Course Information

Grade(s):	**7**
Discipline/Course:	**Mathematics**
Course Title:	**Math 7**
Prerequisite(s):	**Math 6**
Course Description: *Program of Studies*	In the Math 7 course, instructional time should focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples. 1. Students extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships. 2. Students develop a unified understanding of numbers, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and

	dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems. 3. Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in Grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms. 4. Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.
Course Essential Questions:	● How do patterns and functions help us describe data and physical phenomena and solve a variety of problems? ● How are quantitative relationships represented by numbers? ● How do geometric relationships and measurements help us to solve problems and make sense of our world? ● How can collecting, organizing and displaying data help us analyze information and make reasonable and informed decisions?
Course Enduring Understandings:	Insights learned from exploring generalizations through the essential questions. (Students will understand that…) ● Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technologies. ● Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies. ● Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technologies.

	• Data can be analyzed to make informed decisions using a variety of strategies, tools, and technologies.
Duration:	One Year
Course Materials/Resources:	EdGems Course 2

Grade Seven Standards for Mathematical Practice The K-12 Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. This page gives examples of what the practice standards look like at the specified grade level. Students are expected to:	
Standards	Explanations and Examples
1. Make sense of problems and persevere in solving them.	In grade 7, students solve problems involving ratios and rates and discuss how they solved them. Students solve real world problems through the application of algebraic and geometric concepts. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, "What is the most efficient way to solve the problem?", "Does this make sense?", and "Can I solve the problem in a different way?"
2. Reason abstractly and quantitatively.	In grade 7, students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.
3. Construct viable arguments and critique the reasoning of others.	In grade 7, students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, and graphs, tables, and other data displays (i.e. box plots, dot plots, histograms, etc.). They further refine their mathematical communication skills through mathematical discussions in which they critically evaluate their own thinking and the thinking of other students. They pose questions like "How did you get that?", "Why is that true?" "Does that always work?" They explain their thinking to others and respond to others' thinking.

4. Model with mathematics.	In grade 7, students model problem situations symbolically, graphically, tabularly, and contextually. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations. Students explore covariance and represent two quantities simultaneously. They use measures of center and variability and data displays (i.e. box plots and histograms) to draw inferences, make comparisons and formulate predictions. Students use experiments or simulations to generate data sets and create probability models. Students need many opportunities to connect and explain the connections between the different representations. They should be able to use all of these representations as appropriate to a problem context.
5. Use appropriate tools strategically.	Students consider available tools (including estimation and technology) when solving a mathematical problem and decide when certain tools might be helpful. For instance, students in grade 7 may decide to represent similar data sets using dot plots with the same scale to visually compare the center and variability of the data. Students might use physical objects or applets to generate probability data and use graphing calculators or spreadsheets to manage and represent data in different forms.
6. Attend to precision.	In grade 7, students continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students define variables, specify units of measure, and label axes accurately. Students use appropriate terminology when referring to rates, ratios, probability models, geometric figures, data displays, and components of expressions, equations or inequalities.
7. Look for and make use of structure.	Students routinely seek patterns or structures to model and solve problems. For instance, students recognize patterns that exist in ratio tables making connections between the constant of proportionality in a table with the slope of a graph. Students apply properties to generate equivalent expressions (i.e. $6 + 2x = 3\ (2 + x)$ by distributive property) and solve equations (i.e. $2c + 3 = 15$, $2c = 12$ by subtraction property of equality), $c=6$ by division property of equality). Students compose and decompose two- and three-dimensional figures to solve real world problems involving scale drawings, surface area, and volume. Students examine tree diagrams or systematic lists to determine the sample space for compound events and verify that they have listed all possibilities.

8. Look for and express regularity in repeated reasoning.	In grade 7, students use repeated reasoning to understand algorithms and make generalizations about patterns. During multiple opportunities to solve and model problems, they may notice that a/b ÷ c/d = ad/bc and construct other examples and models that confirm their generalization. They extend their thinking to include complex fractions and rational numbers. Students formally begin to make connections between covariance, rates, and representations showing the relationships between quantities. They create, explain, evaluate, and modify probability models to describe simple and compound events.

