Fairfield Public Schools

MATH 7

MATH 7

Critical Areas of Focus

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 number, 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.

Pacing Guide										
1st Marking Period			2nd Marking Period			3rd Marking Period			4th Marking Period	
September	October	November	December	January	February	March	April	May	June	
Unit 1 **Operating with Rational Numbers (add/sub)** 5 weeks	Unit 2 **Operating with Rational Numbers (mult/div)** 4 weeks	Unit 3 **Two and Three Dimensional Geometry** 5 weeks	Unit 4 **Proportional Relationships** 6 weeks		Unit 5 **Algebraic Reasoning II** 5 weeks	Unit 6 **Inferences about Populations** 4 weeks	Unit 7 **Probability** 4 weeks			

Course Overview		
Central 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.	**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?	**Assessments** • Formative Assessments • Summative Assessments

Content Outline	**Standards**
I. Unit 1 – Operating with Rational Numbers (add/sub) II. Unit 2 – Operating with Rational Numbers (mult/div) III. Unit 3 – Two and Three Dimensional Geometry IV. Unit 4 – Proportional Relationships V. Unit 5 - Algebraic Reasoning II VI. Unit 6 – Inferences about Populations VII. Unit 7 – Probability	Connecticut Common Core State Standards are met in the following areas: • ***Ratios and Proportional Relationships*** • ***The Number System*** • ***Expressions and Equations*** • ***Geometry*** • ***Statistics and Probability***

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 $a/b \div c/d = ad/bc$ 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.

Unit 1 – Operating with Rational Numbers (add/sub), 5 weeks top

Students have studied operations with whole numbers, fractions, and decimals in previous grades. In this unit, students should extend this understanding to operations with negative numbers for addition and subtraction. Exploring ideas about negative numbers by building and connecting to what students already know will not only help develop understandings of negative numbers, but also deepen understanding of meaning and operations of positive numbers, Doing this will require students making meaning of the operations and analyzing what kinds of situations call for which operation.

Students come to this unit having already informally experienced positive and negative numbers in their everyday lives—temperatures in winter dropping below zero, TV game shows in which participants lose points if they answer incorrectly, and sports teams being ahead or behind by some amount. This unit recommends exploring situations that require students to reason and represent with integers. Number lines offer a wonderful model for developing understanding of order, for comparing integers, as well as for developing the concept of opposites, distances, and absolute value. The number line can also be used to model addition and subtraction.

The inverse relationship between addition and subtraction need to be addressed to help students generalize algorithms for the operations as well as looking at number patterns. Asking questions about meaning and about what makes sense will help focus students' attention on the situation, the operation and connections.

Big Ideas The central organizing ideas and underlying structures of mathematics	**Essential Questions**
• Fractions and decimals express a relationship between numbers. • Rational numbers allow us to make sense of situations that involve numbers that are not whole.	• How can you convert a rational number to a decimal? • How can you add and subtract rational numbers? • How can you solve multi-step problems with rational numbers?

Common Core State Standards

THE NUMBER SYSTEM

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

7.NS.1

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.

7.NS.1a

Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*

7.NS.1b

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.

7.NS.1c
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.

7.NS.1d
Apply properties of operations as strategies to add and subtract rational numbers.

7.NS.3
Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)

Unit 2 – Operating with Rational Numbers (mult/div), 4 weeks top

Students have studied addition and subtraction operations with rational numbers. In this unit, students should extend this understanding to the multiplication and division operations with negative numbers. Exploring ideas about negative numbers by building and connecting to what students already know will not only help develop understandings of negative numbers, but also deepen understanding of meaning and operations of positive numbers, Doing this will require students making meaning of the operations and analyzing what kinds of situations call for which operation.

The inverse relationship between multiplication and division need to be addressed to help students generalize algorithms for the operations as well as looking at number patterns. Asking questions about meaning and about what makes sense will help focus students' attention on the situation, the operation and connections. The operation with rational numbers will then lead the students to the basic understandings of operations with mathematical expressions and equations.

Big Ideas The central organizing ideas and underlying structures of mathematics	**Essential Questions**
• Rational numbers allow us to make sense of situations that involve numbers that are not whole. • 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.	• How do you multiply and divide rational numbers? • How do you solve multistep problems with rational numbers? • How can you rewrite expressions to help you solve problems? • How can you solve problems by using expressions, equations, and inequalities?

Common Core State Standards

THE NUMBER SYSTEM

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

7.NS.2

Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

7.NS.2a

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.

7.NS.2b

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.

