Pinellas County Schools

GRADE 6 MATHEMATICS ADVANCED

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

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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

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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 Rates

MAFS.6.RP.1.1 MAFS.6.RP.1.3a,b,d,e

MAFS.6.RP.1.2 MAFS.6.NS.2.4

Unit 2: Compute with Multi-Digit Numbers

MAFS.6.NS.2.2 MAFS.6.NS.2.3

Unit 3: Division of Fractions

MAFS.6.NS.1.1

Unit 4: Integers, Absolute Value, and the Coordinate Plane

MAFS.6.NS.3.5 MAFS.6.NS.3.7

MAFS.6.NS.3.6 MAFS.6.NS.3.8

Unit 5: Percent of a Quantity

MAFS.6.RP.1.3c

Unit 6: Expressions

MAFS.6.EE.1.1 MAFS.6.EE.1.4

MAFS.6.EE.1.2 MAFS.6.EE.2.6

MAFS.6.EE.1.3

Unit 7: Equations

MAFS.6.EE.2.5 MAFS.6.EE.3.9

MAFS.6.EE.2.7

Unit 8: Inequalities

MAFS.6.EE.2.5 MAFS.6.EE.2.8

Unit 9: Statisitical Measures & Displays

MAFS.6.SP.1.1 MAFS.6.SP.2.4

MAFS.6.SP.1.2 MAFS.6.SP.2.5

MAFS.6.SP.1.3

Semester 1 Review and Exam

All standards from first semester

Re-Building Community in the Math Classroom

Unit 9: Statisitical Measures & Displays

MAFS.6.SP.1.1 MAFS.6.SP.2.4

MAFS.6.SP.1.2 MAFS.6.SP.2.5

MAFS.6.SP.1.3

Unit 10: Area, Surface Area and Volume

MAFS.6.G.1.1 MAFS.6.G.1.3

MAFS.6.G.1.2 MAFS.6.G.1.4

Unit 11: Ratios and Proportional Reasoning

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

MAFS.7.RP.1.2

Unit 12: Multi-Step Percent Problems

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

Unit 13: Rational Numbers

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

MAFS.7.NS.1.2

FSA Testing Window

April 9, 2018-May 4, 2018

Unit 14: Expressions

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

January 2018

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7	8	9	10	11	12	13
14	15	16	17	18	19	20
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February 2018

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4	5	6	7	8	9	10
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March 2018

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April 2018

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8	9	10	11	12	13	14
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29	30					

May 2018

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27	28	29	30	31		

Grade 6 Math Adv Semester 1	**Unit 1: Ratios and Rates**	Projected Time Allotment: **11 Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.6.NS.2.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 10. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as (4(9+2).*	• Whole numbers less than or equal to 100. • Least common multiple of two whole numbers less than or equal to 12. Calculator: **NO** • Equation Editor • GRID • Matching Item • Multiple Choice
MAFS.6.RP.1.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*	• Whole numbers should be used for the quantities. • Ratios can be expressed as fractions, with ":", or with words. • Units may be the same or different across the two quantities. • Context itself does not determine the order. • Limit use of percent to MAFS.6.RP.1.3c. Calculator: **NO** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect Open Response • Table Item
MAFS.6.RP.1.2 Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is $\frac{3}{4}$ cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."*	• Items using the comparison of a ratio will use whole numbers. • Rates can be expressed as fractions, with ":" or with words. • Units may be the same or different across the two quantities. • Context itself does not determine the order. • Name the amount of either quantity in terms of the other as long as one of the values is on unit. Calculator: **NO** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect • Table Item
MAFS.6.RP.1.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?* d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. e. Understand the concept of Pi as the ratio of the circumference of a circle to its diameter.	• Rates can be expressed as fractions, with ":" or with words. • Units may be the same or different across the two quantities. • Percent found as a rate per 100. • Quadrant I only for MAFS.6.RP.1.3a Calculator: **NO** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect • Open Response • Table Item

Decoded Standard

MAFS.6.NS.2.4

The emphasis for this standard is finding factors and multiples of a given number(s). Students need to know that numbers being multiplied are the factors, and the product is the multiple. Explore two different methods for factoring. Introduce the distributive property as an application of factors. When you add two numbers that have a common factor such as 36 and 8, you can remove the greatest common factor, 4, and distribute it to the remaining factors, such as: $36 + 8 = (4 \times 9) + (4 \times 2) = 4(9 \times 2)$. (*Common Core Mathematics Companion*, Pg. 39)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Greatest Common Factors Students are given two whole numbers less than or equal to 100 and asked to find the greatest common factor.
- Least Common Factors Students are asked to find the least common multiple of 8 and 12 and to explain how they found their answers.

Illustrative Mathematics Assessment Tasks

- Factors and Common Factors Students apply the concepts of factors and common factors in a context.
- Multiples and Common Multiples Students apply the concepts of multiples and common multiples in a context.
- Adding Multiples Students use repeated reasoning and generalizing to solve problems involving multiples.
- The Florist Shop Students apply the concepts of factors and common factors in a context.
- Bake Sale Students apply the concepts of factors and common factors in a context.

Lesson Resources

Engage NY

- Grade 6, Module 2, Topic D, Lesson 17 students apply divisibility rules to understand factors and multiples
- Grade 6, Module 2, Topic D, Lesson 18 Students find the least common multiple and greatest common factor and apply factors to the Distributive Property

Illuminations

- Distributing and Factoring Using Area Students are given expressions representing area of a rectangle and use this to enhance understanding of distributive property and factoring.

CPalms

- Factoring out the Greatest This lesson teaches students how to find the GCF and LCM by factoring. This is a different method than is normally seen in textbooks.
- Can You find the Relationship? Students will take their understanding of GCF and LCM and apply them to solve word problems and demonstrate their understanding by creating posters.
- Can you say that another way? Students model how to express and addition problem using the distributive property.
- Digesting the Distributive Property Students use the distributive property to express a sum of tow whole numbers 1-100.

MARS/Shell

- Factors and Multiples This lesson unit is intended to help you to assess how well students are able to understand the meanings of the terms (GCF) and (LCM).

