Math 8

Semester A Summary:

In this course, students will learn, practice, and apply the fundamental skills and strategies that will help them grow into strong mathematical thinkers. Daily instruction supports student learning of core math concepts and development of procedural fluency regarding the number system; exponent rules; scientific notation; roots and irrational numbers; triangles; cones, cylinders, and spheres; and right rectangular prisms and pyramids. Students are encouraged to use visual representations of their thinking to bridge their understanding between the concrete and abstract, allowing patterns and mathematical principles to come to life. Peer Model videos throughout provide illustrations of a peer learning how to use and apply the target mathematical skill using a real-world example. 21st Century instruction further illustrates the connection of mathematical concepts to the real world while supporting students' development of skills, knowledge, and expertise they must master to succeed in life and work. Mathematical discussion prompts encourage students to revise misunderstanding, uncover nuances in application, make connections to prior knowledge, identify patterns, and engage with vocabulary. Students are encouraged to listen critically, critique the reasoning of others, and justify their own solutions. The courses are designed to support a growth mindset regarding math and encourage students to engage in productive struggle; instructional materials explicitly and frequently remind students that mistakes are opportunities for learning and acquiring new skills. Together the course elements ensure the student grows as a mathematical thinker and masters the skills to succeed in life and work.

Semester A Outline

1. **Math 8 A Course Overview**
    1. Math 8 A Course Overview
2. **The Number System**
    1. The Number System Introduction
    2. The Real Number System
        - In this section, you will show the hierarchy of the real number system, including natural numbers, whole numbers, integers, rational numbers, and irrational numbers.
        - In this section, you will describe how sets of real numbers relate to each other.
        - In this section, you will identify appropriate uses of the real number system in real-world situations.
    3. Rational and Irrational Numbers
        - In this section, you will identify rational and irrational numbers.
        - In this section, you will estimate the value of expressions involving irrational numbers.
    4. Approximate Values of Irrational Numbers

- In this section, you will use rational approximations of irrational numbers to locate them approximately on a number line diagram.
- In this section, you will use rational approximations of irrational numbers to compare the size of irrational numbers.
5. Decimal Expansions
    - In this section, you will represent numbers as decimals to demonstrate an understanding that every number has a decimal expansion.
6. Rational Numbers in Different Forms
    - In this section, you will show that rational numbers in decimal form either terminate or fall into a repeating cycle.
    - In this section, you will convert repeating decimals into rational numbers.
7. Numbers Between Rational Numbers
    - In this section, you will find a rational number and an irrational number between two rational numbers.
    - In this section, you will find rational and irrational numbers between two irrational numbers.
8. Numbers Between Rational Numbers Discussion
9. Numbers Between Rational Numbers Discussion
10. The Number System Apply
11. The Number System Review
12. The Number System Unit Test

3. Exponent Rules
1. Exponent Rules Introduction
2. Product Rule of Exponents
    - In this section, you will develop the Product Rule of Integer Exponents.
    - In this section, you will apply the Product Rule of Integer Exponents to find equivalent numerical expressions.
3. Quotient Rule of Exponents
    - In this section, you will develop the Quotient Rule for exponents by looking for patterns. You will then use the Quotient Rule to simplify exponential expressions.
    - In this section, you will apply the Quotient Rule of Integer Exponents to simplify an exponential expression.
4. Zero Power Rule of Exponents
    - In this section, you will develop the Zero Power Rule of Integer Exponents.
    - In this section, you will apply the Zero Power Rule properties of integer exponents to generate equivalent numerical expressions.
5. Power Rule of Exponents
    - In this section, you will develop the power rule for integer exponents.
    - In this section, you will apply the Power Rule of Integer Exponents to generate equivalent numerical expressions.
6. Negative Integer Exponents
    - In this section, you will develop the properties of negative integer exponents.
    - In this section, you will apply the properties of negative integer exponents to generate equivalent numerical expressions.
7. Apply All Exponent Rules
    - In this section, you will apply a combination of the properties of integer exponents to generate equivalent numerical expressions and justify each step of the process.
8. Apply All Exponent Rules Discussion