7.NS.2c
Apply properties of operations as strategies to multiply and divide rational numbers.

7.NS.2d
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.NS.3
Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)

EXPRESSIONS AND EQUATIONS

Use properties of operations to generate equivalent expressions.

7.EE.2
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. *For example, a + 0.05a = 1.05a means that "increase by 5 percent" is the same as "multiply by 1.05."*

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

7.EE.3
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. *For example: If a woman making $25 an hour gets a 10 percent raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.*

Unit 3 – Two and Three Dimensional Geometry, 5 weeks top

In this unit, students should study circumference and area of circles, and explore volume and surface area of right prisms and polygons in depth.

The unit should build on students' prior experiences in 6th grade, studying perimeter and area of polygons. The teaching of area and perimeter of circles as an extension to polygons provides deeper understanding of each. It is the contrast between circles and polygons that reinforces and supports the understanding of both. Although the development of the area and circumference formulas for circles should be a focus of the unit, emphasizing formulas prior to developing a conceptual understanding of the methods typically contributes to confusion and errors in applying the formulas While students can become adept at plugging numbers into formulas, they often have a hard time remembering which formula does what. This is often because they have an incomplete understanding of what the measurements are about and how the formulas capture their more informal, intuitive computations. For this reason, the lessons in this unit need to be structured so as to help students realize for themselves the distinctions between measures.

In addition to studying circles, the unit should also build on students' measurement knowledge and experiences and develop in-depth understanding of volume and surface area. Through a carefully selected and organized set of experiences, students should understand volume as a measure of filling and surface area as a measure of wrapping an object. Students should have the opportunity to generate their own strategies for finding volume and surface area. Lessons should include opportunities for students to see patterns and develop rules/formulas for finding surface area and volume of prisms. Lessons should also include students looking at how figures may have the same volume but different surface areas and how changing the scale of a box affects its surface area and volume (and extending students' understanding of similarity and scale factor to three-dimensional figures).

Big Ideas The central organizing ideas and underlying structures of mathematics	**Essential Questions**
• 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-dimentional figure. • Volume represents the space enclosed by a 3-dimentional object.	• How can you use scale drawings to solve problems? • How can you draw shapes that satisfy given conditions? • How can you identify cross sections of three-dimensional figures? • How can you use angle pairs to solve problems? • How can you find the circumference of a circle? • How do you find the area of a circle? • How do you find the area of composite figures? • How do you find the surface area of a figure made of prisms? • How do you find the volume of a figure made up of cubes and prisms?

Common Core State Standards

GEOMETRY

Draw, construct, and describe geometrical figures and describe the relationships between them.

7.G.2

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.3
Describe the two-dimensional figures that result from slicing three dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

7.G.4
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
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
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.

Unit 4 – Proportional Relationships, 6 weeks top

Students studied rates and ratios in sixth grade. In this unit, students reason proportionally. They use ratios as a basis of comparison between two sets of data. They observe related data in the form of a table and look for patterns connecting these data values. Plotting the paired data points to see a graphical representation, and writing an equation that shows the relationship of the data in the table further strengthens this understanding. When the change observed in the table is constant, students connect to a linear graph. This demonstrates a proportional relationship across multiple representations and deepens the understanding of these characteristics. The unit rate studied in grade six is now a focus of rate of change used in writing linear equations in grade seven. Other concepts in this unit include solving problems to find an unknown part of a proportion and applying proportional reasoning to real-world contexts. Students think proportionally in such situations as calculating sales tax, interest, and commissions; scale drawings; and unit pricing.

Big Ideas The central organizing ideas and underlying structures of mathematics	**Essential Questions**
• 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. • 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.	• How do you find and compare unit rates? • How can you use tables and equations to identify and describe proportional relationships? • How can you use graphs to represent and analyze proportional relationships? • How do you use percents to solve problems?

Common Core State Standards

RATIOS AND PROPORTIONAL RELATIONSHIPS

Analyze proportional relationships and use them to solve real-world and mathematical problems.

7.RP.1

Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½ to ¼ miles per hour, equivalently 2 miles per hour.*

7.RP.2

Recognize and represent proportional relationships between quantities.

7.RP.2a

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.

7.RP.2b

Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

7.RP.2c

Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.*

7.RP.2d

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

Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.*

GEOMETRY

Draw, construct, and describe geometrical figures and describe the relationships between them.

7.G.1

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.