McGraw-Hill

Course 1, Chapter 1

Lesson 1

Decoded Standard

MAFS.6.RP.1.1

In this standard, students learn to compare two quantities or measures such as 6:1 or 10:2. These comparisons are called ratios. Students discover that ratios can be written and described in different ways. For instance, 6:1 uses a colon to separate values. Ratios can also be stated with words such as 6 to 1, or as fractions such as $\frac{6}{1}$. This standard focuses on understanding the concept of a ratio, however, students should use ratio language to describe real-world experiences and use their understanding for decision making. (*Common Core Mathematics Companion*, Pg. 8)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Writing Ratios Students are asked to write part-to-part and part-to-whole ratios using values given in a table.

Lesson Resources

Engage NY

- Grade 6, Module 1, Topic A, Lesson 1 Students understand that a ratio is an ordered pair of numbers which are not

- Interpreting Ratios Students are asked to explain the meaning of ratios in the context of problems.
- Comparing Time Students are given a scenario involving an additive comparison of two quantities, asked to write a ratio, and explain its meaning.
- Comparing Rectangles Students are asked to determine which of three given comparisons contains a correctly computed ratio in a context involving rectangles.

Illustrative Mathematics Assessment Tasks

- Games at Recess Students write sentences describing ratio relationships and use the appropriate symbolic notation for ratios.
- Bag of Marbles Students develop fluency in their understanding of the relationship between fractions and ratios.

both zero and use precise language and ratio notation. Can be combined with Lesson 2

- Grade 6, Module 1, Topic A, Lesson 7 Students understand the relationship between ratios and fractions.

Illuminations

- The Golden Ratio Students examine different ratios to determine whether the Golden Ratio can be found in the human body.

CPalms

- The Concept of Ratios This lesson introduces students to the term ratio, its meaning and use, and the various ways in which a ratio can be presented.
- My Favorite Recipe This lesson shows how ratios can be indicated in words such as "to", "for every", "out of every."

McGraw-Hill

Course 1, Chapter 1

Inquiry Lab: Ratios; Lesson 2

Decoded Standard

MAFS.6.RP.1.2

This standard focuses student learning on the concept of a unit rate as special kind of ratio. Students compare different units of measure such as the amount of money earned to the hours worked while babysitting and calculate unit rates by setting up ratios and simplifying them. Students understand a situation in ratio form and write the unit that describes the situation using appropriate rate language with words such as *per*, and symbols such as / to compare different units or measures. (*Common Core Mathematics Companion*, Pg. 9)

Instructional Resources

- **Formative Tasks**

Mathematics Formative Assessments (MFAS)

- Writing Unit Rates Students are given verbal descriptions of rates and asked to write them as unit rates.
- Identify Unit Rates Students are asked to decide if given statements express unit rates.
- Explaining Rates Students are asked to explain the meaning of given rates and identify any that are unit rates.
- Book Rates Students write and explain the meaning of a ratio and corresponding unit rate in the context of a word problem.

Illustrative Mathematics Assessment Tasks

- Mangos for Sale Students generate a classroom discussion about ratios and unit rates in context.
- Price per pound and pounds per dollar Students develop the concept of unit rates.
- Riding at a Constant Speed, Assessment Variation Multiple choice task to gage student understanding of unit rates.
- The Escalator, Assessment Variation Multiple choice task to gage student understanding of unit rates.
- Hippos Love Pumpkins Students find unit rates in different situations involving unusual units.
- Ticket Booth Students compare unit rates in a real world context.

Lesson Resources

Engage NY

- Grade 6, Module 1, Topic C, Lesson 16 Students recognize that they can associate a ratio of two quantities, such as the ratio of miles per hour is 5:2, to another quantity called the rate.
- Grade 6, Module 1, Topic C, Lesson 17 Given a rate, students find ratios associated with the rate.

CPalms

- Pancakes Over a Campfire! Students will learn how to set up ratios and calculate unit rates using a recipe.
- Savvy Shopper This a culminating activity for unit rates that has students apply knowledge to purchasing groceries. Specifically how knowledge of unit rates can help save money over time.

McGraw-Hill

Course 1, Chapter 1

Inquiry Lab: Unit Rate; Lesson 3

Decoded Standard

MAFS.6.RP.1.3a,b,d,e

In these standards, students use reasoning about multiplication and division to solve a variety of ratio and rate problems about quantities. They make tables of equivalent ratios relating quantities with whole-number measurements, finding missing values in the tables, and plot pairs of values on the coordinate plane. They use tables to compare ratios and solve unit rate and constant speed problems. Problems involving finding the whole given a part and the percent, such as 20% of a quantity means $\frac{20}{100}$, are also a focus. For these standards, students can use equivalent ratio tables, tape diagrams, double number lines or equations. Students connect ratios and fractions. (*Common Core Mathematics Companion*, Pg. 10)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Sara's Hike Students are asked to solve a problem involving ratios.
- Bargain Breakfast Students are given the prices of three different quantities of cereal and are asked to determine which is the best buy.
- Making Coffee Students are asked to write ratios equivalent to a given ratio.
- Party Punch – Comparing Ratios Students are asked to compare ratios given in two different tables.
- Comparing Rates Students are asked to solve rate problems given the time it takes each of two animals to run different distances.
- Measurement Conversion Students are asked to make unit conversions.
- Comparing Rates Students are asked to solve rate problems given the time it takes each of two animals to run different distances.

Illustrative Mathematics Assessment Tasks

- Mixing Concrete Students practice solving ratio problems.
- Voting for Three, Variation 1 Students define simple ratios, apply their understanding of rations, and apply a known ratio to a new one.
- Voting for Three, Variation 2 Students practice solving simple ratios in a more complex situation.
- Voting for Three, Variation 3 Students solve ratio problems in context.
- Converting Square Units Students use reasoning to solve ratio problems.
- Painting a Barn Students use mathematics addressed in different standards in the same problem.
- Friends Meeting on Bicycles Students solve ratio problems in context.
- Running at a Constant Speed Students use reasoning to solve problems with equivalent ratios and unit rates from both sides of the ratio.
- Jim and Jesse's Money Students solve ratio problems in a real world context.
- Speed Conversion Speed Conversion Students perform a unit conversion in the context of speed while also focusing on the precision of the conversion factor.
- Unit Conversion Students study conversion between some volume and weight units.

