or its table of values.	MP 1 MP 3 MP 4	Glencoe Course 3: 3.5
Write Linear Equations	8.F.B.4: Given a description of a situation, generate 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 a graph. Track how the values of the two quantities change together. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph, or its table of values.	MP 1 MP 2 MP 3 MP 4 MP 5 MP 7	Glencoe Course 3: 3.6 **Additional Resources:** EngageNY: Grade 8, Mod 4, Topic A

Solve Systems of Equations by Graphing	8.EE.C.8: 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 including cases of no solution and infinite number of solutions. Solve simple cases by inspection. c. Solve mathematical problems and problems in real-world context leading to two linear equations in two variables.	MP 1 MP 3 MP 4 MP 7	Glencoe Course 3: 3.7 **Additional Resources:** EngageNY: Grade 8, Mod 4, Topic B
Solve Systems of Equations Algebraically	8.EE.C.8: Analyze and solve pairs of simultaneous linear equations. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations including cases of no solution and infinite number of solutions. Solve simple cases by inspection. c. Solve mathematical problems and problems in real-world context leading to two linear equations in two variables.	MP 1 MP 3 MP 4 MP 7	Glencoe Course 3:3.8 Inquiry Lab **Additional Resources:** Robert Kaplinsky: Pay Monthly or Annually

Semester 1

Chapter 4: Functions
Essential Question(s):

- **How can you model relationships between quantities?**

Topic	Arizona Mathematics Standard	Mathematical Practices	Resources
Representing Relationships	8.F.B.4: Given a description of a situation, generate 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 a graph. Track how the values of the two quantities change together. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph, or its table of values.	MP 1 MP 3 MP 4 MP 5	Glencoe Course 3: 4.1 Additional Resources: Robert Kaplinsky: Cheeseburger Cost
Relations	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 Grade 8.)	MP 1 MP 3 MP 4 MP 7	Glencoe Course 3: 4.2
Functions	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 Grade 8.) 8.F.B.4: Given a description of a situation, generate 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 a graph. Track how the values of the two quantities change together. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph, or its table of values.	MP 1 MP 2 MP 3 MP 4	Glencoe Course 3: 4.3 **Additional Resources:** EngageNY: Grade 8, Mod 5, Topic A

Linear Functions	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 Grade 8.) 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 = s2 giving the area of a square as a function of its side length in not linear because its graph contains the points (1,1), (2,4), and (3,9) which are not on a straight line. 8.F.B.4: Given a description of a situation, generate 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 a graph. Track how the values of the two quantities change together. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph, or its table of values.	MP 1 MP 2 MP 3 MP 4	Glencoe Course 3: 4.4 **Additional Resources:** EngageNY: Grade 8, Mod 6, Topic A Robert Kaplinsky: Hot Dogs
Compare Properties of 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). 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. 8.F.B.4: Given a description of a situation, generate 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 a graph. Track how the values of the two quantities change together. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph, or its table of values.	MP 1 MP 2 MP 3 MP 4	Glencoe Course 3: 4.5
Construct Functions	8.F.B.4: Given a description of a situation, generate 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 a graph. Track how the values of the two quantities change together. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph, or its table of values.	MP 1 MP 3 MP 4	Glencoe Course 3: 4.6

Linear and Nonlinear Functions	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 Grade 8.) 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 = s2 giving the area of a square as a function of its side length in not linear because its graph contains the points (1,1), (2,4), and (3,9) which are not on a straight line. 8.F.A.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 MP 3 MP 4 MP 7	Glencoe Course 3: 4.7
Quadratic Functions	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 = s2 giving the area of a square as a function of its side length in not linear because its graph contains the points (1,1), (2,4), and (3,9) which are not on a straight line. 8.F.A.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 MP 3 MP 4 MP 7	Glencoe Course 3: 4.8
Qualitative Graphs	8.F.A.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 MP 2 MP 3 MP 4	Glencoe Course 3: 4.9