9. Apply All Exponent Rules Discussion
10. Exponent Rules Apply
11. Exponent Rules Review
12. Exponent Rules Unit Test

4. Scientific Notation

1. Scientific Notation Introduction
2. Estimate Large and Small Quantities
   - In this section, you will express numbers in the form of a single digit multiplied by an integer power of 10 to estimate very large and small quantities and express how much one quantity is more than another quantity.
3. Write in Scientific Notation
   - In this section, you will write very large or very small numbers in scientific notation.
   - In this section, you will rewrite numbers that are given in scientific notation in decimal notation.
4. Compare Very Large and Very Small Numbers
   - In this section, you will compare approximations of very large numbers using scientific notation.
   - In this section, you will compare approximations of very small numbers using scientific notation.
5. Use Scientific Notation
   - In this section, you will use scientific notation and choose units of appropriate size for measurements of very large or very small quantities.
   - In this section, you will interpret scientific notation that has been generated by technology.
6. Add Numbers in Scientific Notation
   - In this section, you will learn how to add numbers that are expressed in scientific notation.
   - In this section, you will add a number expressed in scientific notation to a number expressed as a decimal.
7. Subtract Numbers in Scientific Notation
   - In this section, you will subtract numbers expressed in scientific notation.
   - In this section, you will subtract numbers expressed in scientific notation when both decimal and scientific notation are used.
8. Multiply in Scientific Notation
   - In this section, you will multiply numbers in scientific notation.
   - In this section, you will multiply numbers in scientific notation and regular decimal notation.
9. Divide in Scientific Notation
   - In this section, you will divide numbers in scientific notation.
   - In this section, you will divide numbers in scientific notation and regular decimal notation.
10. Scientific Notation Portfolio
11. Scientific Notation Apply
12. Scientific Notation Review
13. Scientific Notation Unit Test

5. Roots and Irrational Numbers

1. Roots and Irrational Numbers Introduction
2. Add and Subtract Radicals
   - In this section, you will add radicals.

- In this section, you will subtract radicals.
3. Multiply and Divide Radicals
    - In this section, you will multiply radicals.
    - In this section, you will divide radicals.
    - In this section, you will simplify radicals.
4. Evaluate Roots
    - In this section, you will evaluate the square root of small perfect squares.
    - In this section, you will evaluate the cube root of small perfect cubes.
5. Products of Irrational Square Roots
    - In this section, you will rewrite an irrational square root as the product of an integer and another irrational square root.
    - In this section, you will rewrite an irrational cube root as a product of an integer and another irrational cube root.
6. Identify Roots
    - In this section, you will use prime factorization to solve for square and cube roots of non-perfect squares.
7. Estimate Values of Expressions with Pi
    - In this section, you will estimate the value of expressions involving pi to the hundredths place.
8. Roots and Irrational Numbers Apply
9. Roots and Irrational Numbers Review
10. Roots and Irrational Numbers Unit Test

6. Triangles
1. Triangles Introduction
2. Angles of Triangles
    - In this section, you will establish facts about the angle sum of triangles.
    - In this section, you will use the properties of exterior angles of triangles to find missing angle measures.
3. Angles and Parallel Lines
    - In this section, you will establish relationships between angles formed when parallel lines are cut by a transversal.
4. Pythagorean Theorem Proofs
    - In this section, you will explain a proof of the Pythagorean Theorem.
    - In this section, you will explain whether a triangle is a right triangle using the converse of the Pythagorean Theorem.
5. Use the Pythagorean Theorem
    - In this section, you will apply the Pythagorean Theorem to find unknown side lengths of right triangles.
    - In this section, you will apply the Pythagorean Theorem to solve real-world problems.
6. Distance and the Pythagorean Theorem
    - In this section, you will apply the Pythagorean Theorem to find the distance between two points on a graph.
7. The Pythagorean Theorem in Three Dimensions
    - In this section, you will apply the Pythagorean Theorem to determine unknown side lengths in right triangles in mathematical problems in three dimensions.
    - In this section, you will apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world problems in three dimensions.