Lesson Resources

Engage NY

- Grade 6, Module 1, Topic A, Lesson 3 Students develop an intuitive understanding of equivalent ratios by using tape diagrams to explore possible quantities of each part when given the part-to-part ratio can be combined with Lesson 4
- Grade 6, Module 1, Topic A, Lesson 5 Students use tape diagrams to find an equivalent ratio when given the part-to-part ratio and the total or the difference of those two quantities. Can be combined with Lesson 6
- Grade 6, Module 1, Topic B, Lesson 9 Students understand that a ratio table is a table of equivalent ratios and use ratio tables to solve problems.
- Grade 6, Module 1, Topic B, Lesson 12 Students create equivalent ratios using a ratio table and represent these ratios on a double number line diagram.
- Grade 6, Module 1, Topic B, Lesson 14 Students associate with each ratio A:B the ordered pair (A, B) and plot it in the x-y coordinate plane. Represent ratios in ratio tables, equations, and double number line diagrams and then represent those ratios in the coordinate plane. Can be combined with Lesson 15.
- Grade 6, Module 1, Topic C, Lesson 18 Students make use of the structure of division and ratios to model (5 miles)/(2 hours) as a quantity 2.5 mph.
- Grade 6, Module 1, Topic C, Lesson 19 Students solve problems by analyzing different unit rates given in tables, equations, and graphs. Can combine with Lesson 20..
- Grade 6, Module 1, Topic C, Lesson 21 Students use rates between measurements to convert measurement in one unit to measurement in another unit.
- Grade 6, Module 1, Topic C, Lesson 21 Students decontextualize a given speed situation, representing symbolically the quantities involved with the formula rate x time.

Illuminations

- Do You Measure Up? Students identify which units of measurement are used to measure specific objects, and they learn to convert between units within the same system.
- Discovering Gallon Man Students practice making volume conversions in the customary system.

Teacher Vision

- Discovering the Magical Pi In this lesson student use data on the circumference and diameter of various objects to calculate Pi.

CPalms

- But Mom, I Really Want an iPad!!!!! Part 1 A situational story is used to capture the students' interest and to help students create a visual for the relationship between quantities in a ratio.
- Orange Juice Conversion Students will be able to convert

	measurements within systems and between systems. • Shopping and Conversion Word Problems Presents students with three shopping problems that challenge students to convert between smaller and larger measurement units and use all four mathematical operations. • It's Carnival Time This lesson uses a carnival theme that challenges the students to calculate unit rates and make measurement conversions to determine the best value for food. • Square Circles This lesson will help students discover *pi* as a constant ratio as they start by measuring squares, then move on to measuring circles. **MARS/Shell** • Solving Real-Life Problems: Selling Soup This lesson is intended to assess how well students can use proportional relationships to solve multistep ratio and percent problems. **McGraw-Hill** Course 1, Chapter 1 Inquiry Lab: Ratio and Rate; Lesson 4, 5, 6 & 7 Course 1, Chapter 4 Lesson 5

Grade 6 Math Adv Semester 1	Unit 2: Compute with Multi-Digit Numbers	Projected Time Allotment: **8 Days**

Standards/Learning Goals:	Content Limits, Assessment Types, Calculator
MAFS.6.NS.2.2 Fluently divide multi-digit numbers using the standard algorithm.	• Items may only have 5-digit dividends divided by 2-digit divisors or 4-digit dividends divided by 2- or 3-digit divisor. • Numbers in items are limited to non-decimal rational numbers. Calculator: **NO** • Equation Editor • Multiple Choice
MAFS.6.NS.2.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.	• Numbers in items must be rational numbers. • Items may include values to the thousandths place. • Items may be set up in standard algorithm form. Calculator: **NO** • Equation Editor • Multiple Choice

Decoded Standard

MAFS.6.NS.2.2

The focus for this standard is using the traditional, standard algorithm for long division. However, major emphasis is placed on the meaning of division and the understanding of place value of multi-digit numbers when dividing fluently. Fluently dividing multi-digit numbers means dividing quickly and accurately. To have fluency, students need sufficient, on-going practice with long division. (*Common Core Mathematics Companion*, Pg. 37)

Instructional Resources

Formative Tasks

Illustrative Mathematics Assessment Tasks

- Interpreting a Division Computation Use the computation shown below to find the products
- How many staples? Perform long division with a remainder in context.
- Batting Average Perform and analyze division with whole numbers in a sports context.

Lesson Resources

Engage NY

- Grade 6, Module 2, Topic C, Lesson 12 Students connect estimation with place value in order to determine the standard algorithm for division.
- Grade 6, Module 2, Topic C, Lesson 13 Students understand that the standard algorithm of division is simply a tally system arranged in place value columns.

Illuminations

- The Quotient Café This applet illustrates partial quotient division and remainders by the division of food to aliens, dinosaurs, penguins and more.

CPalms

- Dividing Decimals Investigations Students test how the basic operations performed on the dividend and divisor affect the quotient of a pair of numbers.

MARS/Shell

- Using Standard Algorithms Make sense of standard algorithms for addition, subtraction, multiplication and division of positive integers.

Annenberg Learner

- Area Models for Multiplication and Division "Division with Manipulatives": This applet helps students understanding division of multi-digit numbers using manipulatives.