Semester 1

Chapter 9: Scatter Plots, Data Analysis and Probability

Essential Question(s):

- **How are patterns used when comparing two quantities?**

Topic	Arizona Mathematics Standard	Mathematical Practices	Resources
Scatter Plots	8.SP.A.1: Construct and interpret scatter plots for bivariate measurement data to investigate and describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	MP 1 MP 3 MP 4	Glencoe Course 3: 9.1 Inquiry Lab
Lines of Best Fit	8.SP.A.1: Construct and interpret scatter plots for bivariate measurement data to investigate and describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear 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 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.	MP 1 MP 3 MP 4 MP 5	Glencoe Course 3: 9.2 Inquiry Labs
Two-Way Tables	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.	MP 1 MP 3 MP 4 MP 5	Glencoe Course 3: 9.3

Glencoe Course 2 Chapter 9: Probability Lesson 3: Probability of Compound Events Lesson 4: Simulations Lesson 5: Fundamental Counting Principle Lesson 7: Independent and Dependent Events	8.SP.B.5: Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. a. Understand that the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. b. Represent sample spaces for compound events using organized lists, tables, tree diagrams and other methods. Identify the outcomes in the sample space which compose the event. c. Design and use a simulation to generate frequencies for compound events.	MP 1 MP 3 MP 4 MP 5	Glencoe Course 2 Chapter 9 **Additional Resources:** CPM Course 2: 5.2.3, 5.2.4, 5.2.5, and 5.2.6
Descriptive Statistics *Optional	Preparation for S.ID.1 and S.ID.2	MP 1 MP 2 MP 3 MP 4 MP 7	Glencoe Course 3: 9.4
Measures of Variation *Optional	Preparation for S.ID.2	MP 1 MP 3 MP 4 MP 7	Glencoe Course 3: 9.5
Analyze Data Distributions *Optional	Preparation for S.ID.2 and S.ID.3	MP 1 MP 3 MP 4	Glencoe Course 3: 9.6

Semester 2

Chapter 1: Real Numbers
Essential Question(s):

- **Why is it helpful to write numbers in different ways?**

Topic	Arizona Mathematics Standard	Mathematical Practices	Resources
Rational Numbers	8.NS.A.1: Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion. Know that numbers whose decimal expansions do not terminate in zeros or in a repeating sequence of fixed digits are called irrational.	MP 1 MP 3 MP 4 MP 6 MP 7 MP 8	Glencoe Course 3: 1.1 **Additional Resources:** EngageNY: Grade 8, Mod 1, Topic A
Positive Exponents	8.EE.A.1: Understand and apply the properties of integer exponents to generate equivalent numerical expressions.	MP 1 MP 3 MP 4 MP 8	Glencoe Course 3: 1.2 **Additional Resources:** CPM Course 3: 8.2.2
Product and Quotient of Powers Properties	8.EE.A.1: Understand and apply the properties of integer exponents to generate equivalent numerical expressions.	MP 1 MP 3 MP 4 MP 7	Glencoe Course 3: 1.3
Power of a Power and Power of a Product Properties	8.EE.A.1: Understand and apply the properties of integer exponents to generate equivalent numerical expressions	MP 1 MP 3 MP 4 MP 7	Glencoe Course 3: 1.4

Zero and Negative Exponents	8.EE.A.1: Understand and apply the properties of integer exponents to generate equivalent numerical expressions.	MP 1 MP 3 MP 4 MP 7	Glencoe Course 3: 1.5 **Additional Resources:** CPM Course 3: 8.2.3 Robert Kaplinsky: Stronger Passwords
Scientific Notation	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 express 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.	MP 1 MP 3 MP 4 MP 7	Glencoe Course 3: 1.6 **Additional Resources:** CPM Course 3: 8.2.4 EngageNY: Grade 8, Mod 1, Topic B
Computations with Scientific Notation	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 express 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.	MP 1 MP 3 MP 4	Glencoe Course 3: 1.7 Inquiry Lab
Square and Cube Roots	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. Know that is irrational. a. Evaluate square roots of perfect squares less than or equal to 225. b. Evaluate cube roots of perfect cubes less than or equal to 1000.	MP 1 MP 3 MP 4	Glencoe Course 3: 1.8
Estimating Square and Cube Roots of Irrational 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 their values.	MP 1 MP 3 MP 4	Glencoe Course 3: 1.9 Inquiry Lab