Academic Expectations The Fairfield Public Schools describe a variety of cross curricular expectations that all students should exemplify during their time within the schooling experience. This page gives examples of what the practice standards look like at the specified grade level. Students are expected to:		
Standards	Explanations	Example
1. Exploring and Understanding [MP1]	When students engage in problem solving situations, they should be able to understand the problem, determine relevant information, and ask relevant additional questions.	Students should be able to answer the following questions when approaching a problem: 1. Do you understand all the words used in stating the problem? 2. What are you asked to find or show? 3. Can you restate the problem in your own words? 4. Can you think of a picture or diagram that might help you understand the problem?
2. Synthesizing and Evaluating	Engaging in a problem solving situation, students should be able to analyze the most efficient approach, and reflect on the process used to solve the problem.	Students should be able to answer the following questions when analyzing how to approach a problem, and also reflect on the result: 1. Is there enough information to enable you to find a solution? If not, what additional information is needed? 2. Are there multiple ways to complete the task? Which approach do you think is most efficient, and why? 3. Do you know a related problem? Look at the unknown and try to think of a familiar problem having the same or similar unknown. Can you use it? 4. Was your strategy effective? What worked? What didn't? 5. Was there another approach that could have been more efficient? 6. Is your answer reasonable? How do you know? 7. Was your presentation approach effective? If not, what would you change? 8. How did the communication tools allow you to get the message across to the intended audience?

3. Creating and Constructing	Engaged in a problem solving situation, students should implement a plan.	Students should be able to answer the following question to implementing their plan to solve a problem: 1. What strategy will you use to complete the task?
4. Conveying Ideas	Students should be able to use correct mathematical language, logically display their work for the desired problem.	Students should be able to answer the following questions to convey their mathematical thinking to solve a problem: 1. How will you present your information to your intended audience? 2. Does your response illustrate the correct terms and work to the problem?
5. Using Communicatio n Tools	Students should be able to choose the correct tools to illustrate their mathematical work to solve a specific problem.	Students should be able to answer the following question to use specific communication tools to solve a problem: 1. If applicable, what communication tools will you use to convey your ideas and solution?
6. Collaborating Strategically	Students should be able to work collaboratively to solve problems.	Students should be able to answer the following question to collaboratively solve problems: 1. In what ways did you work together to help solve the desired problem?

Unit Number and Title:	**Unit 1: Rates and Ratios**
Resource(s):	EdGems Course 2: Unit 1
Learning Goals	
Standard(s):	7.RP.1 (Major Standard) Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. 7.G.1 (Additional Standard) Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
Essential Question(s):	● How do you find and compare unit rates? ● How can you use scale drawings to solve problems?
Enduring Understanding(s):	● Reasoning with ratios involves attending to and coordinating two quantities. ● Ratios are often expressed in fraction notation, although ratios and fractions do not have identical meaning.

	● Ratios are often used to make "part-to-part" comparisons, but fractions are not. ● Equivalent ratios can be created by iterating and/or partitioning a composed unit. ● A rate is a set of infinitely many equivalent ratios.
Learning Goal(s): *Students will be able to use their learning to:*	1. Write ratios to represent a situation, and use ratio concepts to solve problems. 2. Calculate unit rates and use unit rates to solve problems. 3. Compute rates and ratios that include complex fractions. 4. Use scales and scale figures to draw figures and find missing side lengths.

Unit and Title:	**Unit 2: Proportional Relationships**
Resource(s):	EdGems Course 2: Unit 2
Learning Goals	
Standard(s):	7.RP.2 (Major Standard) Recognize and represent proportional relationships between quantities. a) Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. b) Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. c) Represent proportional relationships by equations. d) Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate. 7.RP.3 (Major Standard) Use proportional relationships to solve multi-step ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

Essential Question(s):	● What makes a relationship proportional? ● How can we represent proportional relationships in tables, graphs, and equations?
Enduring Understanding(s):	● Several ways of reasoning, all grounded in sense making, can be generalized into algorithms for solving proportion problems. ● A proportion is a relationship of equality between two ratios.
Learning Goal(s): *Students will be able to use their learning to:*	1. Determine if ratios form a proportion and solve for a missing value in a proportion. 2. Solve problems by writing and solving proportions. 3. Recognize proportional relationships in tables and graphs. 4. Write equations for proportional relationships and graph them.