McGraw-Hill

Course 1, Chapter 3

Lessons 5

Decoded Standard

MAFS.6.NS.2.3

This standard requires students to extend the models and strategies for the four operations previously developed for whole numbers in Grades 1-5 to decimals. Emphasis for addition, subtraction, multiplication, and division of multi-digit decimals is on using standard algorithms. Students estimate answers and self-correct errors in computation if needed. Fluently adding, subtracting, multiplying, and dividing multi-digit decimals means students can find a sum, difference, product, or quotient quickly and accurately. To obtain fluency, students need sufficient, on-going practice for each. (*Common Core Mathematics Companion*, Pg. 38)

Instructional Resources

Formative Tasks

Illustrative Mathematics Assessment Tasks

- Reasoning about Multiplication and Division and Place Value, Part 1 Develop reasoning and estimation strategies in order to support algorithmic computations.
- Reasoning about Multiplication and Division and Place Value, Part 2 Develop reasoning and estimation strategies in order to support algorithmic computations.
- Jayden's Snacks Add and subtract multi-digit decimals in the context of money.
- Buying Gas Recognizing contexts and compute division of multi-digit decimals.
- Gifts from Grandma, Variation 3 Multiply and divide multi-digit decimals in the context of money.
- Movie Tickets Multiply and divide multi-digit decimals in the context of money and interpreting remainders. (This task supports financial literacy)
- Setting Goals Subtract and divide multi-digit decimals in the context of money and interpreting remainders. (This task supports financial literacy)

Lesson Resources

Engage NY

- Grade 6, Module 2, Topic C, Lesson 14 Students use the algorithm to divide multi-digit decimals with and without remainders.
- Grade 6, Module 2, Topic C, Lesson 15 Students use mental math and their knowledge of dividing multi-digit numbers to solve for quotients of multidigit decimals.

CPalms

- Where Will We Stay? Students explore lodging options for their dream family vacation. Students will plan a vacation for a family of four. With a budget of $5,000 students will prepare a budget to include the cost of transportation, lodging, and attractions.
- Florida Food Round Up! Students will practice using a grocery list with a predetermined budget as they add and subtract decimals.
- A Tasty Treat In this lesson, students will be given a list of ingredients and prices they must use to create their own snack mix. Students will have to add, subtract, multiply, and divide decimal numbers.
- The Mystery of Decimals In this lesson, students review all four operations with decimals by solving problems in real-world context.

MARS/Shell

- Using Standard Algorithms Make sense of standard algorithms for addition, subtraction, multiplication and division of positive integers.

McGraw-Hill

Course 1, Chapter 3

Lessons 1, 2, 4, 6 & 8

Grade 6 Math Adv Semester 1	Unit 3: Division of Fractions	Projected Time Allotment: **5 Days**

Standards/Learning Goals:	Content Limits, Assessment Types, Calculator
MAFS.6.NS.1.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3)÷(3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3)÷(3/4)=8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷(c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi. and area 1/2 square mi.?*	• At least the divisor or dividend needs to be a non-unit fraction. • Dividing a unit fraction by a whole number or vice versa (e.g., $\frac{1}{a} \div q$ *or* $q \div \frac{1}{a}$) is below grade level Calculator: **NO** • Equation Editor • GRID • Multiple Choice • Multiselect

Decoded Standard

MAFS.6.NS.1.1

This standard emphasizes the use of fraction models including manipulative and visual diagrams to interpret, represent, and solve word problems with division of fractions. Students write equations to show how word problems are solved. Sixth graders interpret the meaning of fractions, the meaning of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. What they are actually doing is working with a complex fractions. In the example

$\frac{2}{3} \div \frac{3}{4}, \frac{2}{3}$ *is the numerator and* $\frac{3}{4}$ *is the denominator as* $\frac{\frac{2}{3}}{\frac{3}{4}}$. (*Common Core Mathematics Companion*, Pg. 34)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Fraction Division Students are asked to complete two fraction division problems – one with fractions and one with mixed numbers.
- Juicing Fractions Students are asked to write and evaluate a numerical expression involving division of fractions and mixed numbers to model and solve a word problem.
- Contextualizing Fraction Division Students are asked to write a story context for a given fraction division problem.
- Models of Fraction Division Students are asked to explain the relationship between a fraction division word problem and either a visual model or an equation.

Illustrative Mathematics Assessment Tasks

- Baking Cookies Students must first add fractions with familiar but unlike denominators then divide fractions by fractions.
- Cups of Rice Students use visuals to help understand the remainder and the fractional part of a mixed number answer.
- Dan's Division Strategy Students explore the meaning of fraction division and to connect it to what they know about whole-number division.
- Traffic Jam Students visualize division of fraction problems with contexts where the quantities involved are continuous.

Lesson Resources

Engage NY

- Grade 6, Module 2, Topic A, Lesson 1 Students use visual models, such as fraction bars, number lines, and area models, to show the quotient of whole numbers and fractions and to show the connection between them and the multiplication of fractions.
- Grade 6, Module 2, Topic A, Lesson 2 Students use visual models such as fraction bars, number lines, and area models to show the quotient of whole numbers and fractions. Students use the models to show the connection between those models and the multiplication of fractions.
- Grade 6, Module 2, Topic A, Lesson 3 Students use visual models such as fraction bars and area models to show the division of fractions by fractions with common denominators.
- Grade 6, Module 2, Topic A, Lesson 4 Students use visual models such as fraction bars and area models to divide fractions by fractions with different denominators.
- Grade 6, Module 2, Topic A, Lesson 5 Students demonstrate further understanding of division of fractions when they create their own word problems.
- Grade 6, Module 2, Topic A. Lesson 7 Students formally connect models of fractions to multiplication through the use of multiplicative inverses as they are represented in models.

CPalms

- Dividing Fractions – Tackling Word Problems Students explore the foundation for dividing fractions as well as correctly solving word problems involving division of fractions.
- Dividing Fractions Students will explore the different methods

	available for dividing fractions through a student based investigation. • Dividing by Fractions Discovery Students derive the algorithm for dividing fractions using visual fraction models and equations to represent the problem. **McGraw-Hill** Course 1, Chapter 4 Inquiry Labs: Divide Whole Numbers by Fractions, Divide Fractions; Lesson 6 & 7