Compare and Order Rational and Irrational Numbers	8.NS.A.1: Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion. Know that numbers whose decimal expansions do not terminate in zeros or in a repeating sequence of fixed digits are called irrational. 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 their values. 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. Know that is irrational. a. Evaluate square roots of perfect squares less than or equal to 225. b. Evaluate cube roots of perfect cubes less than or equal to 1000.	MP 1 MP 3 MP 4 MP 6	Glencoe Course 3: 1.10

Semester 2

Chapter 5: Triangles and the Pythagorean Theorem
Essential Question(s):

- **How can algebraic concepts be applied to geometry?**

Topic	Arizona Mathematics Standard	Mathematical Practices	Resources
Lines	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 1 MP 3 MP 4	Glencoe Course 3: 5.1 Inquiry Lab **Additional Resources:** CPM Course 3: 9.2.1
Geometric Proof		MP 1 MP 2 MP 3 MP 4	Glencoe Course 3: 5.2
Angles of Triangles	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 1 MP 2 MP 3 MP 4	Glencoe Course 3: 5.3 Inquiry Lab **Additional Resources:** CPM Course 3: 9.1.2 EngageNY: Grade 8, Mod 2, Topic C
Polygons and Angles	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 1 MP 3 MP 4	Glencoe Course 3: 5.4

Right Triangle Relationships	8.G.B.6: Understand the Pythagorean Theorem and its converse.	MP 1 MP 3 MP 4	Glencoe Course 3: Inquiry Labs
Pythagorean Theorem	8.G.B.7: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world context and mathematical problems in two and three dimensions. 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. Know that square root of 2 is irrational. a. Evaluate square roots of perfect squares less than or equal to 225. b. Evaluate cube roots of perfect cubes less than or equal to 1000.	MP 1 MP 3 MP 4 MP 5	Glencoe Course 3: 5.5 **Additional Resources:** CPM Course 3: 9.2.2 EngageNY: Grade 8, Mod 2, Topic D Grade 8, Mod 3, Topic C
Use the Pythagorean Theorem	8.G.B.7: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world context and mathematical problems in two and three dimensions. 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. Know that square root of 2 is irrational. a. Evaluate square roots of perfect squares less than or equal to 225. b. Evaluate cube roots of perfect cubes less than or equal to 1000.	MP 1 MP 3 MP 4 MP 7	Glencoe Course 3: 5.6 **Additional Resources:** CPM Course 3: 9.2.5 EngageNY: Grade 8, Mod 4, Topic E
Distance on the Coordinate Plane	8.G.B.8: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	MP 1 MP 3 MP 4 MP 5	Glencoe Course 3: 5.7

Semester 2

Chapter 6: Transformations
Essential Question(s):

- **How can we best show or describe the change in position of a figure?**

Topic	Arizona Mathematics Standard	Mathematical Practices	Resources
Translations	8.G.A.1: Verify experimentally the properties of rotations, reflections, and translations. Properties include: lines are taken to lines, line segments are taken to line segments of the same length, angles are taken to angles of the same measure, parallel lines are taken to parallel lines.	MP1 MP2 MP3 MP4 MP8	Glencoe Course 3: 6.1 Inquiry Lab **Additional Resources:** EngageNY: Grade 8, Mod 2, Topic A Robert Kaplinsky: Skytypers
Reflections	8.G.A.1: Verify experimentally the properties of rotations, reflections, and translations. Properties include: lines are taken to lines, line segments are taken to line segments of the same length, angles are taken to angles of the same measure, parallel lines are taken to parallel lines. 8.G.A.3: Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	MP1 MP3 MP4 MP7	Glencoe Course 3: 6.2
Rotations	8.G.A.1: Verify experimentally the properties of rotations, reflections, and translations. Properties include: lines are taken to lines, line segments are taken to line segments of the same length, angles are taken to angles of the same measure, parallel lines are taken to parallel lines. 8.G.A.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	MP1 MP3 MP4 MP7	Glencoe Course 3: 6.3 Inquiry Lab **Additional Resources:** CPM Course 3: 6.1.3
Dilations	8.G.A.3: Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	MP1 MP3 MP4	Glencoe Course 3: 6.4 Inquiry Lab **Additional Resources:** CPM Course 3: 6.2.2