Unit Number and Title:	**Unit 3: Percents**
Resource(s):	EdGems Course 2: Unit 3
Learning Goals	
Standard(s):	7.NS.2d (Major Standard) Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats 7.RP.3 (Major Standard) Use proportional relationships to solve multi-step ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error*
Essential Question(s):	● What does a percent mean ? ● How can you solve percent problems?
Enduring Understanding(s):	● Several ways of reasoning, all grounded in sense making, can be generalized into algorithms for solving proportion problems.

	• A proportion is a relationship of equality between two ratios.
Learning Goal(s): *Students will be able to use their learning to:*	1. Convert between fractions, decimals, and percents. 2. Use percentages to find a missing number using proportions and equations. 3. Find the percentage of increase or decrease or the percent error when given a real world scenario.

Unit Number and Title:	**Unit 4: Sums and Differences of Rational Numbers**
Resource(s):	EdGems Course 2: Unit 4
Learning Goals	
Standard(s):	7.NS.1 (Major Standard) Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a) Describe situations in which opposite quantities combine to make 0. b) Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. c) Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. d) Apply properties of operations as strategies to add and subtract rational numbers.

	7.NS.3 (Major Standard) Solve real-world and mathematical problems involving the four operations with rational numbers
Essential Question(s):	● How can we add and subtract integers? rational numbers? ● How can we visualize adding and subtracting negative numbers?
Enduring Understanding(s):	● Fractions and decimals express a relationship between numbers. ● Rational numbers allow us to make sense of situations that involve numbers that are not whole.
Learning Goal(s): *Students will be able to use their learning to:*	1. Add two or more integers to find the sum 2. Add positive and negative fractions and decimals. 3. Subtract two integers to find the difference 4. Subtract positive and negative fractions and decimals

Unit and Title:	**Unit 5: Products and Quotients of Rational Numbers**
Resource(s):	EdGems Course 2: Unit 5
Learning Goals	
Standard(s):	7.NS.2 (Major Standard) Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. a) Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts. b) Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts. Interpret quotients of rational numbers by describing real-world contexts.

	c) Apply properties of operations as strategies to multiply and divide rational numbers. 7.NS.3 (Major Standard) Solve real-world and mathematical problems involving the four operations with rational numbers.
Essential Question(s):	● How can we multiply and divide integers? rational numbers? ● How can we apply the order of operations when working with expressions containing negative numbers?
Enduring Understanding(s):	● Rational numbers allow us to make sense of situations that involve numbers that are not whole.
Learning Goal(s): *Students will be able to use their learning to:*	● Find the value of multiplication and division expressions involving integers. ● Find products of positive and negative fractions and decimals ● Find quotients of positive and negative fractions and decimals ● Find the value of expressions using the order of operations

Unit Number and Title:	**Unit 6: Algebraic Expressions**
Resource(s):	EdGems Course 2: Unit 6
Learning Goals	
Standard(s):	7.EE.1 (Major Standard) Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. 7.EE.2 (Major Standard) Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. 7.EE.3 (Major Standard) Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert

	between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
Essential Question(s):	● How do we evaluate algebraic expressions with negative numbers? ● How can we use the properties of algebra to write equivalent expressions?
Enduring Understanding(s):	● Expressions are foundational for Algebra; they serve as building blocks for work with equations and functions. ● Two or more expressions may be equivalent, even when their symbolic forms differ. ● A relatively small number of symbolic transformations can be applied to expressions to yield equivalent expressions. ● Variables are tools for expressing mathematical ideas clearly and concisely. They have many different meanings, depending on the context and purpose. ● Using variables permits writing expressions whose values are not known or vary under different circumstances.
Learning Goal(s): *Students will be able to use their learning to:*	1. Write and evaluate algebraic expressions. 2. Use the Distributive Property to write equivalent expressions 3. Simplify expressions by using the Distributive Property and combining like terms.