8. The Pythagorean Theorem Portfolio
9. Triangles Apply
10. Triangles Review
11. Triangles Unit Test

7. Cones, Cylinders, & Spheres
1. Cones, Cylinders, & Spheres Introduction
2. Cylinders and Cones
   - In this section, you will describe the features of a cone.
   - In this section, you will describe the features of a cylinder.
3. Surface Area of Cylinders
   - In this section, you will find the surface area of cylinders to solve problems.
   - In this section, you will solve real-world problems using the formula for surface area of a cylinder.
4. Surface Area of Cones
   - In this section, you will find the surface area of cones to solve problems.
   - In this section, you will solve real world problems using the formula for surface area of a cone.
5. Volume of Cylinders
   - In this section, you will find the volume of cylinders to solve mathematical problems.
   - In this section, you will solve real-world problems by finding the volume of cylinders.
6. Volume of Cones
   - In this section, you will solve mathematical problems using the formula for volume of a cone.
   - In this section, you will use the formula for the volume of a cone to solve real-world problems.
7. Surface Area of Spheres
   - In this section, you will describe the attributes of spheres.
   - In this section, you will use the formula for the surface area of a sphere to solve mathematical problems.
   - In this section, you will use the formula for the surface area of a sphere to solve real-world problems.
8. Volume of Spheres
   - In this section, you will use the formula for the volume of a sphere to solve mathematical problems.
   - In this section, you will use the formula for the volume of a sphere to solve real-world problems.
9. Volume of Cones, Cylinders, and Spheres
   - In this section, you will describe the relationship among the formulas for the volumes of cones, cylinders, and spheres.
   - In this section, you will use the relationship among the formulas for the volumes of cones, cylinders, and spheres to solve mathematical problems.
   - In this section, you will use the relationship among the formulas for the volumes of cones, cylinders, and spheres to solve real-world problems.
10. Cones, Cylinders, & Spheres Apply
11. Cones, Cylinders, & Spheres Review
12. Cones, Cylinders, & Spheres Unit Test

8. Right Rectangular Prisms & Pyramids
1. Right Rectangular Prisms & Pyramids Introduction

2. Attributes of Rectangular Prisms and Pyramids
   - In this section, you will describe the attributes of right rectangular prisms.
   - In this section, you will describe attributes of the three types of pyramids.
3. Surface Area of Right Rectangular Prisms
   - In this section, you will use the formula for the surface area of right rectangular prisms to solve mathematical problems.
   - In this section, you will use the formula for the surface area of right rectangular prisms to solve real-world problems.
4. Surface Area of Pyramids
   - In this section, you will use the formula for the surface area of a rectangular pyramid to solve mathematical problems.
   - In this section, you will use the formula for the surface area of a square pyramid to solve mathematical problems.
   - In this section, you will use the formula for finding the surface area of a triangular pyramid.
5. Volume of Right Rectangular Prisms
   - In this section, you will use the formula for the volume of a right rectangular prism.
   - In this section, you will use the formula for the volume of a right rectangular prism to solve real-world problems.
6. Volume of Pyramids
   - In this section, you will find the volume of pyramids using a formula.
   - In this section, you will find the volume of pyramids in real-world problems.
7. Right Rectangular Prisms & Pyramids Apply
8. Right Rectangular Prisms & Pyramids Review
9. Right Rectangular Prisms & Pyramids Unit Test

Semester B Summary:

In this course, students will learn, practice, and apply the fundamental skills and strategies that will help them grow into strong mathematical thinkers. Daily instruction supports student learning of core math concepts and development of procedural fluency regarding transformations and congruence, transformations and similarity, solving linear equations, graphing linear equations, systems of linear equations, scatter plots and data analysis, and functions. Students are encouraged to use visual representations of their thinking to bridge their understanding between the concrete and abstract, allowing patterns and mathematical principles to come to life. Peer Model videos throughout provide illustrations of a peer learning how to use and apply the target mathematical skill using a real-world example. 21st Century instruction further illustrates the connection of mathematical concepts to the real world while supporting students' development of skills, knowledge, and expertise they must master to succeed in life and work. Mathematical discussion prompts encourage students to revise misunderstanding, uncover nuances in application, make connections to prior knowledge, identify patterns, and engage with vocabulary. Students are encouraged to listen critically, critique the reasoning of others, and justify their own solutions. The courses are designed to support a growth mindset regarding math and encourage students to engage in productive struggle; instructional materials explicitly and frequently remind students that mistakes are opportunities for learning and acquiring new skills. Together the course elements ensure the student grows as a mathematical thinker and masters the skills to succeed in life and work.

Semester B Outline

1. **Math 8 B Course Overview**
    1. Math 8 B Course Overview
2. **Transformations and Congruence**
    1. Transformations and Congruence Introduction
    2. Translations and Reflections
        - In this section, you will demonstrate translations by moving line segments and lines to new locations.
        - In this section, you will reflect lines and line segments over the *x*-axis and *y*-axis.
    3. Rotations
        - In this section, you will rotate line segments and lines about the origin.
        - In this section, you will identify what happens to the size, shape, orientation, and position of a figure when it is translated, reflected, or rotated.
    4. Vertical & Horizontal Translations
        - In this section, you will translate geometric figures vertically.
        - In this section, you will translate geometric figures horizontally.
        - In this section, you will translate geometric figures vertically and horizontally.
        - In this section, you will translate figures both horizontally and vertically using the coordinates of the vertices.
    5. Reflections Across the x- or y- Axis
        - In this section, you will reflect geometric figures across the *x*-axis.
        - In this section, you will reflect geometric figures with respect to the *y*-axis.
        - In this section, you will reflect geometric figures with respect to the *x*-axis and *y*-axis.
        - In this section, you will describe the effect of reflections on two-dimensional figures, using coordinates.
    6. 90 and 270 Degree Rotations
        - In this section, you will rotate geometric figures 90 degrees clockwise and 270 degrees counterclockwise.
        - In this section, you will rotate geometric figures 270 degrees clockwise and 90 degrees counterclockwise.
    7. 180 Degree Rotations
        - In this section, you will rotate geometric figures 180 degrees about the origin.
        - In this section, you will describe the effect of rotations on a two dimensional figure.
    8. Congruent Figures
        - In this section, you will describe a two-dimensional figure as being congruent to another figure if one can be obtained from the other using rigid transformations.
        - In this section, you will describe a sequence of transformations that shows the congruence between two figures.
    9. Transformations and Congruence Portfolio
    10. Transformations and Congruence Apply
    11. Transformations and Congruence Review
    12. Transformations and Congruence Unit Test
3. **Transformations and Similarity**
    1. Transformations and Similarity Introduction
    2. Dilations
        - In this section, you will describe the effect of dilations of line segments on the

coordinate plane.
- In this section, you will describe the effect of dilations of lines on the coordinate plane.
- In this section, you will describe the effect of dilations on two-dimensional figures, using coordinates.

3. Similar Figures
- In this section, you will describe a two-dimensional figure as being similar to another figure if the second figure can be obtained from the first by a sequence of rotations, reflections, translations, and dilations.
- In this section, you will describe a sequence of transformations that shows the similarity between two similar two-dimensional figures.

4. Similar Figures Prompt
5. Similar Figures Discussion
6. Scale Drawings
- In this section, you will relate scale drawings to dilations of geometric figures.
- In this section, you will dilate geometric figures using scale factors that are positive rational numbers.

7. Sides of Similar Figures
- In this section, you will use proportions to find the missing side lengths of two similar figures.

8. Angles of Similar Triangles
- In this section, you will describe two similar figures as having congruent corresponding angles.
- In this section, you will use informal arguments to show facts about the angle-angle criterion for similarity of triangles.

9. Transformations and Similarity Apply
10. Transformations and Similarity Review
11. Transformations and Similarity Unit Test

4. Solving Linear Equations
1. Solving Linear Equations Introduction
2. Solve One-Step Linear Equations
- In this section, you will solve one-step linear equations with one variable.

3. Solve Two-Step Linear Equations
- In this section, you will solve two-step linear equations with one variable.
- In this section, you will solve two-step linear equations with rational coefficients in one variable.

4. Solve Multi-Step Linear Equations
- In this section, you will solve linear equations that require simplifying using the distributive property.
- In this section, you will fluently solve multistep linear equations in one variable.

5. Solve Equations with Variables on Both Sides
- In this section, you will fluently solve multistep linear equations in one variable when the same variable appears on both sides of the equal sign.

6. Linear Equations in Real-World Scenarios
- In this section, you will write linear equations with the same variable on both sides that represent a real-world problem.
- In this section, you will solve linear equations in one variable with the same variable on both sides representing a real-world problem.

7. How Many Solutions?

- In this section, you will give examples of linear equations in one variable with one solution, infinitely many solutions, or no solution.
- In this section, you will solve multi-step linear equations 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).
  8. Solving Linear Equations Portfolio
  9. Solving Linear Equations Apply
  10. Solving Linear Equations Review
  11. Solving Linear Equations Unit Test
5. **Graphing Linear Equations**
  1. Graphing Linear Equations Introduction
  2. Proportional Relationships
      - In this section, you will describe what makes a ratio.
      - In this section, you will describe what makes a proportion.
      - In this section, you will determine if two ratios are proportional.
  3. Unit Rate from Tables and Equations
      - In this section, you will determine the unit rate of a proportional relationship from a table.
      - In this section, you will determine the unit rate of a proportional relationship from an equation.
  4. Graphing Proportional Relationships
      - In this section, you will derive the equation $y = mx$ for a line through the origin.
      - In this section, you will graph proportional relationships.
  5. Slope as Unit Rate
      - In this section, you will determine the unit rate of a proportional relationship using a graph.
      - In this section, you will interpret the unit rate as the slope of the graph of a proportional relationship.
      - In this section, you will use similar triangles to explain why the slope, mm, is the same between any two distinct points on a non-vertical line in the coordinate plane.
  6. Compare Proportional Relationships
      - In this section, you will compare two different proportional relationships represented in two different ways.
  7. Graphing Equations
      - In this section, you will derive the equation $y = mx + b$ for a line intercepting the vertical axis at b.
      - In this section, you will graph linear equations in the form $y = mx + b$.
  8. Slope-Intercept Form
      - In this section, you will transform linear equations in any form to slope-intercept form.
      - In this section, you will graph linear equations in any form by rewriting in slope-intercept form.
  9. Graphing Linear Equations Portfolio
  10. Graphing Linear Equations Apply
  11. Graphing Linear Equations Review
  12. Graphing Linear Equations Unit Test
6. **Systems of Linear Equations**

1. Systems of Linear Equations Introduction
2. Solving Systems of Equations by Graphing
   - In this section, you will solve a system of linear equations by looking for the intersection point of linear graphs.
   - In this section, you will estimate the solution of a system of linear equations in two variables after graphing the equations.
3. One Solution, No Solution, or Many Solutions
   - In this section, you will determine how many solutions a system of linear equations has by writing the equations in slope-intercept form.
   - In this section, you will determine by graphing if a system of linear equations has no solution.
   - In this section, you will determine by graphing that a system of linear equations has an infinite number of solutions.
4. Solving Equations Using Substitution
   - In this section, you will solve systems of two linear equations in two variables using substitution.
5. Solving with Elimination
   - In this section, you will solve systems of two linear equations in two variables using elimination.
   - In this section, you will solve systems of two linear equations in two variables using elimination with multiplication.
6. Real-World Systems of Equations
   - In this section, you will create a pair of linear equations in two variables that represent a real-world problem.
   - In this section, you will solve real-world problems leading to two linear equations in two variables.
7. Real-World Systems of Equations Prompt
8. Real-World Systems of Equations Discussion
9. Systems of Linear Equations Apply
10. Systems of Linear Equations Review
11. Systems of Linear Equations Unit Test