Semester 2

Chapter 7: Congruence and Similarity
Essential Question(s):

- **How can you determine congruence and similarity?**

Topic	Arizona Mathematics Standard	Mathematical Practices	Resources
Congruence and Transformations	8.G.A.1: Verify experimentally the properties of rotations, reflections, and translations. Properties include: lines are taken to lines, line segments are taken to line segments of the same length, angles are taken to angles of the same measure, parallel lines are taken to parallel lines. 8.G.A.2: Understand that a two-dimensional figure is congruent to another if one can be obtained from the other by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that demonstrates congruence.	MP 1 MP 3 MP 4	Glencoe Course 3: 7.1 Inquiry Lab **Additional Resources:** EngageNY: Grade 8, Mod 2, Topic B
Congruence	8.G.A.2: Understand that a two-dimensional figure is congruent to another if one can be obtained from the other by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that demonstrates congruence.	MP 1 MP 2 MP 3 MP 4	Glencoe Course 3: 7.2 Inquiry Labs **Additional Resources:** EngageNY: Grade 8, Mod, 2, Topic C
Similarity and Transformations	8.G.A.4: Understand that a two-dimensional figure is similar to another if, and only if, one can be obtained from the other by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that demonstrates similarity.	MP 1 MP 3 MP 4 MP 7	Glencoe Course 3: 7.3 Inquiry Lab **Additional Resources:** CPM Course 3: 6.2.4 Robert Kaplinsky: Ms. Pac-Man
Properties of Similar Polygons	8.G.A.4: Understand that a two-dimensional figure is similar to another if, and only if, one can be obtained from the other by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that demonstrates similarity.	MP 1 MP 3 MP 4	Glencoe Course 3: 7.4 **Additional Resources:** CPM Course 3: 6.2.3

Similar Triangles and Indirect Measurements	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.	MP 1 MP 2 MP 3 MP 4 MP 7	Glencoe Course 3: 7.5 **Additional Resources:** CPM Course 3: 10.1.2 EngageNY: Grade 8, Mod 5, Topic B
Slope and Similar Triangles	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 (0, b).	MP 1 MP 2 MP 3 MP 4	Glencoe Course 3: 7.6 **Additional Recourses:** CPM Course 3: 10.1.3
Area and Perimeter of Similar Figures	8.G.A.4: Understand that a two-dimensional figure is similar to another if, and only if, one can be obtained from the other by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that demonstrates similarity.	MP 1 MP 3 MP 4 MP 7	Glencoe Course 3: 7.7 **Additional Resources:** CPM Course 3: 10.1.4 Robert Kaplinsky: Sinkhole

Semester 2

Chapter 8: Volume and Surface Area
Essential Question(s):

- **Why are formulas important in math and science?**

Topic	Arizona Mathematics Standard	Mathematical Practices	Resources
Volume of Cylinders	8.G.C.9: Understand and use formulas for volumes of cones, cylinders and spheres and use them to solve real-world context and mathematical problems.	MP 1 MP 2 MP 3 MP 4 MP 5	Glencoe Course 3: 8.1 Inquiry Lab
Volume of Cones	8.G.C.9: Understand and use formulas for volumes of cones, cylinders and spheres and use them to solve real-world context and mathematical problems.	MP 1 MP 2 MP 3 MP 4	Glencoe Course 3: 8.2
Volume of Spheres	8.G.C.9: Understand and use formulas for volumes of cones, cylinders and spheres and use them to solve real-world context and mathematical problems.	MP 1 MP 2 MP 3 MP 4	Glencoe Course 3: 8.3
Surface Area of Cylinders *Optional		MP 1 MP 3 MP 4 MP 5	Glencoe Course 3: 8.4 Inquiry Lab