Unit Number and Title:	**Unit 7: Solving Equations and Inequalities**
Resource(s):	EdGems Course 2: Unit 7
Learning Goals	
Standard(s):	7.EE.2 (Major Standard) Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. 7.EE.3 (Major Standard) Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. 7.EE.4a,b (Major Standard) Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. a) Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. b) Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.
Essential Question(s):	● How can we use the properties of algebra to solve multi step algebraic equations?
Enduring Understanding(s):	● The equal sign indicates that two expressions are equivalent. It can also be used in defining or naming a single expression or function rule.

	• An inequality is another way to describe a relationship between expressions; instead of showing that the values of two expressions are equal, inequalities indicate that the value of one expression is greater than (or greater than or equal to) the value of the other expression.
Learning Goal(s): *Students will be able to use their learning to:*	1. Solve one-step equations 2. Solve two-step equations 3. Simplify and solve equations with variables on one side of an equation 4. Solve inequalities and graph the solutions on a number line

Unit Number and Title:	**Unit 8: Two Dimensional Geometry**
Resource(s):	EdGems Unit 8
Standard(s):	7.G.2 (Additional Standard) Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle 7.G.4 (Additional Standard) Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. 7.G.5 (Additional Standard) Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. 7.G.6 (Additional Standard) Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
Essential Question(s):	● What are different types of angle relationships? ● How do you find the circumference and area of a circle?
Enduring Understanding(s):	● Representation of geometric ideas and relationships allows multiple approaches to geometric problems and connects geometric interpretations to other contexts. ● Area represents the space enclosed by a 2-dimensional figure.

Learning Goal(s): *Students will be able to use their learning to:*	1. Use facts about complementary and supplementary angles to solve problems. 2. Use facts about vertical angles, adjacent angles, and linear pairs to solve problems. 3. Determine if given conditions lead to a unique triangle. 4. Find the area of polygons. 5. Use the relationship between pi and diameter of a circle to find circumference. 6. Understand and use the circle area formula. 7. Find the area of composite figures.

Unit Number and Title:	**Unit 9: Three Dimensional Geometry**
Resource(s):	EdGems Unit 9
Standard(s):	7.G.3 (Additional Standard) Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. 7.G.6 (Additional Standard) Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
Essential Question(s):	● How can we find the cross-sections or three-dimensional shapes? ● How can we find the surface areas and volumes of three-dimensional shapes? ● How can we find a missing dimension of a three-dimensional shapes when given the volume?
Enduring Understanding(s):	● Volume represents the space enclosed by a 3-dimensional object.
Learning Goal(s): *Students will be able to use their learning to:*	1. Describe three-dimensional figures and the two-dimensional cross-sections formed by slicing solids 2. Calculate the surface area of prisms 3. Calculate the surface area of regular pyramids. 4. Find the volume of prisms and pyramids 5. Find the volume of cylinders and solve real-world problems involving cylinders 6. Find the volume of cones and solve real-world problems involving cones 7. Find the volume of spheres and solve real-world problems involving spheres

Unit Number and Title:	**Unit 10: Probability and Statistics**
Resource(s):	EdGems Unit 10
Standard(s):	7.SP.1 (Supporting Standard) Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. 7.SP.2 (Supporting Standard) Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. 7.SP.3 (Supporting Standard) Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. 7.SP.4 (Supporting Standard) Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. 7.SP.5 (Supporting Standard) Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1 2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event 7.SP.6 (Supporting Standard) Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability 7.SP.7 (Supporting Standard) Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. 7.SP.8 (Supporting Standard) Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

Essential Question(s):	● How can you determine the probability of an event? ● How can we use models to determine the probability of an event? Compound event?
Enduring Understanding(s):	● The probability of an event's occurrence can be predicted with varying degrees of confidence.
Learning Goal(s): *Students will be able to use their learning to:*	1. Find and interpret experimental and theoretical probabilities 2. Predict an outcome using experimental and theoretical probability 3. Find compound probabilities using lists, tree diagrams and tables 4. Make inferences about a population using data from random samples 5. Compare samples using measures of center and variability