Unit 5 – Algebraic Reasoning II, 5 weeks top

The main goal of this unit is for students to be able to recognize mathematical characteristics of proportional situations and to be able to identify, represent, and interpret such relationships. To do this, students explore multiple representations (i.e., graphs, words, equations, and tables) to interpret and solve tasks and understand how these models relate to one another.

To develop such understanding, students need to explore situations involving constant rate of change between two variables and be asked to express and represent the situation with a verbal description, a table, a graph, and/or an equation. The unit should involve lessons in which students experience constant rates of change and are asked to identify the rate of change, such as driving a car at a constant rate over a period of time. They also need to explore non-proportional situations where as one variable changes, the other variable continues to change at a constant rate but the relationship between any two points is no longer proportional, such as in a purchasing plan where there is a start-up fee in addition to a constant per item fee. Doing this prior to learning how to formally solve equations can help students make sense of the constant term in an equation and eventually learn to write equivalent equations to solve. Contrasting these different types of situations creates opportunities to deepen students understanding of proportional relationships, and lays the groundwork for introducing slope.

By the end of the unit, students should be able to determine whether relationships are changing at a constant rate, if they are proportional or non-proportional, and strategically and efficiently use a variety of representations to reason about these relationships. By comparing table and graphs, and looking for common solutions/points of intersection and discussing the meaning of these solutions students are informally solving systems of equations. This unit sets the foundation for work in eighth grade using linear functions to model relationships between quantities. In eighth grade students will also formalize their mathematical language (e.g., slope) and rely more on symbolic representations as appropriate.

Big Ideas The central organizing ideas and underlying structures of mathematics	**Essential Questions**
• 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.	• How do you add, subtract, factor, and multiply algebraic expressions? • How do you solve equations that contain multiple operations? • How do you solve inequalities that involve one operation? • How do you solve inequalities that involve multiple operations?

Common Core State Standards

EXPRESSIONS AND EQUATIONS

Use properties of operations to generate equivalent expressions.

7.EE.1

Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

7.EE.2

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. *For example, a + 0.05a = 1.05a means that "increase by 5 percent" is the same as "multiply by 1.05."*

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

7.EE.4

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.

7.EE.4a

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. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*

7.EE.4b

Solve word problems leading to equations 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. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make and describe the solutions.*

Unit 6 – Inferences about Populations, 4 weeks top

This unit builds off the learning from grade six where the students began to investigate statistical thinking. As students learned approaches to collect and represent data, the concepts in this unit allow students to apply this knowledge and investigate how statistical thinking applies to populations and samples. The students being able to generalize information from a sample allow them to make judgments and assertions of the entire population.

Big Ideas The central organizing ideas and underlying structures of mathematics	**Essential Questions**
• The information from a sample can be used to make generalizations about a population.	• How can you use a sample to gain information about a population? • How can you use samples to make and compare predictions about populations? • How can you use measures of center and variability to compare two populations?

Common Core State Standards

STATISTICS AND PROBABILITY

Use random sampling to draw inferences about a population.

7.SP.1

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

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. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.*

Draw informal comparative inferences about two populations.

7.SP.3

Informally assess the degree of visual overlap of two numerical data distributions with similar variability, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.*

7.SP.4

Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.

Unit 7 – Probability, 4 weeks top

The overarching goal of this unit is to learn how to make predictions and decisions using knowledge of probability and expected values. Initially, students need to develop an understanding of how numbers represent the likelihood of an event occurring, with higher numbers representing a higher likelihood up to the maximum of 1. They should have opportunities to calculate likelihoods of simple probabilities, and then run trials to determine experimental probabilities, and compare those to the theoretical probabilities.

Moving into compound probabilities, students should have the opportunity to use many different strategies for representing all the outcomes of a probability situation, such as lists, tables, area models, and tree diagrams. Students should also have the opportunity to make sense of the idea of expected values, and develop a strategy for calculating expected values.

Big Ideas The central organizing ideas and underlying structures of mathematics	**Essential Questions**
• The probability of an event's occurrence can be predicted with varying degrees of confidence.	• How can you describe the likelihood of an event? • How can you find the theoretical probability of an event? • How do you find the experimental probability of an event? • How do you find the probability of a compound event? • How can you use simulations to estimate probabilities?

Common Core State Standards

STATISTICS AND PROBABILITY

Investigate chance processes and develop, use, and evaluate probability models.

7.SP.5

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

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. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.*

7.SP.7

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.7a

Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.*

7.SP.7b

Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*

7.SP.8

Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

7.SP.8a

Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

7.SP.8b

Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the events.

7.SP.8c

Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40 percent of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood*