Pinellas County Schools

GRADE 7 MATHEMATICS

2017-2018

August 2017

		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

September 2017

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

October 2017

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

November 2017

			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

December 2017

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

Building Community in the Math Classroom

Unit 1: Ratios and Proportional Reasoning

MAFS.7.RP.1.1 MAFS.7.RP.1.3

MAFS.7.RP.1.2

Unit 2: Multi-Step Percents Problems

MAFS.7.RP.1.3 MAFS.7.EE.2.3

Unit 3: Rational Numbers

MAFS.7.NS.1.1 MAFS.7.NS.1.3

MAFS.7.NS.1.2

Unit 4: Expressions

MAFS.7.EE.1.1 MAFS.7.EE.1.2

Unit 5: Multi-Step Equations and Inequalities

MAFS.7.EE.2.3 MAFS.7.EE.2.4

Semester 1 Review and Exam

All standards from first semester

Re-Building Community in the Math Classroom

Unit 5: Multi-Step Equations and Inequalities

MAFS.7.EE.2.3 MAFS.7.EE.2.4

Unit 6: Geometric Figures

MAFS.7.G.1.1 MAFS.7.G.1.3

MAFS.7.G.1.2 MAFS.7.G.2.5

Unit 7: Circumference, Area, Surface Area, and Volume of Compound Figures

MAFS.7.G.2.4 MAFS.7.G.2.6

Unit 8: Probability

MAFS.7.SP.3.5 MAFS.7.SP.3.7

MAFS.7.SP.3.6 MAFS.7.SP.3.8

Unit 9: Statistics

MAFS.7.SP.1.1 MAFS.7.SP.2.3

MAFS.7.SP.1.2 MAFS.7.SP.2.4

FSA Testing Window

April 19, 2018-May 4, 2018

Remediation, Enrichment, Preview

Instruction must continue!!!

1) Remediation of content standards from current year.

2) Enrichment of content standards from current year.

3) Preview of Unit 1 from next course students will take.

January 2018

	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

February 2018

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28			

March 2018

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

April 2018

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

May 2018

		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Grade 7 Math Semester 1	**Unit 1: Ratios and Proportional Reasoning**	Projected Time Allotment: **17 Days**

Standards/Learning Goals:	**Content Limits, Calculator, Assessment Types**
MAFS.7.RP.1.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, area and other quantities measured in like or different units.	• The item stem must include at least one fraction. • Ratios may be expressed as fractions, with ":" or with words. • Units may be the same or different across the two quantities. Calculator: **YES** • Equation Editor • GRID • Multiple Choice • Multiselect • Open Response • Table Item
MAFS.7.RP.1.2 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. *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* $t = pn$. 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 $(1, r)$ were *r* is the unit rate.	• Numbers in items must be rational numbers. • Ratios should be expressed as fractions, with ":" or with words. • Units may be the same or different across the two quantities. Calculator: **YES** • Editing Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item
MAFS.7.RP.1.3 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.*	• Numbers in items must be rational numbers. • Units may be the same or different across the two quantities. Calculator: **YES** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item

Decoded Standard

MAFS.7.RP.1.1

This standard focuses on computing unit rates using ratios of fractions known as complex fractions. In a complex fraction, the numerator, denominator, or both are fractions. In the standard, $\frac{\frac{1}{2}}{\frac{1}{4}}$ is an example of a complex fraction. Complex fractions can be interpreted as division statements. For example, $\frac{\frac{1}{2}}{\frac{1}{4}}$ can be thought of as $\frac{1}{2} \div \frac{1}{4}$. Applications include situation where the quantities are measured in different units such as miles per hour, pounds per square foot, feet per second, and so on. (*Common Core Mathematics Companion*, Pg. 18)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Unit Rate Area Convert this ratio to a unit rate and explain what this unit rate means in the context of the problem.
- Computing Unit Rates Write two unit rates and explain what each unit rate means in the context of the problem.
- Comparing Unit Rates Express a rate as a **unit** rate in gallons per hour and determine which is faster.
- Unit Rate Length Show how you converted this ratio to a unit rate.

Illustrative Mathematics Assessment Tasks

- Cooking with the Whole Cup Use a recipe to find unit rates for many different pair-wise ratios.
- Molly's Run Context involving constant speed provides a transition from working with ratios involving whole numbers to ratios involving fractions.
- Molly's Run-Assessment Variation This task is part of three assessment tasks that address various aspects of 6.RP domain and help distinguish between 6th and 7th grade expectations.
- Track Practice Ask students to find the unit rates that one can compute in this context with same and different units.
- Buying Bananas-Assessment Version Find a unit rate for a ratio of non-whole numbers.

Lesson Resources

Engage New York

- Module 1, Topic C, Lesson 11 Students use ratio tables and ratio reasoning to compute unit rates associated with ratios of fractions in the context of measured quantities such as recipes, lengths, areas, and speed.
- Module 1, Topic C, Lesson 12 Students use ratio tables and ratio reasoning to compute unit rates associated with ratios of fractions in the context of measured quantities, e.g., recipes, lengths, areas, and speed.

Learnzillion

- Find Unit Rates in Situations Involving Fractions In this lesson you will learn how to find unit rates in situations involving fractions by using division.
- Can Conundrum Understand that we can use the same multiplication ideas with fractions as we can with whole numbers to maintain proportional relationships.

Yummy Math

- Not enough mashed potatoes Students change decimals to fractions, and calculate ingredient measures for various-sized gatherings.
- How many pies does this behemoth make? Students calculate the quantities of pumpkin puree and the number of pumpkin pies that could be made.

Videos

- Unit Rates Short video clip defining unit rate
- Unit Rates Shmoop video on unit rates (may require free account)
- Finding Unit Rates by Simplifying Complex Fractions

McGraw-Hill

Course 2, Chapter 1

Inquiry Lab: Unit Rates

Lesson 2

Decoded Standard

MAFS.7.RP.1.2

Sections a-d of this standard break down the standard to give guidance on ways to recognize and represent proportional relationships.

A. This standard emphasizes two methods for deciding whether a proportional relationship exists. One method is to use equivalent ratios in a table. If the rations are equivalent, then you have a proportional relationship such as:

# of people in a room	1	2	3	4	5
# of hands in the room	2	4	6	8	?

The other method is to graph the relationship on a coordinate plane and observe whether the graph is a straight line that goes through the origin. Note that computation using cross-multiplication is not a part of this standard. (*Common Core Mathematics Companion,* Pg. 19)

B. This standard focuses on proportional relationships that can be represented as tables, graphs, equations, diagrams, and verbal descriptions. Students have already seen tables, graphs, and verbal descriptions. The unit rate on a graph is the point where *x*=1. In an equation, it is the slope represented by the coefficient, *m*, in the formula $y = mx + b$. The terms *unit rate*, *constant of proportionality*, and *slope* are equivalent. Note that students are only required to read and interpret equations in this standard. (*Common Core Mathematics Companion*, Pg. 21)

C. In the previous standard students read equations to find the unit rates. In this standard students are given verbal descriptions of proportional relationships and are expected to create the equations in the form *y*=*mx*. For example, in Town C if you are caught speeding, you receive a traffic ticket. The penalty is $25 for every mile over the speed limit. What is the equation if *p* represents the penalty and *m* represents the number of miles over the speed limit? The equation is *p*=25*m*. (*Common Core Mathematics Companion*, Pg. 22)

D. An example of a proportional situation is: The scale on a map suggests that 1 centimeter represents an actual distance of 4 kilometers. The map distance between two towns is 8 centimeters. What is the actual distance? The graph of this relationship is represented as:

please see image on Pg. 23 of the Common Core Mathematics Companion

Note the points (0,0) and (1,4). The point is the unit rate or slope of the line for the equation *d*=4*c*, where *d* is the total distance and *c* is the number of centimeters. (*Common Core Mathematics Companion*, Pg. 23)

Instructional Resources

Mathematics Formative Assessments (MFAS)

- Teacher to Student Ratios Graph four ordered pairs given in context and decide if the variables they represent are proportionally related.
- Constant of Proportionality Trip Identify and explain the constant of proportionality given a verbal description and a diagram representing a proportional relationship.
- Finding Constant of Proportionality Determine the constant of proportionality using a table and a graph and explain it within the context of the problem.
- Deciding if Proportional Decide if two variables are proportionally related based on data given in a table.
- Writing an Equation Write an equation to represent a proportional relationship depicted in a graph.
- Identify Constant of Proportionality in Equations Identify and explain the constant of proportionality in three different equations.
- Graphs of Proportional Relationships Identify the graph of a proportional relationship.
- Babysitting Graph Given a graph that models the hourly earnings, interpret ordered pairs in context.
- Serving Size Write an equation for the size of the serving and the number of calories.

Illustrative Mathematics Assessment Tasks

- Art Class, Assessment Variation Decide proportional relationship using a table, find a unit rate using non-whole numbers, and represent with an equation.

Lesson Resources

EngageNY

- Module 1, Topic A, Lesson 1 Students compute unit rates associated with ratios of quantities measured in different units. Students use the context of the problem to recall the meaning of value of a ratio, equivalent ratios, rate and unit rate, relating them to the context of the experience.
- Module 1, Topic A, Lesson 2 Students understand that two quantities are proportional to each other when there exists a constant (number) such that each measure in the first quantity multiplied by this constant gives the corresponding measure in the second quantity.
- Module 1, Topic A, Lesson 5 Students decide whether two quantities are proportional to each other by graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
- Module 1, Topic B, Lesson 10 Students consolidate their understanding of equations representing proportional relationships as they interpret what points on the graph of a proportional relationship mean in terms of the situation or context of the problem, including the point (0, 0).

Yummy Math

- Should I Buy the Big One? Decide if the BIG one is a fair deal
- Say Cheese! Practice with proportional relationships of unlike units on double number lines

- Buying Coffee Find a unit rate in a context and to draw the graph.
- Robot Races Identify the points on a distance vs. time graph within context.
- Robot Races, Assessment Variation Explain the meaning of a point on the graph and compute and compare unit rates with fractions.
- Sore Throats-Variation 1 Finding equivalent ratios and proportional reasoning.
- Walk-a-thon 2 Translate information in a table (with decimals) and find unit distance and distance traveled per unit time. Translate into equations and graphs.
- Cider versus Juice-Variation 1 Compare two rates in different units.
- Proportionality Make sense out of the definition of direct proportionality.

LearnZillion

- Identify the constant of proportionality from a diagram Student will identify the constant of proportionality from a labeled diagram by writing an equation of the form y=mx and solving for m.

CPalms

- How Does It Compare? Students will be able to identify whether a statement shows proportionality or is simply two non-proportional ratios.
- Are Corresponding Leaf Veins Proportional to Leaf Heights Measure and graph leaves and vein lengths to determine proportionality.

MARS/Shell

- Proportion and Non-Proportion Situations Identify when two quantities are proportional or not. Solve proportionality problems.
- Modeling: A Race Recognize and use proportional relationships.
- Busses Task Works with a distance-time graph describing a bus journey.
- Comparing Strategies for Proportion This lesson unit is intended to help you assess whether students recognize relationships of direct proportion and how well they solve problems that involve proportional reasoning Problems.

Videos

- Means-Extremes Property of Proportions
- How Do You Set Up a Proportion From a Word Problem?

McGraw-Hill

Course 2, Chapter 1

Lessons 3,4,5 (For Lesson 3, consider using proportions for conversions instead of dimensional analysis)
Inquiry Lab: Proportional and Nonproportional Relationships
Inquiry Lab: Rate of Change
Lesson 7, 9 (Constant of Proportionality)

Decoded Standard

MAFS.7.RP.1.3

In this standard students solve problems involving proportional relationships. Students set up and solve proportions using cross-multiplication. For example: *"Directions to make a tablecloth call for $\frac{3}{4}$ yard of ribbon for every 2 yards of fabric. If you increase the amount of fabric used to 3 years, how much ribbon will be needed?"* The proportion is $\frac{\frac{3}{4}}{2} = \frac{x}{3}$. To cross-multiply:

$$3 \cdot \frac{3}{4} = 2x$$

Problems for this standard should be multi-step and include contexts with simple interest, tax, tips, commissions, percent error, percent increase/decrease, discounts, fees, markups, markdowns, discount, sales, and/or original prices.
To calculate a percent increase from 2 to 10, find the difference between the two numbers, in this case, 10-2=8. Take the difference, 8, and divide by the original number: $\frac{8}{2} = 4$. Multiply the quotient by 100: $4 \times 100 = 400\%$. (*Common Core Mathematics Companion,* Pg. 24)

Special Note: Students will solve multistep percent problems in Unit 2.

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MAFS)

- Making Cookies Find values given a set of rational number quantities.

Illustrative Mathematics Assessment Tasks

- Friends Meeting on Bikes Determine speed based on distance and speed approaching from opposite direction.
- Two-School Dance Calculate the fraction of a combined population given different ratios for two distinct populations.
- Sale! Students need opportunities to evaluate the relative savings of advertised sales.
- Tax and Tip How much will the total bill be, including tax and tip?
- Shirt Sale A tape diagram shows the solution in a very succinct way.
- Gotham City Taxis Solve a multi-step ratio problem that can be approached in many ways.

MARS/Shell

- Ice Cream Task Uses multi-step proportional reasoning to solve a real-world problem related to ice cream.
- Short Tasks-Ratio and Proportions Uses several short questions from RP cluster. Most problems are multi-step.

Lesson Resources

Engage NY

- Module 1, Topic C, Lesson 13 Students use tables to find an equivalent ratio of two partial quantities given a part-to-part ratio and the total of those quantities, in the third column, including problems with ratios of fractions.
- Module 1, Topic c, Lesson 15 Students use equations and graphs to represent proportional relationships arising from ratios and rates involving fractions.

Cpalms

- Best Day Care Center in the Neighborhood Students formulate a comparison-based solution to a problem involving choosing the best day care center in the neighborhood.
- Developing a Sense of Scale This lesson helps you assess whether students recognize relationships of direct proportion and how well they solve problems that involve proportional reasoning.
- How Fast Can One Travel On a Bicycle? Students investigate how the pedal and rear wheel gears affect the speed of a bicycle.

Yummy Math

- Cruising Consider how these cruise ships manage their resources and calculate per day and per cruise requirements.

Videos

- Find an Unknown in a Proportion
- Find an Unknown in a Proportion 2
- How Do You Solve a Word Problem Using a Proportion?
- What is the formula for simple interest?

McGraw-Hill

Course 2, Chapters 1
Chapter 1 Lesson 6

Course 2, Chapter 4
Chapter 4 Lesson 7

Grade 7 Math Semester 1	Unit 2: Multi-Step Percent Problems	Projected Time Allotment: **14 Days**

Standards/Learning Goals:	Content Limits, Assessment Types, Calculator
MAFS.7.RP.1.3 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.*	• Numbers in items must be rational numbers. • Units may be the same or different across the two quantities. Calculator: **YES** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item
MAFS.7.EE.2.3 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 hours gets a 10% raise, she will make an additional $\frac{1}{10}$ of her salary an hour, or #2.50, for a new salary of $27.50. If you want to place a towel bar $9\frac{3}{4}$ inches long in the center of a door that is $27\frac{1}{2}$ 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.*	• Numbers in items must be rational numbers. • No variables. • Items should require two or more steps. Calculator: **YES** • Equation Editor • Multiple Choice • Multiselect

tandard

MAFS.7.RP.1.3

In this standard students solve problems involving proportional relationships. Students set up and solve proportions using cross-multiplication. For example: *"Directions to make a tablecloth call for $\frac{3}{4}$ yard of ribbon for every 2 yards of fabric. If you increase the amount of fabric used to 3 years, how much ribbon will be needed?"* The proportion is $\frac{\frac{3}{4}}{2} = \frac{x}{3}$. To cross-multiply:

$$3 \cdot \frac{3}{4} = 2x$$

Problems for this standard should be multi-step and include contexts with simple interest, tax, tips, commissions, percent error, percent increase/decrease, discounts, fees, markups, markdowns, discount, sales, and/or original prices.

To calculate a percent increase from 2 to 10, find the difference between the two numbers, in this case, 10-2=8. Take the difference, 8, and divide by the original number: $\frac{8}{2} = 4$. Multiply the quotient by 100: $4 \times 100 = 400\%$.. (*Common Core Mathematics Companion,* Pg. 24)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Finding Fees Complete a multi-step fee percent problem.
- Tiffany's Tax Calculate the amount of sales tax and total price, given prices of individual items to purchase.
- Gasoline Prices Calculate the percent change for gas prices.

Illustrative Mathematics Assessment Tasks

Lesson Resources

EngageNY

- Module 1, Topic C, Lesson 14 Students will solve multi-step ratio problems including fractional markdowns, markups, commissions, fees, etc.
- Module 4, topic B, Lesson 7 Students understand equations for markup and markdown problems and use them to solve markup and markdown problems.

- Anna in D.C. Solve a multi-step percentage problem.
- Lincoln's math problem Solve a multi-step problem involving simple interest.
- Buying Protein Bars and Magazines Solve a multistep problem involving sales tax.
- Chess Club Solve a percent increase in one part with a percent decrease in the remaining. Find the overall percent change.
- Double Discounts Calculate percent decreases in the context of several discounts.
- Finding a 10% increase Simple percent increase task.
- Selling Computers Calculate quantities based on percent increase.
- Tax and Tip Calculate the tax and tip given the subtotal.
- Sale! Students need opportunities to evaluate the relative savings of advertised sales.

MARS/Shell

- 25% Sale Task Uses multi-step discount problem.
- Ice Cream Task Plan how to sell ice cream at a school event.

- Module 4, Topic B, Lesson 10 Students solve simple interest problems using the formula *I = Prt*,
- Module 4, Topic B, Lesson 11 Students solve real-world percent problems involving tax, gratuities, commissions, and fees.

CPalms

- Pricing the Twelve Days of Christmas Determine the current cost of items in the 12 Days of Christmas song.
- Let's Go Shopping: Calculating Percents The students will apply the percent formula and the percent of change formula to real world financial situations, I learn how to calculate percent discounts, their percent of savings, and tax, analyze, compare, and draw conclusions and explain in writing.

Three Act Math

- Dueling Discounts Which coupon should I use?

MARS/Shell

- Increasing or Decreasing Quantities by Percents Translating between percents, decimals, and fractions. Representing percent increase and decrease as multiplication. Recognizing the relationship between increases and decreases.

Videos

- What is the formula for simple interest?

McGraw-Hill

Course 2, Chapter 2

Inquiry Lab: Find Percents

Lesson 3

Decoded Standard

MAFS.7.EE.2.3

Students solve multi-step real-world and mathematical problems. The problems should contain a combination of whole numbers, positive and negative integers, fractions, and decimals. Students will apply what they learned in previous standards about convert fractions, decimals, and percents and use properties of operations to find equivalent forms of expressions as needed. Students will be expected to check their work for reasonableness using estimation strategies, which may include but are not limited to the following:

- rounding the values in the problem up or down and then adjusting the estimate to make up for the closeness of the rounded values to the originals,
- using friendly or compatible numbers for the values in the problem that allow for common factors for multiplication or easy addition such as grouping hundreds or thousands, and
- using benchmark numbers that are easy to work with such as 2 for $1\frac{7}{8}$ to make an estimate.

(*Common Core Mathematics Companion*, Pg. 108)

Special Note: Students will compute with integers and positive and negative numbers in Unit 3.

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Discount and Tax Solve a multi-step problem involving percent.
- Gas Station Equations Solve a two-step problem involving percent.
- Using Estimation Assess the reasonableness of answers using estimation.

Illustrative Mathematics Assessment Tasks

- Anna in D.C. Solve a multi-step percentage problem that can be approached in many ways.
- Discounted Books Examine different ways of looking at percentages and turn a verbal description of several operations into mathematical symbols and identify equivalent expressions without variables.

Lesson Resources

EngageNY

- Module 3, Topic B, Lesson 7 Build an algebraic expression using the context of a word problem and use that expression to write an equation that can be used to solve the word problem.
- Module 4, Topic D, Lesson 16 Students write and use algebraic expressions and equations to solve percent word problems related to populations of people and compilations.

Illuminations

- Fun with Baseball Stats Explore statistics surrounding baseball.
- CPalms
- Math in Mishaps Explore how percents, proportions, and solving for unknowns are used in important jobs.
- Bargain Town, USA Participate in a simulated real-world exploration of the relationship between fractions, decimals, and percents, by converting number forms and calculating discounted prices.
- Percent of Change Investigate percent of change in real-world situations and differentiate between an increase or a decrease.
- Here's A Tip Solve problems involving sales tax and tips; apply the properties of operations with numbers in decimal, percent and fraction form.

Yummy Math

- Jock Tax Consider the differences in state taxes that high paid pro athletes pay and determine how much more money an athlete should be paid in a high tax state in order to offset the taxes.

MARS/Shell

- Steps to Solving Equations Form and solve linear equations involving factorizing and using the distributive law.

McGraw-Hill

Course 2, Chapter 2

Inquiry Lab: Percent Diagrams
Lessons 1, 2,4
Inquiry Lab: Percent of Change
Lessons 5, 6, 7,

Grade 7 Math Semester 1	**Unit 3: Rational Numbers**	Projected Time Allotment: **24 Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.7.NS.1.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal and 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.	• Numbers in items must be rational numbers. Calculator: **NEUTRAL** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect • Open Response
MAFS.7.NS.1.2 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 no-zero divisor) is a rational number. If *p* and *q* are integers, the *–(p/q)=(-p)/q=p/(-q)*. Interpret quotients of rational numbers by describing real-world contexts. c. Apply properties of operations as strategies to multiply and divide rational numbers. d. 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.	• Numbers in items must be rational numbers. • *7.NS.1.2a,b,c* require the incorporation of a negative value. Calculator: **NO** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect • Table Item
MAFS.7.NS1.3 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.)*	• Numbers in items must be rational numbers. • Complex fractions may be used, but should contain fractions with single-digit numerators and denominators. Calculator: Nuetral • Equation Editor • Multiple Choice • Multiselect • Table Item

Decoded Standard

MAFS.7.NS.1.1

A. Students use real-world situation that model using opposite quantities to make zero. This prepares students for adding rational numbers with opposite signs such as $4 + (-4) = 0$. Examples can include temperature, elevation above and below sea level, owing money, and so on. (*Common Core Mathematics Companion*, Pg. 58)

B. This standard formalizes the concept of a positive and negative making zero from the previous standard into written equations. For example, $4 + (-4) = 0$. The 4 and (-4) are opposites because they are equidistant from 0 on the number line in opposite directions. They are also additive inverses because their sum is 0. Be sure to include examples of fractions and decimals such as $-\frac{1}{2}$ and -4.72 so that students are working with all types of rational numbers. Addition of integers is modeled on a number line as in the following example: *"Jose has $6 and owes Steven $5. How much money will Jose have left when he pays Steven what he owes?"* see image on page 59 (*Common Core Mathematics Companion*, Pg. 59)

C. Subtraction of rational numbers can be thought of in terms of addition using the additive inverse (sometimes referred to as "the opposite"). For example, 6-7 can be understood as 6+(-7). The distance between two rational numbers on a number line is the same as the absolute value of the difference between the two numbers. For example, using a real-world context, if the temperature is -6 at 7a.m. and +8 at noon, how many degrees has the temperature increased between 7 a.m. and noon? The difference between $-6 - 8 = -14$. $|-14| = 14$. Shown on a number line, the distance between -6 and 8 is 14. see image on page 60 (*Common Core Mathematics Companion,* Pg. 60)

D. Students have previously used the commutative, associative, and additive identity properties with whole numbers. These properties apply to rational numbers. For example:

Commutative Property of Addition: $4.5 + (-6) = (-6) + 4.5$

Associative Property of Addition: $6.9 + (-5) + 3.1 = 6.9 + 3.1 + (-5)$

Additive Identity Property of Addition (also called the Zero Property): $(-4.8) + 0 = (-4.8)$

(*Common Core Mathematics Companion*, pg. 61)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Exploring Additive Inverse Describe a student-generated example of additive inverse and demonstrate on a number line.
- Adding Integers Add integers using a vertical and horizontal number line.
- Rational Addition and Subtraction Rewrite a subtraction problem as an equivalent addition problem and explain the equivalence using a number line.
- Finding Difference Find the difference between two integers using a number line.
- Rational Water Management Combine rational numbers, including fractions and decimals, and use the properties of operations to simplify calculations.

Illustrative Mathematics Assessment Tasks

- Comparing Freezing Points Calculate the differences of signed numbers.
- Bookstore Account Use algebra and the number line to understand why it makes sense that we sometimes represent debt using negative numbers.
- Difference of Integers Subtract integers in a real world context.
- Differences and Distances Connect the distance between points on a number line with the difference between numbers.
- Distances Between Houses Solve a problem involving distances between objects whose positions are defined relative to a specified location and to see how this kind of situation can be represented with signed numbers.
- Rounding and Subtracting Addresses what happens to

Lesson Resources

Engage NY

- Grade 7 Module 2 Topic A Lesson 1 Students explore additive inversed and quantities that combine to make 0.
- Grade 7 Module 2 Topic A Lesson 2 Students model integer addition on the number line
- Grade 7 Module 2 topic A Lesson 3 & 4 Students understand adding integers by using arrows to show the sum of two integers.
- Grade 7 Module 3 Topic A Lesson 5 Students justify the rules for subtracting integers.
- Grade 7 Module 3 Topic A lesson 8 & 9 Students use properties of operations to add and subtract rational numbers without the use of a calculator.

CPalms

- Add It Up with T-Charts Use T-charts to add and subtract positive and negative numbers included mixed numbers and decimals
- Discovering Our Addition of Integer Rules Develop the rules for adding integers by using the absolute value of integers and number lines.
- Money Matters: Integers are Integral Design and develop a working budget for a one-month period after learning to add and subtract integers.

rounding discrepancies when arithmetic is performed on rounded numbers and would be a good problem for classroom discussion.

- Distances on a Number Line 2 Reinforce understanding of rational numbers as points on the number line and visually understand that the sum of a number and its inverse is zero.
- Operations on the Number Line Solidify understanding numbers as points on a number line and understand the geometric interpretation of adding and subtracting signed numbers.Ch

- Math Match Review math concepts, including shapes, shape names, addition, multiplication, negative numbers, and equivalent expressions. ()
- Integers Jeopardy Game This game has 4 categories: adding integers, subtracting integers, multiplying integers, and dividing integers. Students can play individually or in teams.

MARS/Shell

- A Day Out Task Analyze the results of a survey in order to plan a school trip.
- Using Positive and Negative Numbers in Context. Use directed numbers in context. Identify and aid in ordering, comparing, adding, and subtracting positive and negative integers.

Yummy Math

- Deflategate Work with negative numbers, inequalities, and graph on the number line and use proportional reasoning to determine if an air temperature difference could have accounted for the deflated footballs.

McGraw-Hill

Course 2, Chapter 3 and 4

Consider organizing the unit by operation instead of by chapter. For example, teach students how to add integers, positive and negative fractions and positive and negative mixed numbers at the same time instead of teaching all of the integer operations and then move on to the other rational numbers

Ch 3, Lesson 1 - Remediation only
Ch 3, Inquiry Lab: Add Integers
Ch 3, Lesson 2
Ch 3, Inquiry Lab: Subtract Integers
Ch 3, Lesson 3
Ch 3, Inquiry Lab: Distance on a Number Line
Ch 4, Inquiry Lab: Rational Numbers on the Number Line – Remediation only
Ch 4, Lesssons 1 and 2 – Remediation only
Ch 4, Inquiry Lab: Add and Subtract on the Number Line
Ch 4, Lessons 3,4, and 5

** Special emphasis in this standard on horizontal and vertical number line diagrams. Teachers will need to supplement the text to include practice with rational numbers in various forms within the same problem.

B Decoded Standard

MAFS.7.NS.1.2

Standards 7.NS.1.2a-d break down the understandings needed to multiply and divide rational numbers.

A. Real-world contexts help students make sense of multiplication of rational numbers. For example, it makes sense that $4 \times (-6.50) = -26$ when the context for this equations is Janene owes $6.50 to each of 4 people. How much does Janene owe altogether?
It is common to read and understand (-6) as "the opposite of six" as well as "negative six." Use "the opposite of" wording to make sense of equations such as $(-2) \times (-5)$ so that we read "the opposite of 2 times negative 5" or $\big((-1) \times 2\big) \times (-5) = -(2 \times -5) = -(-10) = 10.$
Students should discover the rules for multiplying signed numbers, and the rules make more sense when given context. For example, the chart below shows equations with context. *see image on page 62* (*Common Core Mathematics Companion*, Pg. 62)

B. Division of rational numbers can be thought of as the inverse of multiplication relying on previous understanding of the relationship between multiplication and division. For example, $(-25) \div 5 = -5$ because $5 \times -5 = -25$. This preserves the relationship between multiplication and division found with whole numbers, including the fact that division by 0 is undefined. One explanation is: $x \times 0 = 5$, so $5 \div 0 = x$. There is no possible number for *x*. The equation $-\frac{p}{q} = \frac{-p}{q} = \frac{p}{-q}$ is for the teacher, no the students. Use both $p \div (-q)$ and $\frac{p}{-q}$ notations for division.

(*Common Core Mathematics Companion*, Pg. 63)

C. Present problems in real-world contexts that allow students to see the meaning of the properties of the operations. Properties include:

Commutative Property of Multiplication: $3.6 \times 2 = 2 \times 3.6$

Associative Property of Multiplication: $3 \times (6 \times (-7)) \times (-2) = (3 \times 6) \times ((-7) \times (-2))$

Distributive Property: $-4(4 + (-3)) = ((-4) \times 4) + ((-4) \times (-3))$

Multiplicative Identify: $1 \times (-9) = (-9)$

Zero Property of Multiplication: $(-4.6) \times 0 = 0$

(*Common Core Mathematics Companion*, Pg. 64)

D. To convert rational numbers in fraction form to decimal form, use the meaning of fractions as division. For example, $\frac{4}{5} = 4 \div 5$. Using long division, $4 \div 5 = 0.80$. From repeated examples, students learn that the decimal form either ends in 0s (as in the example) or repeated digits/sets of digits. Students learn to use the bar above a digit/set of digits to designate digits that repeat. For example, $\frac{2}{3} = 2 \div 3 = 0.\overline{6}$ and $\frac{39}{99} = 0.\overline{39}$. This prepares students to learn about irrational numbers in Grade 8. (*Common Core Mathematics Companion*, Pg. 65)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Negative Times Given an illustration of why the product of two negatives is a positive, provide a rationale.
- Quotients of Integers Given an integer division problem and asked to identify fractions which are equivalent to the division problem.
- Understanding Products Explain why the product of a positive and a negative ration number is negative.
- Negative Explained Describe a real-world context for a given expression involving the product of two rational numbers.
- Applying Rational Number Properties Evaluate expressions involving multiplication or rational numbers and use the properties of operations to simplify calculations.
- Integer Division Describe a real-world context for a given expression involving the quotient of two rational integers.

Illustrative Mathematics Assessment Tasks

- Products and Quotients of Signed Rational Numbers Provide a context for multiplying and dividing signed rational numbers, providing a means for understanding why the signs behave the way they do when taking products.
- Why is a Negative Times a Negative Always Positive? Understand the reason it makes sense for the product of two negative numbers to be positive.
- Temperature Change Provide a context for interpreting division expressions.

Lesson Resources

Engage NY

- Grade 7 Module 2, Topic B Lesson 10 Students develop the rules for multiplying and dividing signed numbers.
- Grade 7 Module 2 Topic B Lesson 11 Students understand the rules for multiplication of integers.
- Grade 7 Module 2 Topic B Lesson 14 Students represent fractions as decimals (repeating and terminating decimals)
- Grade 7 Module 2 Topic B Lesson 15 Students apply the rules for multiplying and dividing rational numbers
- Grade 7 Module 2 Topic B Lesson 16 Students use the properties of operations to multiply and divide rational numbers.

MARS/Shell

- Increasing and Decreasing Quantities by a Percent Interpret percent increase and decrease, and in particular, to identify and help students who have the following difficulties: Translating between percents, decimals, and fractions. Representing percent increase and decrease as multiplication. Recognizing the relationship between increases and decreases.
- Fencing Task Calculate the cost of building fences from fence posts and wooden panels.

YummyMath

- Two Suggestions for Father's Day Asks students to change the amount in a blueberry muffin recipe to multiples of and fractions of ¼ cup measuring cup.
- Passover Macaroons Review fractions in the investigation on halving and tripling the fractional quantities of ingredients in a Passover macaroon recipe.

Illuminations

- Multiplying Integers Using Videotape Explore integer multiplication through the construct of videotaping.

	CPalms • Math Match Review math concepts, including shapes, shape names, addition, multiplication, negative numbers, and equivalent expressions. • Integers Jeopardy Game This game has 4 categories: adding integers, subtracting integers, multiplying integers, and dividing integers. Students can play individually or in teams. **Better Lessons** • Integer Product Signs-Using Counters to Discover the Signs of Products Use integer counters to model products of positive and negative integers. **McGraw-Hill** Course 2, Chapters 3 and 4 The concepts of multiplication and division were taught previously. Focus on the problems with signed numbers. Ch 3, Inquiry Lab: Multiplying Integers Ch 3, Lesson 4 Ch 4, Lesson 6 Ch 3, Inquiry Lab: Use properties to multiply Ch 3, Lesson 5 Ch 4, Lesson 8

Decoded Standard

MAFS.NS.1.3

Extend the work with order of operations to all rational numbers. A example of a mathematical problem Is $-3 \times 2\left(\frac{5}{6} + -\frac{1}{2}\right) = -2$. Complex fractions are fractions with a fraction in the numerator and/or a fraction in the denominator such as $\frac{\frac{3}{4}}{\frac{1}{2}}$. Interpret the division bar to turn a complex fraction into division: $\frac{\frac{3}{4}}{\frac{1}{2}} = \frac{3}{4} \div \frac{1}{2}$

Instructional Resources

Formative Tasks	**Lesson Resources**
Mathematics Formative Assessments (MFAS) • Positive and Negative Fractions Students are asked to add, subtract, multiply, and divide positive and negative fractions. • A Rational Number Expression Students are given a numerical expression to evaluate. • Complex Fractions Students are asked to rewrite complex fractions as simple fractions in lowest terms.	**Engage NY** • Module 2 Topic C Lesson 20 Students perform various calculations involving rational numbers to solve a problem related to the change in an investment's balance over time. **CPalms** • Bargain Town, USA Participate in a simulated real-world exploration of the relationship between fractions, decimals, and percents, by converting number forms and calculating discounted prices.

- Monitoring Water Temperatures Students are asked to solve a word problem that involves finding the average of positive and negative decimal numbers.
- Trail Mix Munchies Students are asked to solve a word problem involving division of fractions.

Illustrative Mathematics Assessment Tasks

- Comparing Freezing Points This task is appropriate for assessing student's understanding of differences of signed numbers.

Yummy Math

- Jock Tax Consider the differences in state taxes that high paid pro athletes pay and determine how much more money an athlete should be paid in a high tax state in order to offset the taxes.
- Shopping Season Begins Analyze shopping trips after calculating savings in dollars and percents.

Better Lessons

- WP: Solve a Multi-Step Problem Involving Integers Solve real world word problems involving integers and time conversions.

McGraw-Hill

Course 2, Chapter 3
Lessons 2,3,4,5: Do Real-World Link and H.O.T. Problems from each lesson

Course 2, Chapter 4
Lessons 3,4,5,6,8: Do Real-World Link and H.O.T. Problems from each lesson

Grade 7 Math Semester 1	Unit 4: Expressions	Projected Time Allotment: **11 Days**

Standards/Learning Goals:	Content Limits, Assessment Types, Calculator
MAFS.7.EE.1.1 Apply properties of operations as strategies to add, subtract, factor and expand linear expressions with rational coefficients.	• Numbers in items must be rational numbers. • Expressions must be linear and contain a variable. Calculator: **YES** • Equation Editor • Multiple Choice • Multiselect • Open Response
MAFS.7.EE.1.2 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%" is the same as "multiplying by 1.05".*	• Numbers in items must be rational numbers. • Expressions must be linear. Calculator: **NEUTRAL** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect • Open Response

Decoded Standard

MAFS.7.EE.1.1

Apply previously learned properties of operations (distributive, commutative, associative, identity, and inverse properties of addition and multiplication, as well as the zero property of multiplication) as strategies for adding, subtracting, factoring, and expanding linear expressions. Coefficients are limited to rational numbers that include integers, positive/negative fractions, and decimals. Use the properties to write equivalent expressions; for example, $3(4a + 2) = 12a + 6$ uses the distributive property.

Substituting a numerical value for the variable and then evaluating the expressions to find the same solution is a tool to determine whether two expressions are equivalent. For example, $3(4a + 2)$ is equal to $12a + 6$. Let $a = 5$ and substitute 5 for *a* in both expressions.

$$\begin{array}{ll} 3(4a+2) & 12a+6 \\ 3(4\cdot 5)+2) & (12\cdot 5)+6 \\ 3(20+2) & 60+6 \\ 3(22) & 66 \\ 66 & \end{array}$$

(*Common Core Mathematics Companion*, Pg. 104)

Special Note: Be sure to supplement rational coefficient problems in this unit. The textbook does not include many problems with fractions or decimals.

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Equivalent Perimeters Students are asked to solve a geometric problem by simplifying an algebraic expression.
- Equivalent Rational Expressions Students are given a polynomial with rational coefficients and asked to identify equivalent expressions from a given list.
- Factored Forms Students are given two expressions and asked to rewrite each in factored form using the fewest number of terms.
- Identify Equivalent Multistep Expressions Students are given an expression and are asked to identify expressions equivalent to it.

Lesson Resources

Engage NY

- Use Properties of Operations to Generate Equivalent Expressions Students will generate equivalent expressions using the fact that addition and
- Module 2, Topic C Lesson 22 Students identify and compare the sequence operations to find the solution to and equation algebraically.
- Module 2, Topic C Lesson 23 Students solve equations for the value of the value of the variable using inverse operations.
- Module 3, Topic A Lesson 2 Using Properties and grouping to solve equations.
- Module 3, Topic A Lesson 6 Rewrite rational number expressions by collecting like terms & combining them through the use of the Distributive Property.

Illustrative Mathematics Assessment Tasks

Writing Expressions The instructions for two expressions sound very similar, however, the order in which the different operations are performed and the exact wording make a big difference in the final expression.

Illuminations

- Distributing and Factoring Using Area Expressions representing area of a rectangle are used to enhance understanding of the distributive property.

CPalms

- Total Recall Using the notion of a broken robot, this lesson provides opportunities for students to apply different strategies and properties to expand, add, subtract, or multiply to determine equivalent expressions.

MARS/Shell

- Steps to Solving Equations Students match equations to stories and then order the steps used to solve these equations.

McGraw-Hill

Course 2, Chapter 5
Lesson 1 and 2 and emphasize 6th grade content.
Inquiry Lab: Sequences emphasizes 6th grade content.
Combine Lessons 3 and 4 in preparation to teach Lesson 5.

Decoded Standard

MAFS.7.EE.1.2

Using equivalent expressions from the previous standard, focus on how writing an equivalent statement can better show the relationship among the terms in the expressions. For example, $6x + 15 = 3(3x + 5)$ means that three groups of $2x + 5$ is the same as one group of 6*x* and 15. (*Common Core Mathematics Companion*, Pg. 105)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Rectangular Expressions Students are given equivalent expressions with rational coefficients and asked to explain what each expression represents within the context of the problem.
- Explain Equivalent Expressions Students are given equivalent expressions with rational coefficients and asked to explain what each expression represents within the context of a problem.

Illustrative Mathematics Assessment Tasks

- Ticket to Ride The purpose of this instructional task is to illustrate how different, but equivalent, algebraic expressions can reveal different information about a situation represented by those expressions.
- Writing Expressions The instructions for two expressions sound very similar, however, the order in which the different operations are performed and the exact wording make a big difference in the final expression.

Lesson Resources

Illuminations

- Interpreting Algebraic Expressions This lesson unit is intended to help you assess how well students are able to translate between words, symbols, tables, and area representations of algebraic expressions.

- McGraw-Hill
  Lesson 5, 6, 7
  Inquiry Lab: Factor Linear Expressions
  Lesson 8
  **Lessons 6-8, be sure to include problems with fractions and decimals from alternate resources.

Grade 7 Math Split Across Semester 1 & 2	**Unit 5: Multi-Step Equations and Inequalities**	Projected Time Allotment: **16 Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.7.EE.2.3 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 hours gets a 10% raise, she will make an additional $\frac{1}{10}$ of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar $9\frac{3}{4}$ inches long in the center of a door that is $27\frac{1}{2}$ 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.*	• Numbers in items must be rational numbers. • No variables. • Items should require two or more steps. Calculator: **YES** • Equation Editor • Multiple Choice • Multiselect
MAFS.7.EE.2.4 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. 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. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is the width?* 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. *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.*	• Numbers in items must be rational numbers. • Inequalities must have context. • Inequalities may use ≤ or ≥. • Inequalities may not be compounded inequalities. Calculator: **YES** • Equation Editor • GRID • Multiple Choice • Multiselect • Open Response

Decoded Standard
MAFS.7.EE.2.3 Students solve multi-step real-world and mathematical problems. The problems should contain a combination of whole numbers, positive and negative integers, fractions, and decimals. Students will apply what they learned in previous standards about converting fractions, decimals, and percents and use properties of operations to find equivalent forms of expressions as needed. Students will be expected to check their work for reasonableness using estimation strategies, which may include but are not limited to the following: • Rounding the values in the problem up or down and then adjusting the estimate to make up for the closeness of the rounded values to the originals, • Using friendly or compatible numbers for the values in the problem that allow for common factors for multiplication or easy addition such as grouping hundreds or thousands, and • Using benchmark numbers that are easy to work with such as using 2 for $1\frac{7}{8}$ to make an estimate. •

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Reeling in Expressions Solve a multi-step problem involving rational numbers.
- Discount and Tax Solve a multi-step problem involving percent.

Illustrative Mathematics Assessment Tasks

- Anna in D.C. Solve a multi-step percentage problem that can be approached in many ways.
- Discounted Books Determine two different ways to look at percentages both as a decrease and an increase of an original amount and turn a verbal description of several operations into mathematical symbols.
- Shrinking Calculating and explaining percent decrease within context.
- Who is the better batter? Given a natural real-world context for comparing fractions, convert the fractions to decimals or describe the situation in terms of percents.
- Gotham City Taxis Solve a multi-step ratio problem that can be approached in many ways.

Lesson Resources

EngageNY

- Module 3, Topic B, Lesson 8 Use properties of equality to solve word problems.

CPalms

- Travel Troubles This activity engages the students into time scheduling, budgeting, and decision making to maximize time efficiency.
- It's All About Properties of Equality Complete a gallery walk as formative assessment, to determine students' understanding of properties of operations and equality when applied to equations.

MARS/Shell

- Steps to Solving Equations Work collaboratively in pairs or threes, matching equations to stories and then ordering the steps used to solve these equations and explain their reasoning to their peers.

Better Lesson

- Scaffold Lesson to Increase Deeper Understanding in Solving Problems Involving Discount, Tax, and Tip Understand terminology needed to solve problems involving discount, tax, and tip. SWBAT apply the deeper understanding to solve real world problems.

McGraw-Hill

Course 2, Chapter 6

Problem-Solving Investigation: Work Backward

Decoded Standard

MAFS.7.EE.2.4

A. Students will become fluent in solving equations. Students use the arithmetic from the problem to generalize an algebraic solution.

Use word problems that lend themselves to equations in the forms of $px + q = r$ and $p(x + q) = r$. Two examples are as follows:

1. Three consecutive even numbers add up to 48. What is the lowest number of the three? $x + x + 2 + x + 4 = 3x + 6 = 48 \quad (px + q = r)$
2. Ms. Thomas had \$25 to spend on party favors. She had \$10.40 left after buying 10 balloons. How much did she spend on each balloon? $0.1(25 - 10.40) = r \quad (p(x + q) = r)$

Students should develop fluency solving word problems that can be modeled by linear equations in the form $px + q = r$. Integers, fractions, and decimals should be included as values in the word problems.

(*Common Core Mathematics Companion*, Pg. 109)

B. In this standard, students move from solving word problems with equations to word problems with inequalities. Inequalities follow a similar form to those of the equations, $px + q > r$ and $px + q < r$. Students graph the solution set of the inequality on a number line and describe what it means of the context of the word problem. Be aware that sometimes the solution set to the inequality contains values that do not make sense as solutions for the word problems. For example, in the word problem, *"Donna has at most \$60 to spend on a shopping spree. She wants to buy a dress for \$22 dollars and spend the rest on bracelets. Each Bracelet costs \$8. How many bracelets can she purchase?"* we see a solution of

$$\$60 - \$22 = \$38$$
$$8x \leq 38$$
$$\frac{8x}{8} \leq \frac{38}{8}$$
$$x \leq 4.75$$

The number of bracelets is less than or equal to 4.75. However, Donna cannot buy .75 of a bracelet, so when we graph the inequality as below:

see image on page 110 of the *Common Core Mathematics Companion*

we see that the only viable solutions to the word problems are 4, 3, 2, 1, or no bracelets.
(*Common Core Mathematics Companion*, Pg. 110)

*Emphasis should be placed on two-step equations. Teachers will need to supplement the text to fully address the standard.

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Solve Equations Solve two multistep equations involving rational numbers.
- Squares Write and solve an equation of the form $p(x + q) = r$ in the context of a problem about the perimeter of a square.
- Write and Solve an Equation Write and solve a two-step equation to model the relationship among variables in a given scenario.
- Algebra or Arithmetic? Compare an arithmetic solution to an algebraic solution of a word problem.

Illustrative Mathematics Assessment Tasks

- Fishing Adventures 2 Write and solve inequalities, and represent the solutions graphically.
- Bookstore Account Use algebra and the number line to understand why we sometimes represent debt using negative numbers.
- Gotham City Taxis Solve a multi-step ratio problem that can be approached in many ways.
- Sports Equipment Set An instructional task with context that can naturally be represented with an inequality; explore the relationship between the context and the mathematical representation of that context.

Lesson Resources

EngageNY

- Module 2, Topic C, Lesson 17 Students use tape diagrams to solve equations of the form $px + q = r$ and $p(x + q) = r$, (where p, q, and r, are *small positive* integers), and identify the sequence of operations used to find the solution.
- Module 3, Topic B, Lesson 8 and
- Module 3, Topic B, Lesson 9 Students understand and use the addition, subtraction, multiplication, division, and substitution properties of equality to 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.
- Module 3, Topic B, Lesson 13 Students understand that an inequality is a statement that one expression is less than (or equal to) or greater than (or equal to) another expression, such as $2x + 3 < 5$ or $3x + 50 \geq 100$. Students interpret a solution to an inequality as a number that makes the inequality true when substituted for the variable.
- Module 3, Topic B, Lesson 14 Students solve word problems leading to inequalities that compare $px + q$ and r, where p, q, and r are specific rational numbers. Students interpret the solutions in the context of the problem.
- Module 3, Topic B, Lesson 15 Students graph solutions to inequalities taking care to interpret the solutions in the context of the problem.

CPalms

- Understanding Equations Using Perimeter Introductory lesson in writing and solving equations in the form p(x + q) = r using the perimeter of rectangles.
- Translating Word Problems into Equations Shows students how to translate word problems into equations in seven steps.
- Inequal-tile-ies Work with Algebra Tiles to solve inequalities.
- Guess My Number Represent a sequence of operations using an expression and then to write and solve simple equations. The problem is posed as a game and allows the students to visualize mathematical operations.

MARS/Shell

- Steps to Solving Equations Work collaboratively in pairs or threes, matching equations to stories and then ordering the steps used to solve these equations and explain their reasoning to their peers.

Better Lesson

- Word Problems with Equations Students will be able to set up and solve equations for real world problems.
- Equations with Distributive Property In the activity, students will be working with a partner, and will be charged with the role of analyzing their partner's work if mistakes exist.

	• Inequalities Students *will be able to solve and graph inequalities with one variable.* • Inequalities - Negative Rule Students will be able to solve and graph inequalities with a negative coefficient for x. **McGraw-Hill** Course 2, Chapter 6 Lessons 1, 2, and 3: Focus on the problems with signed rational numbers; students were taught one step equations in 6th grade. The only new content in these sections is solving equations with rational numbers (integers, signed fractions and decimals). Inquiry Lab: Solve Two-Step Equations Lesson 4 Inquiry Lab: More Two-Step Equations Lesson 5 Inquiry Lab: Solve Inequalities Lessons 6,7,and 8

Grade 7 Math Semester 2	**Unit 6: Geometric Figures**	Projected Time Allotment: **12 Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.7.G.1.1 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.	• Geometric figures must be two-dimensional polygons. Calculator: **YES** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect
MAFS.7.G.1.2 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, notice when the conditions determine a unique triangle, more than one triangle, or no triangle.	• Items may include the sum of two side lengths of a triangle being greater than the third side length. • Given conditions should not focus on similarity or congruence or that the sum of angles in a triangle is 180 degrees. • Be aware of the scoring capabilities for the GRID tool when designing these items. • To distinguish from other grades, conditions should include factors other than parallel/perpendicular lines and angle measure, such as symmetry and side length. Calculator: **NEUTRAL** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect
MAFS.7.G.1.3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.	• Spheres, cones, and cylinders are allowed. • Slicing is limited to horizontal or vertical slices. • Bases of prisms and pyramids can be a triangle (any type); a square; a rectangle; or a regular pentagon or hexagon. • No composite figures. Calculator: **NEUTRAL** • GRID • Matching Item • Multiple Choice • Multiselect • Open Response
MAFS.7.G.2.5 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.	• Angle measurements are shown only in degrees and should not be greater than 180. • The following words should not be used in any item: supplementary, complementary, vertical, and adjacent. • Graphics must appear in every item. Calculator: **YES** • Equation Editor • GRID • Multiple Choice • Open Response

Decoded Standard

MAFS.7.G.1.1

Students work with scale drawings. They learn how to read them, calculate the scale, compute the actual lengths from the scale in the drawings, and reproduce a scale drawing using another scale. Scale drawings are proportional to one another. Problems should center on experiences in the students' own lives. Examples include but are not limited to scale drawings of student rooms at home, the classroom, and comic book strips. The term scale factor should be used when students are asked to reproduce a scale drawing at a different scale. A scale factor is a number that multiplies some quantity. For example, doubling the length of a window that is 3 ft long corresponds to a scale factor of 2 $(2 \times 3 = 6)$.
(*Common Core Mathematics Companion*, Pg. 165)

* Special Note: This would be an excellent place to introduce the conversion tables on the reference sheet.

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Flying Scale Find the length and area of an object when given a scale drawing of the object.
- Space Station Scale Find the ratio of the area of an object in a scale drawing to its actual area and then relate this ratio to the scale factor in the drawing.
- Garden Design Reproduce a scale drawing using a different scale.

Illustrative Mathematics Assessment Tasks

- Floor Plan Translate between measurements given in a scale drawing and the corresponding measurements of the object represented by the scale drawing. If used in an instructional setting, it would be good for students to have an opportunity to see other solution methods, perhaps by having students with different approaches explain their strategies to the class.
- Map distance Translate between information provided on a map that is drawn to scale and the distance between two cities represented on the map.
- Rescaling Washington Park Think critically about the effect that changing from one scaling to another has on an image, and then to physically produce the desired image.

Lesson Resources

Engage NY

- Grade 7 Module 1 Topic D Lesson 16 Students understand scale drawings.
- Grade 7 Module 1 Topic D Lesson 18 Students compute the lengths of pictures using a scale drawing.
- Grade 7 Module 1 Topic D Lesson 19 Given a scale drawing students compute the area of the actual picture.
- Grade 7 Module 1 Topic D Lesson 20 Students create their own scale drawings of a room or building
- Grade 7 Module 1 Topic D Lesson 21 Students produce scale drawings at a different scale.

Illuminations

- Off the Scale Examine maps of their home states and calculate distances between cities.
- Planning a Playground Design a playground using manipulatives and multiple representations and scaling the City using SimCity Objects

CPalms

- Designing a Geo-World: A Geometry Based Theme Park Investigate a contextual problem in which they will need to construct a 2-dimensional polygon, compute actual lengths and areas and then reproduce a scale drawing of the figure at a different scale.
- Making a Scale Drawing Create a detailed scale drawing.

MARS/Shell

- Drawing to Scale: Designing a Garden Interpret and use scale drawings to plan a garden layout.

McGraw-Hill

Course 2, Chapter 7

Inquiry Lab: Scale Drawing; Lesson 4

Decoded Standard

MAFS.7.G.1.2

Students practice drawing geometric shapes using technology (computer programs both commercial and free on the Internet), rulers and protractors, and free hand. While giving practice with multiple shapes, focus on triangles and constructing them from three given angles or sides. Students should determine, by looking at the given measures, whether one, more than one, or no triangles can be created. Angles need to add up to 180° to make a triangle. The sum of two side lengths of a triangle is always greater than the third side. If this is true for all three combinations of added side lengths, then you will have a triangle. (*Common Core Mathematics Companion*, Pg. 166)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Drawing Triangles AAA Draw a triangle with given angle measures, and explain if these conditions determine a unique triangle.
- Drawing Triangles AAS Draw a triangle given the measures of two angles and a non-included side and to explain if these

Lesson Resources

Engage NY

- Grade 7 Module 6 Topic B Lesson 6
- Grade 7 Module 6 Topic B Lesson 7 Lesson 6 &7 - Students use tools to draw geometric shapes based on given conditions.

conditions determine a unique triangle.

- Drawing Triangles ASA Draw a triangle given the measures of two angles and their included side and to explain if these conditions determine a unique triangle.
- Drawing Triangles SAS Draw a triangle given the measures of two sides and their included angle and to explain if these conditions determine a unique triangle.
- Drawing Triangles SSA Draw a triangle given the lengths of two of its sides and the measure of a non-included angle and to decide if these conditions determine a unique triangle.
- Drawing Triangles SSS Draw a triangle with given side lengths, and explain if these conditions determine a unique triangle.
- Sides of Triangles Determine if given lengths will create a triangle.

- Grade 7 Module 6 Topic B Lesson 8 Students draw triangles under different conditions to explore if it forms many, few or one triangle
- Grade 7 Module 6 Topic B Lesson 9
- Grade 7 Module 6 Topic B Lesson 10 Lesson 9 & 10- Students explore conditions of triangles.
- Grade 7 Module 6 Topic B Lesson 11 Students understand that three given lengths determine a triangle, provided the largest length is less than the sum of the other two lengths; otherwise, no triangle can be formed
- Grade 7 Module 6 Topic B Lesson 12 Students explore unique triangles
- Grade 7 Module 6 Topic B Lesson 13 Students use conditions to determine a unique triangle to determine when two triangles are identical.

CPalms

- Triangle Inequality Investigation Use hands-on materials to understand that only certain combinations of lengths will create closed triangles.
- Congruent Triangles Construct triangles with the parts provided.

MARS/Shell

- Possible Triangle Constructions Recall, sketch, construct and apply triangle properties and to determine whether given conditions describe a unique triangle, more than one possible triangle or does not describe a possible triangle.

McGraw-Hill

Course 2, Chapter

Inquiry Lab: Investigate Online Maps and Scale Drawings; Inquiry Lab: Create Triangles; Lesson 3

ecoded Standard

MAFS.7.G.1.3

Students relate the two-dimensional shape that results from slicing a three-dimensional figure. Three-dimensional shapes will include right rectangular prisms and right rectangular pyramids. (*Common Core Mathematics Companion*, Pg. 167)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Square Pyramid Slices Sketch and describe the two-dimensional figures that result from slicing a square pyramid.
- Rectangular Prism Slices Sketch and describe two-dimensional figures that result from slicing a rectangular prism.
- Cylinder Slices Sketch and describe the two-dimensional figures that result from slicing a cylinder.
- Cone Slices Sketch and describe the two-dimensional figures that result from slicing a cylinder.

Illustrative Mathematics Assessment Tasks

- Cube Ninjas! Explore various cross sections of a cube and use precise language to describe the shape of the resulting faces.

Lesson Resources

Engage NY

- Grade 7 Module 6 Topic C Lesson 16 Students describe rectangular regions that result from slicing a right rectangular prism by a plane perpendicular to one of the faces.
- Grade 7 Module 6 Topic C Lesson 17 Students describe polygonal regions that result from slicing a right rectangular pyramid by a plane perpendicular to the base and by another plane parallel to the base.
- Grade 7 Module 6 Topic C Lesson 18 Students describe polygonal regions that result from slicing a right rectangular prism or pyramid by a plane
- Grade 7 Module 6 Topic C Lesson 19 Students describe three-dimensional figures built from cubes by looking at horizontal slicing planes

	CPalms • Can You Cut It? Slicing Three Dimensional Figures Sketch, model, and describe cross-sections formed by a plane passing through a three-dimensional figures. **Virtual Manipulative** • Shodor: Cross Section Flyer Explore cross sections of various cones, cylinders, prisms, and pyramids. **McGraw-Hill** Course 2, Chapter 7 Lesson 6 (limit content to 7.G.1.3)

ecoded Standard	
MAFS.7.G.2.5 Explore supplementary, complementary, vertical, and adjacent angles and their relationships to one another. These facts are used in multi-step problems. see images on page 170 of the Common Core Mathematics Companion (*Common Core Mathematics Companion*, Pg. 170)	
Instructional Resources	
Formative Tasks **Mathematics Formative Assessments (MFAS)** • Solve for the Angle Write and solve equations to determine unknown angle measures in supplementary and complementary angle pairs. • Find the Angle Measure Use knowledge of angle relationships to write and solve equations to determine unknown angle measures. • Straight Angles Write and solve equations to determine unknown angle measures in supplementary angle relationships. • What Is Your Angle? Use knowledge of angle relationships to write and solve equations to determine unknown angle measures.	**Lesson Resources** **Engage NY** • Grade 7 Module 6 Topic A Lesson 1 Students solve for unknown angles in word problems and in diagrams involving complementary and supplementary angles. • Grade 7 Module 6 Topic A Lesson 2 Students solve for unknown angles in word problems and in diagrams involving complementary, supplementary, vertical, and adjacent angles. • Grade 7 Module 6 Topic A Lesson 3 Students solve for unknown angles in word problems and in diagrams involving all learned angle facts. • Grade 7 Module 6 Topic A Lesson 4 Students solve for unknown angles in word problems and in diagrams involving all learned angle facts **CPalms** • Angles, Angles Everywhere Discover complementary and supplementary angles by measuring the degrees for sets of angles. **MARS/Shell** • Applying Angle Theorems Use geometric properties to solve problems using the measures of the interior and exterior angles of polygons. **McGraw-Hill** Course 2, Chapter 7 Lessons 1 & 2 with an emphasis on supplementary, complementary, vertical, and adjacent

Grade 7 Math Semester 2	**Unit 7: Circumference, Area, Surface Area, and Volume of Compound Figures**	Projected Time Allotment: **15 Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.7.G.2.4 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.	• Circles are limited to whole circles and semicircles. Calculator: **YES** • Editing Task Choice • Equation Editor • Hot Text • Multiple Choice • Multiselect
MAFS.7.G.2.6 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.	• Three-dimensional shapes may include right prisms and right pyramids. • When the base of a figure has more than four sides, the area of the base must be given. Calculator: **YES** • Equation Editor • GRID • Multiple Choice

Decoded Standard

MAFS.7.G.2.4

Students learn formulas for area ($A = \pi r^2$) and circumference ($C = 2\pi r$) of circles and then solve problems (mathematical and real-world) using these formulas. Students participate in discovering the relationship between the two formulas. (*Common Core Mathematics Companion*, Pg. 169)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Circumference Formula Students are asked to write the formula for the circumference of a circle, explain what each symbol represents, and label the variables on a diagram.
- Circle Area Formula Students are asked to write the formula for the area of a circle, explain what each symbol represents, and label the radius on a diagram.
- Eye on Circumference Students are asked to write the formula for the area of a circle, explain what each symbol represents, and label the radius on a diagram.
- Center Circle Area Students are asked to solve a problem involving the area of a circle.
- Broken Circles Students are asked to complete and explain an informal derivation of the relationship between the circumference and area of a circle.

Illustrative Mathematics Assessment Tasks

- The Circumference of a Circle and the Area of the Region it Encloses The purpose of this task is to help students differentiate between a circle and the region inside of the circle so that they understand what is being measured when the circumference and area are being found. This task is best used as a lead-in to the formulas for circumference and area of a circle.
- Approximating the area of a circle Use formulas for the area of squares and triangles to estimate.
- Circumference of a Circle The goal of this task is to study the circumferences of different sized circles, both using manipulatives and from the point of view of scaling.
- Eight Circles The purpose of this task is to strengthen students' understanding of area.

Lesson Resources

Engage NY

- Module 3, Topic C, Lesson 16 Students know the formula for circumference C of a circle of diameter d and radius r. Students discover that the ratio of the circumference to the diameter of a circle is called pi, written π.
- Module 3, Topic C, Lesson 17 Students know the formula for the area of a circle and use it to solve problems.

Illuminations

- Tree Talk Students will measure circumference of trees in order to find diameter and calculate age of local trees using a growth rate table.
- The Ratio of Circumference to Diameter Students measure the circumference and diameter of circular objects.
- Geometry of Circles Using a MIRA™ geometry tool, students determine the relationships between radius, diameter, circumference and area of a circle.

CPalms

- The Circle This interactive lesson introduces students to the circle, its attributes, and the formulas for finding its circumference and its area.

Videos

- Math Antics - Circles, Circumference And Area Learn the difference and similarities between Circumference and Area formulas while relating them to real-life.

McGraw Hill

Course 2, Chapter 8

Inquiry Lab: Circumference; Inquiry Lab: Area of Circles; Lessons 1, 2, and 3

- Measuring the area of a circle This goal of this task is to give students familiarity using the formula for the area of a circle while also addressing measurement error while looking at the cross-section of a pipe.

Decoded Standard

MAFS.7.G.2.6

This standard pulls together much of what the students know and can do in geometry through problems solving of both mathematical and real-world problems. Students will work with two- and three-dimensional objects and apply what they know about area, volume and surface area. (*Common Core Mathematics Companion*, Pg. 171)

Special Note: Questions should not include cylinders, spheres or cones for this standard.

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Composite Polygon Area Students are asked to find the area of a composite figure.
- Octagon Area Students are asked to find the area of a composite figure.
- Cube Volume and Surface Area Students are asked to calculate the volume and surface area of a cube.
- Chilling Volumes Students are asked to solve a problem involving the volume of a composite figure.
- Composite Surface Area Students are asked to find the surface area of a composite figure.
- Prismatic Surface Area Students are asked to determine the surface area of a right triangular prism and explain the procedure.

Illustrative Mathematics Assessment Tasks

- Drinking the Lake The purpose of this task is for students to solve a volume problem in a modeling context. This task asks students to work with volumes that do not have a well-defined shape, and so is more abstract than it appears.
- Designs The purpose of this task is for students to find the area and perimeter of figures composed of squares and fractions of circles.
- Stained Glass The purpose of this task is for students to find the area and perimeter of geometric figures whose boundaries are segments and fractions of circles and to combine that information to calculate the cost of a project.

Lesson Resources

Engage NY

- Module 3, Topic C, Lesson 19 Students find the areas of triangles and simple polygonal regions in the coordinate plane with vertices at grid points by composing into rectangles and decomposing into triangles and quadrilaterals.
- Module 3, Topic C, Lesson 20 Students find the area of regions in the plane with polygonal boundaries by decomposing the plane into triangles and quadrilaterals, including regions with polygonal holes.
- Module 3, Topic C, Lesson 21 Students find the surface area of three-dimensional objects whose surface area is composed of triangles and quadrilaterals. They use polyhedron nets to understand that surface area is simply the sum of the area of the lateral faces and the area of the base(s).
- Module 3, Topic C, Lesson 22 Students find the surface area of three-dimensional objects whose surface area is composed of triangles and quadrilaterals, specifically focusing on pyramids.
- Module 3, Topic C, Lesson 23 Students use the known formula for the volume of a right rectangular prism (length x width x height).
- Module 3, Topic C, Lesson 24 Students use the formula for the volume of a right rectangular prism to answer questions about the capacity of tanks. Students compute volumes of right prisms involving fractional values for length.
- Module 3, Topic C, Lesson 25 Students solve real-world and mathematical problems involving volume and surface areas of three-dimensional objects composed of cubes and right prisms.

Illuminations

- Patterns and Functions Students investigate properties of perimeter, area, and volume related to various geometric two- and three-dimensions shapes.

MARS/Shell

- Maximizing Area: Gold Rush. Students will Explore the effects on a rectangle's area of systematically varying the dimensions whilst keeping the perimeter constant. Interpret and evaluate the data generated, identifying the optimum case

McGraw-Hill Textbook

Course 2, Chapter 8

Inquiry Lab: Volume of Pyramids; Inquiry Lab: Nets of Three-Dimensional Figures; Inquiry Lab: Relate Surface Area and Volume; Inquiry Lab: Composite Figures; Lessons 4 (review of 6.G.A.2), 5, 6, 7, and 8

Grade 7 Math Semester 2	**Unit 8: Probability**	Projected Time Allotment: **10 Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.7.SP.3.5 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 $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	• Numbers in items must be rational numbers. Calculator: **NEUTRAL** • Editing Task Choice • Equation Editor • Hot Text • Matching Item • Multiple Choice • Multiselect • Open Response
MAFS.7.SP.3.6 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 the probably not exactly 200 times.*	• Numbers in items must be rational numbers. • Long-run frequency should be greater than or equal to 300. Calculator: **NEUTRAL** • Equation Editor • Multiple Choice • Multiselect • Table Item
MAFS.7.SP.3.7 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. a. 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.* b. 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?*	• Numbers in items must be rational numbers. Calculator: **YES** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item
MAFS.7.SP.3.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. a. 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. b. 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 event. c. 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:*	• Numbers in items must be rational numbers. Calculator: **NEUTRAL** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item ASSESSED with MAFS.7.SP.3.7

If 40% 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?	

Decoded Standard

MAFS.7.SP.3.5

This standard introduces students to the concept of chance with events that are likely, unlikely, or neither likely nor unlikely. Students learn to use a scale from 0-1 representing probabilities that range from impossible to certain as in the scale from 0-1 below:

See image on page 224 of the Common Core Mathematics Companion

Numerical probabilities are numbers from 0-1, and the larger the number (the closer to 1), the more likely the event is to occur. A number near 0 $(i.e., \frac{1}{50})$ indicates an unlikely event and a number in the middle (≈ 0.5) is neither likely nor unlikely. A 0 probability is an impossible event, and a 1 is a certainty. Probabilities are expressed as ratios of the number of times an event occurs to the total number of trials performed. Probabilities can be represented as fractions, decimals, and percents. (*Common Core Mathematics Companion*, Pg. 224)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Probability or Not? Students are asked to determine whether or not a given number could represent the probability of an event.
- Likely or Unlikely? Students are asked to determine the likelihood of an event given a probability.
- Likelihood of an Event Students are asked to determine the likelihood of an event given a probability.

Lesson Resources

Engage NY

- Module 5, Topic A, Lesson 1 A probability is a number between 0 and 1 that represents the likelihood that an event will occur; interpret a probability as the proportion of the time that an event occurs when a chance experiment is repeated many times.

MARS/Shell

- Probability Games In this lesson students confront and overcome common probability misconceptions. The will count equally likely outcomes using diagrams, discuss relationships between theoretical probabilities, observe outcomes and samples sizes and calculate probabilities of independent events.

Illuminations

- What Are My Chances? Students will conduct five experiments through stations to compare theoretical and experimental probability. The class data will be combined to compare with previously established theoretical probability. Also covers 7.SP.3.6
- The Game of SKUNK In this lesson, students practice decision-making skills leading to a better understanding of choice versus chance and building the foundation of mathematical probability. Also includes 7.SP.3.6

Interactive Manipulatives/shodar.org

- Spinner In this activity, students adjust how many sections there are on a fair spinner then run simulated trials on that spinner as a way to develop concepts of probability.

McGraw Hill

Course 2, Chapter 9

Lesson 1

Decoded Standard

MAFS.7.SP.3.6

Students collect data on chance events so that they can estimate the probability of the event. Students learn the difference between theoretical probability (probability that is calculated mathematically) and experimental probability (actual outcomes of an experiment). Seldom are the theoretical and experimental probabilities equal, although the more a simulation is repeated, the closer the theoretical and experimental probabilities become.

Relative frequency is the observed number of successful outcomes in a set number of trials. It is the observed proportion of successful events. Students learn to make predictions about the relative frequency of an event by using simulations. (*Common Core Mathematics Companion*, Pg. 225)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Probability Cubed Students are asked to estimate the frequency of an event given its probability and explain why an expected frequency might differ from an observed frequency.
- Hen Eggs Students are asked to estimate the probability of a chance event based on observed frequencies.
- Game of Chance Students are asked to estimate the frequency of an event given its probability and explain why an expected frequency might differ from an observed frequency.

Illustrative Mathematics Assessment Tasks

- Heads or Tails This task asks students to think about how the distribution of observed outcomes from a chance experiment might differ from the theoretical distribution and to use observed data to estimate a probability.
- Rolling Dice Students pool the results of many repetitions of the random phenomenon (rolling dice) and compare their results to the theoretical expectation they develop by considering all possible outcomes of rolling two dice. This gives them a concrete example of what we mean by long term relative frequency.
- Tossing Cylinders The purpose of this task is to provide students with the opportunity to determine experimental probabilities by collecting data.

Lesson Resources

EngageNY

- Module 5, Topic A, Lesson 2 Estimate probabilities by collecting data on an outcome of a chance experiment; use given data to estimate probabilities.
- Module 5, Topic A, Lesson 3 Determine the possible outcomes for simple chance experiments; given a description of a simple chance experiment, students determine the sample space for the experiment; given a description of a chance experiment and an event, students determine for which outcomes in the sample space the event will occur; distinguish between chance experiments with equally likely outcomes and chance experiments for which the outcomes are not equally likely.
- Module 5, Topic B, Lesson 8 Given theoretical probabilities based on a chance experiment, students describe what they expect to see when they observe many outcomes of the experiment; students distinguish between theoretical probabilities and estimated probabilities; students understand that probabilities can be estimated based on observing outcomes of a chance experiment.

Illuminations

- Adjustable Spinner Change the number of sectors and increase or decrease their size to create any type of spinner. Then, conduct a probability experiment by spinning the spinner many times. How does the experimental probability compare with the theoretical probability?

CPalms

- A Roll of the Dice What are your chances of tossing a particular number on a number cube? Students collect data by experimenting and then converting the data in terms of probability. By the end of the lesson, students should have a basic understanding of simple events.

MARS/Shell

- Evaluating Statements About Probability This lesson unit addresses common misconceptions relating to probability of simple and compound events. The lesson will help you assess how well students understand concepts of equally likely events, randomness and sample sizes.

McGraw Hill

Course 2, Chapter 9

Inquiry Lab: Relative Frequency; Lesson 2 (limit content to 7.SP.3.6)

Decoded Standard

MAFS.7.SP.3.7

This standard is broken into two parts (a-b). We will consider them together since they are so closely related.
Overall, students develop and use probability models to find the probability of events. Uniform probability models are those where the likelihood of each outcome is equal. For example, there are 17 children in the class. What is the probability that Sam will be chosen?
Using theoretical probability, students can predict frequencies of outcomes. In part b of this standard, students look at the experimental probability to develop a model. (*Common Core Mathematics Companion*, Pg. 226)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Marble Probability Students are asked to determine probabilities based on observed outcomes from drawing marbles from a bag and to determine if the outcomes appear to be equally likely.
- Number Cube Students are asked to determine probabilities based on observed outcomes from rolling a number cube and to determine if the outcomes appear to be equally likely.
- Technical Difficulties Students are given a scenario and asked to determine the probability of two different events.
- Errand Runner Students are asked to determine the probability of a chance event and explain possible causes for the difference between the probability and observed frequencies.

Illustrative Mathematics Assessment Tasks

- Stay or Switch The purpose of the task is for students to find the theoretical probability of an event by systematically recording all of the possible outcomes in the sample space and identifying those that correspond to the event.
- How Many Buttons This task uses student generated data to assess standard 7.SP.7. This task could also be extended to address Standard 7.SP.1 by adding a small or whole class discussion of whether the class could be considered as a representative sample of all students at your school.

Lesson Resources

Engage NY

- Module 5, Topic A, Lesson 4 Students will calculate probabilities of events for chance experiments that have equally likely outcomes.
- Module 5, Topic A, Lesson 5 Students calculate probabilities for chance experiments that do not have equally likely outcomes.
- Module 5, Topic B, Lesson 9 Students compare estimated probabilities to those predicted by a probability model.

CPalms

- M & M Candy: I Want Green Students compare mathematical expectations and experimental probability; then explain any difference in the two numbers. Students use colored candy pieces (such as M & M's) for their data collection, comparisons, and explanations." from Beacon Learning Center.
- Liklely Events: Which Bag Is It? Students will try to make sense out of the sampled results of both physical and computer simulated experiments. They will indicate an increased confidence in their inferences as the number of trials increases.

McGraw Hill

Course 2, Chapter 9

Lesson 2 ((limit content to 7.SP.3.7) and 3

Decoded Standard

MAFS.7.SP.3.8

This standard is broken into three parts (a-c). We will consider them together since they are so closely related.
Students move to compound events by building on their knowledge of single events. Compound events are those where two or more events are happening at once. For example, what is the probability that you forgot to study last night *and* there will be a surprise quiz in class today? Students select tools such as organized lists, tables, and tree diagrams to represent sample spaces for compound events. Ultimately, students design their own simulation for a compound event. (*Common Core Mathematics Companion*, Pg. 228)

*Lesson 6 on Permutations and Combinations is an unnecessary extension into the High School Standard MAFS.912.S-CP.2.9

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Work Clothing Students are asked to make a tree diagram to determine all possible outcomes of a compound event.
- Number List Students are asked to make an organized list that displays all possible outcomes of a compound event.

Lesson Resources

Engage NY

- Module 5, Topic A, Lesson 6 Use tree diagrams to represent outcomes in the sample space; students calculate probabilities of compound events.
- Module 5, Topic A, Lesson 7 Students calculate

- Coat Count Students are asked to design a simulation to generate frequencies for complex events.
- Automotive Probabilities Students are asked to find the probability of a compound event using a tree diagram and explain how the tree diagram was used to find the probability.

Illustrative Mathematics Assessment Tasks

- Red Green or Blue The purpose of this task is for students to find the probability of compound events using organized lists, tables, or tree diagrams.
- Sitting Across From Each Other The purpose of this task is for students to compute the theoretical probability of a seating configuration. There are 24 possible configurations of the four friends at the table in this problem. Students could draw all 24 configurations to solve the problem but this is time consuming and so they should be encouraged to look for a more systematic method.
- Waiting Times As the standards in statistics and probability unfold, students will not yet know the rules of probability for compound events. Thus, simulation is used to find an approximate answer to these questions. In fact, part b would be a challenge to students who do know the rules of probability, further illustrating the power of simulation to provide relatively easy approximate answers to wide-ranging problems.
- Rolling Twice A fair six-sided die is rolled twice. What is the theoretical probability that the first number that comes up is greater than or equal to the second number?
- Tetrahedral Dice The purpose of this task is to have students develop an organized list, table, etc. to determine all possible outcomes of a chance experiment and then to use this information to calculate various probabilities.

probabilities of compound events.

- Module 5, Topic B, Lesson 10 Students learn how to perform simulations to estimate probabilities; students use various devices to perform simulations (e.g., coin, number cube, cards).
- Module 5, Topic B, Lesson 11 Students design their own simulations; students learn to use two more devices in simulations: colored disks and a random number table.
- Module 5, Topic B, Lesson 12 Use estimated probabilities to judge whether a given probability model is plausible; students will use estimated probabilities to make informed decisions.

Illuminations

- Random Drawing - Sampling Distribution This tool generates a sampling distribution by generating a large number of trials. You can choose the type of trial, how many tickets to draw, and how many times to repeat the trial. The results are shown in a histogram and table.

CPalms

- Pick and Roll This lesson is designed to teach students about independent and dependent compound probability and give students opportunities to experiment with probabilities through the use of manipulatives, games, and a simulation project. Also includes MAFS.7.SP.3.8
- Chancy Candy In this lesson students will use candy to find the probability of independent compound events, determining the sample space from a tree diagram. They will then do an experiment to test the theoretical probability. Once the experiment is complete, the students will compare the theoretical and experimental probability.
- How to Hit it Big in the Lottery – Probability of compound events Students will explore a wide variety of interesting situations involving probability of compound events. Students will learn about independent and dependent events and their related probabilities.

Virtual Manipulatives

- Interactive Marbles: This online manipulative allows the student to simulate placing marbles into a bag and finding the probability of pulling out certain combinations of marbles. This allows exploration of probabilities of multiple events as well as probability with and without replacement.
- Hamlet Happens The purpose of this manipulative is to help students recognize that (1) unusual events do happen, and (2) it may take a longer time for some of them to happen. The letters are drawn at random from the beginning of Hamlet's soliloquy, "To be, or not to be." Any word made from those letters (such as TO) can be entered in the box. When the start is pressed, letters are drawn and recorded. The process continues until the word appears.

McGraw-Hill Textbook

Course 2, Chapter 9

Inquiry Lab: Fair and Unfair Games; Inquiry Lab: Simulate Compound Events; Lessons (limit content to 7.SP.3.8) and 4

Grade 7 Math Semester 2	**Unit 9: Statistics**	Projected Time Allotment: **9 Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.7.SP.1.1 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.	• Numbers in item must be rational numbers. • Context must be grade appropriate. Calculator: **YES** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect • Open Response ASSESSED with MAFS.7.SP.1.2
MAFS.7.SP.1.2 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.*	• Numbers in item must be rational numbers. • Context must be grade appropriate. Calculator: **YES** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect • Open Response
MAFS.7.SP.2.3 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.*	• Numbers in items must be rational numbers. • Two data sets are required for comparison. Calculator: **NEUTRAL** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect ASSESSED with MAFS.7.SP.2.4
MAFS.7.SP.2.4 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.*	• Numbers in items must be rational numbers. • Two data sets are required for comparison. Calculator: **NEUTRAL** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect

Decoded Standard

MAFS.7.SP.1.1

Sampling is taught in this standard as a statistical tool used to gain information about a population without examining the entire population. Sampling is the process of taking a subset of subjects that is representative of the entire population and collecting data on that subset. The sample must have sufficient size to warrant statistical analysis. Samples need to be representative of the population in order to make valid generalizations and, therefore, should be randomly selected. A random sampling guarantees that each element of the population has an equal opportunity to be selected in the sample. An example of a random sample is taking a list of names at a school and selecting every fourth person to be in the sample to represent the population of the school. (*Common Core Mathematics Companion*, Pg. 217)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Ice Cream Survey Choose a sampling method that would be most representative of a population and justify their selection.
- Height Research Describe a method for collecting data in order to estimate the average height of 12 year-old boys in the U.S.
- Favorite Sport Survey Evaluate an inference made using a biased sampling method.

Illustrative Mathematics Assessment Tasks

- Mr. Briggs' Class Likes Math Determine whether the scenario will create a representative sample.

Lesson Resources

Engage NY

- Grade 7 Module 5 Topic C Lesson 13 Students differentiate population characteristic & sample statistics.
- Grade 7 Module 5 Topic C Lesson 14 Students understand how a sample is selected.
- Grade 7 Module 5 Topic C Lesson 15 Students begin to develop an understanding of sampling variability.

CPalms

- And the survey says… Use data from a random sample to draw inferences about a sample population. Analyze the results of a random sample to apply generalizations to an entire population.
- How Old are My Employees This lesson provides activities for students to conceptually understand how to estimate an unknown characteristic of a population, the effect of sample size, the effect of multiple samples in same sizes on estimations, and the representativeness of the random sampling. The lesson consists of three tasks followed by group discussion sessions and a whole class discussion session at the end.
- Populations and Samples Work in pairs to gather information using a biased sample and random sample to compare data and reflect on possible misconceptions that a biased sample could produce.

Yummy Math

- Peeps Estimate the number of Peeps sold each Easter season. Consider reasonability by making guesses. Determine necessary info, problem solve and improve their original estimates. Conduct random samplings of their estimates and compare the mean of their estimates to the actual number of peeps sold each season.

MARS/Shell

- Estimating Counting Trees Solve simple problems involving ratio and direct proportion. Choose an appropriate sampling method. Collect discrete data and record them using a frequency table.

McGraw Hill

Course 2, Chapter 10

Lesson 1

Decoded Standard

MAFS.7.SP.1.2

This standard connects to &.SP.1.1 by using the sample data collected to draw inferences. Generate multiple samples of the same size from a given population to examine the variation in estimates or predictions. This standard provides an introduction to variability. An example of data to collect is two random samples of 100 students about school lunch preferences.

School Lunch Preferred				
Sample	Burgers	Salad	Pizza	Total
#1	13	13	74	100
#2	12	11	77	100

(*Common Core Mathematics Companion*, Pg. 218)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- School Days Use data from a random sample to estimate a population parameter and explain what might be done to increase confidence in the estimate.
- Movie Genre Use data from a random sample to draw an inference about a population.

Illustrative Mathematics Assessment Tasks

- Valentine Marbles Software was used to generate 100 random samples of size 16 from a population where the probability of obtaining a success in one draw is 33.6% (Bernoulli). Given that multiple samples of the same size have been generated, students should note that there can be quite a bit of variability among the estimates from random samples and that on average, the center of the distribution of such estimates is at the actual population value and most of the estimates themselves tend to cluster around the actual population value.

Lesson Resources

Engage NY

- Grade 7 Module 5 Topic C Lesson 21 Random samples to draw informal references about the difference in population means.
- Grade 7 Module 5 Topic C Lesson 22 The difference in sample means as a multiple of a measure of variability.
- Grade 7 Module 5 Topic D Lesson 23 Students understand the *meaningful* difference of two sample means due to sample variability.

CPalms

- Generating Multiple Samples to Gauge Variation Explore variation in random samples and use random samples to make generalizations about the population.
- Using Box Plots and the Mean Absolute Deviation to Interpret Data Explores the use of box plots and the mean absolute deviation to compare two data sets and draw inferences.

Yummy Math

- Peeps Estimate the number of Peeps sold each Easter season. Consider reasonability by making guesses. Determine necessary info, problem solve and improve their original estimates. Conduct random samplings of their estimates and compare the mean of their estimates to the actual number of peeps sold each season.

MARS/Shell

- Estimating Counting Trees Solve simple problems involving ratio and direct proportion. Choose an appropriate sampling method. Collect discrete data and record them using a frequency table.

McGraw Hill

Course 2, Chapter 10

Inquiry Lab: Multiple Samples of Data; Lesson 2

Decoded Standard

MAFS.7.SP.2.3

Students compare statistics on two data sets for the first time. Build on their understanding of graphs, mean, median, mean absolute deviation (MAD), and interquartile range from sixth grade. Students understand that variability is responsible for the overlap of two data sets, which can be visible when the data are presented in graphic form – two dot plots or box-and-whisker plots, for example. With two data distributions with similar variability, students will express the difference between centers (mean, median, mode) as a multiple of a measure of variability. For an example see Reproducible 4 (pg. 261).

(*Common Core Mathematics Companion*, Pg. 220)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- TV Ages Informally determine the degree of overlap between two box plots with the same interquartile range (IQR) by expressing the difference between their medians as a multiple of the IQR.
- More TV Ages Informally determine the degree of overlap between two box plots with the same interquartile range (IQR) by expressing the difference between their medians as a multiple of the IQR.

Illustrative Mathematics Assessment Tasks

- College Athletes Conjecture about the differences in the two groups from a strictly visual perspective and then support their comparisons with appropriate measures of center and variability.
- Offensive Linemen Conjecture about the differences and similarities in the two groups from a strictly visual perspective and then support their comparisons with appropriate measures of center and variability.

Lesson Resources

CPalms

- Stepping Up Measures of Center Explore the use of dot plots and mean absolute deviation to compare and draw inferences from two different sets of numerical data.
- Who's Taller Uses real-world data sets to guide students through representing and comparing data sets in separate dot plots. Represent and compare the data sets by using the mean and MAD (mean absolute deviation).

Illuminations

- Mean and Median Using an interactive applet, students can compare and contrast properties of measures of central tendency, specifically the influence of changes in data values on the mean and median. As students change the data values by dragging the red points to the left or right, the interactive figure dynamically adjusts the mean and median of the new data set.
- Advanced Data Grapher This is an online graphing utility that can be used to create box plots, bubble graphs, scatterplots, histograms, and stem-and-leaf plots.

MARS/Shell

- Comparing Data This lesson is intended to help students to make meaningful comparisons between sets of data. In particular, selecting appropriate measures of center and variability in order to summarize the important features of a set of data and using quantitative measures to justify an argument.

McGraw Hill

Course 2, Chater 10

Inquiry Lab: Visual Overlap of Data Distributions; Lesson 4

Decoded Standard

MAFS.7.SP.2.4

Draw valid comparative inferences about two populations. The inferences are drawn from using measures of center (mean, median, mode) and variability (range, mean absolute deviation, and interquartile range) from random samples. This standard differs from the previous in that students are now drawing inferences. Using the examples from the previous standard where the data were collected will unify this work. (*Common Core Mathematics Companion*, Pg. 221)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Word Lengths Use the mean and the mean absolute deviation (MAD) to compare two distributions.
- Overlapping Trees Compare two distributions given side-by-side box plots.

Illustrative Mathematics Assessment Tasks

- College Athletes Conjecture about the differences in the two groups from a strictly visual perspective and then support their comparisons with appropriate measures of center and variability.
- Offensive Linemen Conjecture about the differences and similarities in the two groups from a strictly visual perspective and then support their comparisons with appropriate measures of center and variability.

Lesson Resources

Illuminations

- Mean and Median Using an interactive applet, students can compare and contrast properties of measures of central tendency, specifically the influence of changes in data values on the mean and median. As students change the data values by dragging the red points to the left or right, the interactive figure dynamically adjusts the mean and median of the new data set.
- Advanced Data Grapher This is an online graphing utility that can be used to create box plots, bubble graphs, scatterplots, histograms, and stem-and-leaf plots.

MARS/Shell

- Comparing Data This lesson is intended to help students to make meaningful comparisons between sets of data. In particular, selecting appropriate measures of center and variability in order to summarize the important features of a set of data and using quantitative measures to justify an argument.

McGraw Hill

Course 2, Chapter 10

Inquiry Lab: Collect Data