7. Scatter Plots & Data Analysis
1. Scatter Plots & Data Analysis Introduction
2. Scatter Plots
   - In this section, you will learn how to create a scatterplot.
   - In this section, you will learn how to interpret scatterplots by describing outliers and patterns of clustering in real-world examples.
3. Scatter Plots Prompt
4. Scatter Plots Discussion
5. Correlation
   - In this section, you will learn how to analyze scatterplots and determine if they have positive, negative, or no association.
   - In this section, you will determine if a scatterplot has a linear association or no association.
6. Line of Best Fit
   - In this section, you will informally assess the model fit of a straight line to a scatterplot by judging the closeness of the data points to the line.
   - In this section, you will interpret data from a scatterplot to write an equation in slope-intercept form.
   - In this section, you will interpret the slope and y-intercept of a linear model in

terms of the data.
- In this section, you will use the equation of a linear model to make predictions about additional data points.
7. Two-Way Tables
- In this section, you will construct a two-way table summarizing data for two categorical variables.
- In this section, you will interpret two-way tables by summarizing the data for two categorical variables.
8. Relative Frequencies
- In this section, you will determine the relative frequency in a two-way table.
- In this section, you will use two-way tables to describe associations between two variables.
9. Independent and Dependent Events
- In this section, you will compare and contrast the probability of independent and dependent events.
- In this section, you will determine probabilities for independent and dependent events.
10. Scatter Plots & Data Analysis Apply
11. Scatter Plots & Data Analysis Review
12. Scatter Plots & Data Analysis Unit Test

8. Functions
1. Functions Introduction
2. Functions
- In this section, you will describe functions as mathematical rules that assign each input to exactly one output.
- In this section, you will determine whether a relation is a function.
- In this section, you will identify functions that are nonlinear.
3. Graph of a Function
- In this section, you will construct graphs of functions by creating tables of ordered pairs.
- In this section, you will analyze graphs of functions to describe the relationship between two quantities presented.
4. Slope and y-intercepts
- In this section, you will determine the initial value and the rate of change for a linear function when given word problems describing the relationship between two real-life quantities.
- In this section, you will determine the initial value and the rate of change for a linear function when two (x, y) values are given from a table.
- In this section, you will determine the initial value and the rate of change of a linear function when two (x, y) values on its graph are given.
5. Slope in Real-World Problems
- In this section, you will interpret the rate of change of a linear function in terms of the situation it models and its table of values.
- In this section, you will interpret the rate of change of a linear function in terms of the situation it models and its graph.
6. y-intercepts in Real-World Problems
- In this section, you will interpret the initial value of a linear function in terms of a real-world situation.
- In this section, you will interpret the initial value of a linear function in terms of the situation it models and its graph.

7. Equations of Linear Functions
   - In this section, you will interpret the equations of linear functions and describe the graphs of linear functions.
   - In this section, you will write the equation of a linear function given a verbal description of the relationship or two (x, y) values in a table.
   - In this section, you will write the equation of a linear function given a verbal description of the relationship or two (x, y) values on a graph.
8. Properties of Functions
   - In this section, you will compare properties of two linear functions, each represented in a different way.
   - In this section, you will sketch the graph of a linear or nonlinear function that has been described verbally.
9. Functions Apply
10. Functions Review
11. Functions Unit Test