Grade 6 Math Adv Semester 1	**Unit 4: Integers, Absolute Value, and the Coordinate Plane**	Projected Time Allotment: **8 Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.6.NS.3.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g.; temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.	• Numbers in items must be rational numbers. • Items should not require the students to perform an operation. Calculator: **NO** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect • Open Response
MAFS.6.NS.3.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on a number line; recognize that the opposite of the opposite of a number is the number itself, e.g., -(-3)=3, and that 0 is its own opposite. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.	• Numbers in items must be rational numbers. • Plotting of points in the coordinate plane should include some negative values (not just first quadrant). • Do not exceed a 10 x 10 coordinate grid, though scales can vary. Calculator: **NO** • Editing Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Multiselect
MAFS.6.NS.3.7 Understanding ordering and absolute value of rational numbers. a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret -3>-7 as a statement that -3 is located to the right or -7 on a number line oriented from left to right.* b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write $-3^0C>-7^0C$ to express the fact that -3^0C is warmer than -7^0C.* c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of -30 dollars, write |-30|=30 to describe the size of the debt in dollars.* d. Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.*	• Numbers in items must be positive and negative rational numbers Calculator: **NO** • Eiditng Task Choice • Equation Editor • GRID • Hot Text • Matching Item • Multiple Choice • Multiselect • Open Response

MAFS.6.NS.3.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	ASSESSED IN: MAFS.6.NS.3.6 • Plotting of points in the coordinate plane should include some negative values (not just first quadrant). • Numbers in must be positive or negative rational numbers. • Do not use polygons/vertices. • Do not exceed a 10 x 10 coordinate grid, though scales can vary. Calculator: NO • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect Graphic Response - Graphing

Decoded Standard

MAFS.6.NS.3.5

In this standard, students investigate positive and negative numbers (integers) in real-world scenarios as being opposite values or opposite directions such as $10°$ below zero (-10) and $10°$ above zero (+10). They use vertical and horizontal number lines to show all rational numbers and must explain that the meaning of zero is determined by the real-world context. (*Common Core Mathematics Companion*, Pg. 44)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Relative Fractions Students are given positive and negative fractions and asked to explain their meanings within the context of a problem.
- Relative Decimals Students are asked to explain the meaning of positive and negative decimals within the context of a problem.
- Relative Integers Students are asked to use numbers to represent gains/losses and to interpret the meaning of zero in the context of football.
- Rainfall Change Students are asked to interpret values given in a chart that represent positive and negative deviations from average rainfall.

Illustrative Mathematics Assessment Tasks

- It's Warmer in Miami Students to apply their knowledge of integers in a real-world context.
- Mile High Students interpret the meaning of signed numbers and reason based on that meaning in a context where the meaning of zero is already given by convention.

Lesson Resources

Engage NY

- Grade 6, Module 3, Topic A, Lesson 1 Students extend their understanding of the number line.
- Grade 6, Module 3, Topic A, Lesson 2 Students use positive and negative numbers to indicate a change (gain or loss) in elevation, temperature, and the balance in a bank account. Can combine with Lesson 3.
- Grade 6, Module 3, Topic A, Lesson 4 Students understand that each nonzero integer, a, has an opposite and that $-a$ and a are opposites and the same distance from zero on a number line. Can be combined with Lesson 5
- Grade 6, Module 3, Topic A, Lesson 6 Students use number lines that extend in both directions and use 0 and 1 to locate integers and rational numbers on the number line.

CPalms

- Positive or Negative, It's All About Shopping! This lesson introduces students to the concept of negative and positive integers as opposites and as indicators of movement, beginning with elevation and ending with real-world application to money.
- Positive, Zero, or Negative? This lesson involves students using positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of zero in each situation.

Better Lessons

- Visualizing Integers in our World This lesson helps students make connections between art, math, and the real world by making connections in their daily lives.

McGraw-Hill

Course 1, Chapter 5

Inquiry Lab: Integers

Decoded Standard

MAFS.6.NS.3.6

The heart of this standard focuses on previous understanding with the use of both horizontal and vertical number lines. Students extend graphing points and reflecting across zero on a number line to graphing and reflecting points across axes on a coordinate grid. They identify and plot coordinates in all four quadrants of the coordinate plane. (*Common Core Mathematics Companion*, Pg. 45)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Explaining Opposites Students are asked to graph on a number line and to explain the relationship between a number and its opposite in terms of the number line.
- Graphing on Cartesian Planes Students are asked to graph points given their coordinates and describe the coordinates of graphed points when the axes have different scales.
- Locating Quadrants Students are asked to determine in what quadrant or on which axis, points described algebraically, are located.
- Graphing Points in the Plane Students are asked to graph points given their coordinates and describe the coordinates of graphed points.
- Graphing Points on the Number Line Students are asked to find the coordinates of graphed points and graph points with rational coordinates on a number line.
- What is the Opposite? Students are asked about numbers and their opposites.

Illustrative Mathematics Assessment Task

- Extending the Number Line Students understand that there is a need for negative numbers and to see that there is a natural representation of them on the number line.
- Reflecting Points over Coordinate Axes Students practice plotting points and their reflections.
- Plotting Points in the Coordinate Plane Students get experience labeling coordinate axes appropriately to plot a given set of points, which will mean choosing an appropriate scale.
- Integers on the Number Line 2 Students get an understanding that taking the opposite of a negative number will produce a positive number with equal distance from 0.

Lesson Resources

Engage NY

- Grade 6, Module 3, Topic C, Lesson 15 Students extend their understanding of the coordinate plane to include all four quadrants, and recognize that the axes.
- Grade 6, Module 3, Topic C, Lesson 16 Students recognize that when two ordered pairs differ only by sign of one or both of the coordinates, then the locations of the points are related by reflections across one or both axes.
- Grade 6, Module 3, Topic C, Lesson 17 Students draw a coordinate plane on graph paper in two steps: (1) Draw and order the horizontal and vertical axes; (2) Mark the number scale on each axis.

CPalms

- Modern Math Warfare The lesson uses the classroom as a coordinate plane then moves into plotting points on a graph. It culminates with a game based on the "Battleship" game. All parts of the standard are covered in this lesson.
- Bomb the Boat – Sink the Teacher's Fleet! In this lesson, students learn about the four quadrants of a coordinate plane and how to plot points in those quadrants.

McGraw-Hill

Course 1, Chapter 5

Lessons 6 & 7

Decoded Standard

MAFS.6.NS.3.7

This standard focuses on understanding the ordering and the absolute value of rational numbers. Students explore the meaning of absolute value as the distance from zero on a number line. They learn that the value of -5 is less than -3 and that with negative numbers, as the absolute value increases, the value of the number decreases.