Surface Area of Cones *Optional		MP 1 MP 2 MP 3 MP 4 MP 7	Glencoe Course 3: 8.5 Inquiry Lab
Change in Dimensions *Optional for surface area but required for volume	8.G.C.9: Understand and use formulas for volumes of cones, cylinders and spheres and use them to solve real-world context and mathematical problems.	MP 1 MP 3 MP 4	Glencoe Course 3: 8.6 Inquiry Lab

The Mathematical Practices: Narratives and Questions

Mathematics Practices		Narratives	Related Questions
Overarching habits of mind of a productive math thinker	**8.MP.1 Make sense of problems and persevere in solving them**	Mathematically proficient students explain to themselves the meaning of a problem, look for entry points to begin work on the problem, and plan and choose a solution pathway. While engaging in productive struggle to solve a problem, they continually ask themselves, “Does this make sense?" to monitor and evaluate their progress and change course if necessary. Once they have a solution, they look back at the problem to determine if the solution is reasonable and accurate. Mathematically proficient students check their solutions to problems using different methods, approaches, or representations. They also compare and understand different representations of problems and different solution pathways, both their own and those of others.	• How would you describe the problem in your own words? • How would you describe what you are trying to find? • What do you notice about...? • What information is given in the problem? • Describe the relationship between the quantities. • Describe what you have already tried. What might you change? • Talk me through the steps you’ve used to this point. • What steps in the process are you most confident about? • What are some other strategies you might try? • What are some other problems that are similar to this one? • How might you use one of your previous problems to help you begin? • How else might you organize...represent... show...?
	8.MP.6 Attend to precision	Mathematically proficient students clearly communicate to others using appropriate mathematical terminology, and craft explanations that convey their reasoning. When making mathematical arguments about a solution, strategy, or conjecture, they describe mathematical relationships and connect their words clearly to their representations. Mathematically proficient students understand meanings of symbols used in mathematics, calculate accurately and efficiently, label quantities appropriately, and record their work clearly and concisely.	• What mathematical terms apply in this situation? • How did you know your solution was reasonable? • Explain how you might show that your solution answers the problem. • What would be a more efficient strategy? • How are you showing the meaning of the quantities? • What symbols or mathematical notations are important in this problem? • What mathematical language...,definitions..., properties can you use to explain...? • How could you test your solution to see if it answers the problem?

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Most questions from all Grades Common Core State Standards Flip Book

The Mathematical Practices: Narratives and Questions

Mathematics Practices		Narratives	Related Questions
Reasoning and Explaining	**8.MP.2 Reason abstractly and quantitatively**	Mathematically proficient students make sense of quantities and their relationships in problem situations. Students can contextualize and decontextualize problems involving quantitative relationships. They contextualize quantities, operations, and expressions by describing a corresponding situation. They decontextualize a situation by representing it symbolically. As they manipulate the symbols, they can pause as needed to access the meaning of the numbers, the units, and the operations that the symbols represent. Mathematically proficient students know and flexibly use different properties of operations, numbers, and geometric objects and when appropriate they interpret their solution in terms of the context.	• What do the numbers used in the problem represent? • What is the relationship of the quantities? • How is _____ related to _____? • What is the relationship between _____and _____? • What does_____mean to you? (e.g. symbol, quantity, diagram) • What properties might we use to find a solution? • How did you decide in this task that you needed to use...? • Could we have used another operation or property to solve this task? Why or why not?
	8.MP.3 Construct viable arguments and critique the reasoning of others	Mathematically proficient students construct mathematical arguments (explain the reasoning underlying a strategy, solution, or conjecture) using concrete, pictorial, or symbolic referents. Arguments may also rely on definitions, assumptions, previously established results, properties, or structures. Mathematically proficient students make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. Mathematically proficient students present their arguments in the form of representations, actions on those representations, and explanations in words (oral or written). Students critique others by affirming or questioning the reasoning of others. They can listen to or read the reasoning of others, decide whether it makes sense, ask questions to clarify or improve the reasoning, and validate or build on it. Mathematically proficient students can communicate their arguments, compare them to others, and reconsider their own arguments in response to the critiques of others.	• What mathematical evidence would support your solution? • How can we be sure that...? / How could you prove that...? • Will it still work if...? • What were you considering when...? • How did you decide to try that strategy? • How did you test whether your approach worked? • How did you decide what the problem was asking you to find? • Did you try a method that did not work? Why didn't it work? Could it work? • What is the same and what is different about...? • How could you demonstrate a counter-example?

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The Mathematical Practices: Narratives and Questions

Mathematics Practices		Narratives	Related Questions
Modeling and Using Tools	**8.MP.4 Model with mathematics**	Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. When given a problem in a contextual situation, they identify the mathematical elements of a situation and create a mathematical model that represents those mathematical elements and the relationships among them. Mathematically proficient students use their model to analyze the relationships and draw conclusions. They interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.	• What number model could you construct to represent the problem? • What are some ways to represent the quantities? • What is an equation or expression that matches the diagram, number line, chart, table, and your actions with the manipulatives? • Where did you see one of the quantities in the task in your equation or expression? What does each number in the equation mean? • How would it help to create a diagram, graph, table...? • What are some ways to visually represent...? • What formula might apply in this situation?
	8.MP.5 Use appropriate tools strategically	Mathematically proficient students consider available tools when solving a mathematical problem. They choose tools that are relevant and useful to the problem at hand. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful; recognizing both the insight to be gained and their limitations. Students deepen their understanding of mathematical concepts when using tools to visualize, explore, compare, communicate, make and test predictions, and understand the thinking of others.	• What mathematical tools can we use to visualize and represent the situation? • Which tool is more efficient? Why do you think so? • What information do you have? • What do you know that is not stated in the problem? • What approach are you considering trying first? • What estimate did you make for the solution? • In this situation would it be helpful to use...a graph..., number line..., ruler..., diagram..., calculator..., manipulative? • Why was it helpful to use...? • What can using a _____ show us that _____may not? • In what situations might it be more informative or helpful to use...?

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The Mathematical Practices: Narratives and Questions

Mathematics Practices		Narratives	Related Questions
Seeing structure and generalizing	**8.MP.7 Look for and make use of structure**	Mathematically proficient students use structure and patterns to assist in making connections among mathematical ideas or concepts when making sense of mathematics. Students recognize and apply general mathematical rules to complex situations. They are able to compose and decompose mathematical ideas and notations into familiar relationships. Mathematically proficient students manage their own progress, stepping back for an overview and shifting perspective when needed.	• What observations do you make about...? • What do you notice when...? • What parts of the problem might you eliminate..., simplify...? • What patterns do you find in...? • How do you know if something is a pattern? • What ideas that we have learned before were useful in solving this problem? • What are some other problems that are similar to this one? • How does this relate to...? • In what ways does this problem connect to other mathematical concepts?
	8.MP.8 Look for and express regularity in repeated reasoning	Mathematically proficient students look for and describe regularities as they solve multiple related problems. They formulate conjectures about what they notice and communicate observations with precision. While solving problems, students maintain oversight of the process and continually evaluate the reasonableness of their results. This informs and strengthens their understanding of the structure of mathematics which leads to fluency.	• Explain how this strategy works in other situations? • Is this always true, sometimes true or never true? • How would we prove that...? • What do you notice about...? • What is happening in this situation? • What would happen if...? • Is there a mathematical rule for...? • What predictions or generalizations can this pattern support? • What mathematical consistencies do you notice?

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