Students interpret that absolute value in a real-world scenario refers to magnitude. For example, in the case of a debt of -30 dollars, the absolute value, 30 is the magnitude or size of the debt. Emphasis in this standard is also placed on comparing rational numbers using inequality symbols. (*Common Core Mathematics Companion*, Pg. 47)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Position of Numbers Students are asked to describe the positions of numbers relative to each other on a number line.
- Submarines Students are asked to write integers to represent quantities given in context and to relate the integers with an inequality.

Lesson Resources

Engage NY

- Grade 6, Module 3, Topic B, Lesson 7 Students write, interpret, and explain order rational numbers in the real-world. Can combine with Lesson 8 and Lesson 9.
- Grade 6, Module 3, Topic B, Lesson 10 Students write and explain inequality statements involving rational numbers.

- South Pole Students are asked to interpret an inequality relating two temperatures
- Visualizing Absolute Value Students are asked to identify a number's possible locations on a number line when given the number's absolute value.
- Absolute Altitudes Students are asked to compare two elevations and their absolute values and then interpret these comparisons within a given real-world context.

Illustrative Mathematics Assessment Tasks

- Jumping Flea Students understand the absolute value of a number as its distance from 0 on the number line.
- Above and below sea level Students interpret signed numbers in a context as a magnitude and a direction and to make sense of the absolute value of a signed number as its magnitude.
- Integers on the Number Line 1 Students plot points on a horizontal number line and determine if the given inequality statements are true.
- Fractions on the Number Line Students plot fractions on a horizontal number line and determine if the given inequality statements are true.
- Comparing Temperatures Students compare signed numbers in a real-world context.

- Grade 6, Module 3, Topic B, Lesson 11 Students understand the absolute value of a number as its distance from zero on the number line. Can be combined with Lesson 12.
- Grade 6, Module 3, Topic B, Lesson 13 Students apply understanding of order and absolute value when examining real world scenarios.

CPalms

- Absolutely Integers Students will graph on number line positive numbers and then negative numbers.

Share My Lesson

- Introduction to Absolute Value This lesson is designed to introduce students to the concept and usage of absolute value.

McGraw-Hill

Course 1, Chapter 5
Lessons 2, 3 & 5

Decoded Standard

MAFS.6.NS.3.8
The focal point for this standard is solving problems by graphing points in all four quadrants of the coordinate plane. Students learn that the distance from a point on a coordinate plane to an axis is an absolute value. The coordinate plane is used to represent real-world scenarios. (*Common Core Mathematics Companion*, Pg. 49)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Garden Coordinates Students are given the coordinates of the vertices of a rectangle and are asked to graph the rectangle and find its perimeter.
- Bike Lot Coordinate Students are asked to graph two points given their coordinates and to find the coordinates of two other points so that the four points represent the vertices of a square.
- Garden Area Students are given coordinates of three vertices of a rectangle and asked to determine the fourth vertex and the area of the rectangle.
- Determine the Distance Students are given the coordinates of three points (with the same *x*- or *y*-coordinate) and asked to determine the distance between pairs of points without graphing.

Illustrative Mathematics Assessment Tasks

- Distances Between Points Students solve mathematical problems using points in the coordinate plane.

Lesson Resources

Engage NY

- Grade 6, Module 3, Topic C, Lesson 18 Students compute the length of horizontal and vertical line segments with integer coordinates for endpoints in the coordinate plane by counting the number of units between end points and using absolute value.
- Grade 6, Module 3, Topic C, Lesson 19 Students solve problems related to the distance between points that lie on the same horizontal or vertical line.

CPalms

- Coordinate Grids: The Key to the City - solving real world problems using the coordinate grid In this lesson students use previous knowledge of graphing in a 4 quadrant coordinate grid and individually solve a real world problem involving finding distance on a coordinate grid

McGraw-Hill

Course 1, Chapter 5
Inquiry Lab: Find Distance on Coordinate Plane

Grade 6 Math Adv Semester 1	Unit 5: Percent of a Quantity	Projected Time Allotment: **6 Days**

Standards/Learning Goals:	Content Limits, Assessment Types, Calculator
MAFS.6.RP.1.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.	• Rates can be expressed as fractions, with ":" or with words. • Units may be the same or different across the two quantities. • Percent found as a rate per 100. Calculator: **NO** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect • Open Response • Table Item

Decoded Standard

MAFS.6.RP.1.3c

In these standards, students use reasoning about multiplication and division to solve a variety of ratio and rate problems about quantities. They make tables of equivalent ratios relating quantities with whole-number measurements, finding missing values in the tables, and plot pairs of values on the coordinate plane. They use tables to compare ratios and solve unit rate and constant speed problems. Problems involving finding the whole given a part and the percent, such as 20% of a quantity means $\frac{20}{100}$, are also a focus. For these standards, students can use equivalent ratio tables, tape diagrams, double number lines or equations. Students connect ratios and fractions. (*Common Core Mathematics Companion*, Pg. 10)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Homework Time Students are asked to convert a given rate to an equivalent rate out of 100.
- Finding the Whole Students are asked to find the whole given a part and a percent.

Illustrative Mathematics Assessment Tasks

- Shirt Sale Find the whole given a part as the percent of the whole.
- Kendall's Vase - Tax Calculate total price based on original price plus tax.
- Exam Scores Determine percent of problems answered correctly on exam and who scored higher.
- Currency Exchange Students practice solving percent problems.
- Dana's House Students use reasoning to solve conversion problems.

Lesson Resources

Engage NY

- Grade 6, Module 1, Topic D, Lesson 24 Students understand that a percent is related to part-to-whole ratios and rates where the whole is 100.
- Grade 6, Module 1, Topic D, Lesson 25 Students write a fraction and a decimal as a percent of a whole quantity and write a percent of whole quantity as fraction or decimal.
- Grade 6, Module 1, Topic D, Lesson 26 Given a part and the percent, students solve problems involving finding the whole.
- Grade 6, Module 1, Topic D, Lesson 27 Given a part and the percent, students solve problems involving finding the whole.
- Grade 6, Module 1, Topic D, Lesson 28 Given a part and the percent, students find the percent of a quantity and solve problems involving finding the whole.
- Grade 6, Module 1, Topic D, Lesson 29 Given a part and the percent, students solve problems involving finding the whole.

Illuminations

- Grid and Percent It In this lesson, students use a 10 × 10 grid as a model for solving various types of percent problems.

CPalms

- Equivalent Fractions and Percents This lesson is designed to give students their very first experience with the concept and representation of percents by showing the visual connection between fractions and percents.

	• All "Tired" Up In this lesson students will utilize mathematical computation skills involving percentages and critical thinking skills to select the best tire deals advertised. • Money: How to Know Where It Is All Going This lesson will help students learn the importance of budgeting and the role percentages play in creating one, as well as how they apply to our daily living. **Better Lessons** • Percents and Double Number Line Diagrams and Tape Diagrams Students will be using visual representations to help them solve percent problems. **McGraw-Hill** Course 1, Chapter 2 Inquiry Labs: Model Percents, Percent of a Number; Lessons, 2, 4, 6, 7 & 8

Grade 6 Math Adv Semester 1	**Unit 6: Expressions**	Projected Time Allotment: **13 Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.6.EE.1.1 Write and evaluate numerical expressions involving whole-number exponents.	• Whole number bases. • Whole number exponents • Calculator: **NO** • Equation Editor • Multiple Choice • Multiselect
MAFS.6.EE.1.2 Write, read, and evaluate expressions in which letters stand for numbers. a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 –y.* b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2(8+7) as a product of two factors; view (8+7) as both a single entity and a sum of two terms.* c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas V=s3 and A=6s^2 to find the volume and surface area of a cube with sides of length s=1/2.*	• Numbers in items must be rational numbers. • Calculator: **NO** • Editing Task Choice • Equation Editor • Hot Text • Multiple Choice • Multiselect • Open Response
MAFS.6.EE.1.3 Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3(2+x) to produce the equivalent expression 6+3x; apply the distributive property to the expression 24x+18y to produce the equivalent expression 6(4x+3y); apply properties of operations to y+y+y to produce the equivalent expression 3y.*	• Positive rational numbers, values may include exponents. • Variables must be included in the expression. • For items using distribution, coefficients may be fractions before distribution but must be integer values after simplification. Only positive rational numbers may be distributed. • Calculator: **NO** • Equation Editor • Multiple Choice • Multiselect
MAFS.6.EE.1.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y+y+y and 3y are equivalent because they name the same number regardless of which number y stands for.*	• Numbers in items must be positive rational numbers. • Variables must be included in the expression. • Calculator: **NO** • Editing Task Choice • Equation Editor • Matching Item • Multiple Choice • Multiselect
MAFS.6.EE.2.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.	• Numbers in items must be nonnegative rational numbers. • Expressions must contain at least one variable. • Calculator: **NO** • Equation Editor • Matching Item • Multiple Choice • Open Response

Decoded Standard

MAFS.6.EE.1.1

This standard concentrates on whole-number exponents with a focus on understanding the meaning of exponents and exponential notation such as $3^2 = 3 \times 3$. Students find the value of an expression using exponential notation such as $4^3 = 64$. Students write and evaluate numerical expressions such as: $5 + 2^4 \cdot 6$. (*Common Core Mathematics Companion*, Pg. 86)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Cube House Students are asked to write a numerical expression using exponents.
- Paul's Pennies Students are asked to write and evaluate a numerical expression using exponents.
- Evaluating Exponents Students are asked to expand and evaluate exponential expressions containing whole number exponents.
- Exponent Priorities Students are asked to evaluate multi-step numerical expressions with exponents.

Illustrative Mathematics Assessment Tasks

- Seven to the What?!? Practice working with positive integer exponents and identify patterns in the last two digits of successive powers of the number seven.
- The Djinni's Offer Determine which would be more lucrative, accepting 50,000 gold coins, or one magical gold coin that doubles every day for 28 days.

Lesson Resources

Engage NY

- Grade 6, Module 4, Topic B, Lesson 5 Students discover that 3x = x + x + x is not the same thing as x3 which is x times x times x.
- Grade 6, Module 4, Topic B, Lesson 6 Students evaluate numerical expressions

CPalms

- The Power of Exponents An introductory lesson that allows students to explore the meaning behind the terms "squared" and "cubed" numbers.
- It's Hip 2b^2 eXponent^s Students will write and simplify numerical and algebraic expressions with whole-number exponents.

MARS/Shell

- Laws of Arithmetic Portion of lesson asks students to perform arithmetic operations, including those involving whole-number exponents.

McGraw-Hill

Course 1, Chapter 6

Lesson 1 & 2

Decoded Standard

MAFS.6.EE.1.2

Parts a-c of this standard emphasize translating expressions from verbal expressions to numerical ones and from numerical expressions to verbal expressions. Students evaluate expressions given values for the variables such as in the example in part c of this standard using the order of operations when appropriate. Students identify parts of an algebraic expression including sum, term, product, factor, quotient, coefficients, and constants. (*Common Core Mathematics Companion*, Pg. 87)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Writing Expressions Students are asked to write expressions involving operations with numbers and variables.
- Parts of Expressions Students are asked to identify key parts of algebraic expressions.
- Substitution Resolution Students are asked to evaluate formulas for given values of the variables.

Illustrative Mathematics Assessment Tasks

- Distance to School Write equivalent expressions to show the number of miles students travel while biking to school over a four week period.
- Rectangle Perimeter 1 Write an algebraic expression that

Lesson Resources

Engage NY

- Grade 6, Module 4, Topic D, Lesson 9 Students write expressions that record addition and subtraction with numbers.
- Grade 6, Module 4, Topic D, Lesson 10 Students identify parts of an expression using mathematical terms for multiplication.
- Grade 6, Module 4, Topic D, Lesson 14 Students write numerical expressions in two forms, dividend divided by divisor and dividend/divisor and note the relationship between the two.
- Grade 6, Module 4, Topic E, Lesson 15 Students read expressions in which letters stand for numbers. They assign operation terms to operations when reading and identify parts of an expression using mathematical terms for all operations.
- Grade 6, Module 4, Topic E, Lesson 16 Students write algebraic expressions that record all operations with

could be used to find the perimeter of a rectangle.	numbers and letters standing for the numbers. • Grade 6, Module 4, Topic E, Lesson 17 Students write algebraic expressions that record all operations with numbers and letters standing for the numbers. **Illuminations** • Join the Club: Identifying and Combining Like Terms In this lesson, students learn the definition of like terms and gain practice in identifying key features to sort and combine them. **CPalms** • Decoding Word Phrases This lesson is designed to help students decode word phrases and then translate them from word form into numerical form. • Let's Translate This lesson teaches students to translate verbal phrases into algebraic expressions. • Expressions, Phrases and Word Problems, Oh My! This lesson allows students to translate written phrases into algebraic expressions and vice versa, and analyze word problems. • Collectively Collecting In this lesson, students will examine and experience collecting like terms through an analogy to real world situations and the use of manipulatives. **MARS/Shell** • Interpreting Algebraic Expressions This lesson unit is intended to assess how well students are able to translate between words, symbols, tables, and area representations of algebraic expressions. **McGraw-Hill** Course 1, Chapter 6 Inquiry Lab: Write Expressions; Lesson 3 & 4

Decoded Standard	
MAFS.6.EE.1.3 This standard spotlights applying properties (distributive property, the multiplicative identify of 1, and the commutative property for multiplication of operations) with expressions involving variables to generate equivalent expressions. (*Common Core Mathematics Companion*, Pg. 89)	
Instructional Resources	
Formative Tasks **Mathematics Formative Assessments (MFAS)** • Generating Equivalent Expressions Students are asked to write equivalent expressions using the Distributive Property. • Equal Sides, Equivalent Expressions Students are asked to generate and justify an expression is equivalent to a given one using the properties of operations. • Associative and Commutative Expressions Students are asked to write expressions equivalent to a given one by using the Associative and Commutative Properties. **Illustrative Mathematics Assessment Tasks** • Watch out for Parentheses Evaluate three different expressions containing the same integers to see how the placement of parentheses will affect the solution.	**Lesson Resources** **Engage NY** • Grade 6, Module 4, Topic D, Lesson 11 Students model and write equivalent expressions using the distributive property. • Grade 6, Module 4, Topic D, Lesson 12 Students model and write equivalent expressions using the distributive property. They move from a factored form to an expanded form of an expression. **Illuminations** • Distributing and Factoring Using Area In this lesson, expressions representing area of a rectangle are used to enhance understanding of the distributive property. **CPalms** • Extending the Distributive Property In this lesson, students will build upon their understanding of the distributive property using real-world situations and manipulatives.

	• Have You Met Your Match? In this lesson, students will use the properties of operations to generate and identify equivalent expressions. **McGraw-Hill** Course 1, Chapter 6 Inquiry Labs: Distributive Property; Lesson 5 & 6

Decoded Standard
MAFS.6.EE.1.4 This standard focuses on combining like terms in expressions. Students substitute values into expressions to prove equivalence. For example, $Are\ 3(x+4) and\ 3x+12\ equivalent\ expressions?$ Substitute a numerical value for *x* such as 2. Then, $3(2+4)=18\ and\ (3\times 2)+12=18$ so the expression are equivalent. (*Common Core Mathematics Companion*, Pg. 90)

Instructional Resources

Formative Tasks	**Lesson Resources**
Mathematics Formative Assessments (MFAS) • Identifying Equivalent Expressions Students are asked to identify expressions equivalent to a given expression and justify their responses. • Equivalent Exponents Students are asked to identify expressions equivalent to a given exponential expression and justify their responses. • Equivalent Expressions Students are asked to determine if pairs of expressions are equivalent and to justify their responses. • Property Combinations Students are asked to identify expressions equivalent to a given expression and justify their responses using properties of operations. **Illustrative Mathematics Assessment Tasks** • Rectangle Perimeter 2 Determine which expressions out of a group of four are equivalent and can be used to calculate the perimeter of a rectangle accurately. • Rectangle Perimeter 3 Compute the perimeter of a rectangle using two different algebraic expressions and explain why result is always the same. • Equivalent Expressions Apply the distributive, commutative, and associative properties to algebraic expressions to match expressions with those that are equivalent.	**Engage NY** • Grade 6, Module 4, Topic C, Lesson 7 Students understand that a letter represents one number in an expression. • Grade 6, Module 4, Topic C, Lesson 8 Students understand that a letter represents one number in an expression. ***Also covers EE.1.3 properties*** **CPalms.** • Equivalent Expressions Students are asked to use properties of operations to match expressions that are equivalent and to write equivalent expressions for any expressions that do not have a match. **Illuminations** • Extending to Symbols In this investigation, students learn about the notion of equivalence in concrete and numerical settings. As students begin to use symbolic representations, they use variables as place holders or unknowns. **McGraw-Hill** Course 1, Chapter 6 Inquiry Lab: Equivalent Expressions; Lesson 7

Decoded Standard
MAFS.6.EE.2.6 This standard concentrates on writing expressions using variable that represent real-world or mathematical problems. Students learn that a variable represents an unknown number or any number in a specified set. (*Common Core Mathematics Companion*, Pg. 93)

Instructional Resources

Formative Tasks	**Lesson Resources**
Mathematics Formative Assessments (MFAS) • Inventing X Students are asked to write and explain a real-world situation to accompany an algebraic expression. • Writing Real Work Expressions Students are asked to use variables to write expressions that represent quantities described in context. • Gavin's Pocket Students are asked to interpret the significance of	**Engage NY** • Grade 6, Module 4, Topic F, Lesson 18 Students use variables to write expressions involving addition and subtraction from real-world problems and evaluate these expressions when given the value of the variable. • Grade 6, Module 4, Topic F, Lesson 19 Students develop expressions involving addition and subtraction from real-world

a variable and its possible values when given a variable expression in a real-world context. .	problems and evaluate these expressions for given values • Grade 6, Module 4, Topic F, Lesson 20 Students develop expressions involving multiplication and division from real-world problems and evaluate for given values. • Grade 6, Module 4, Topic F, Lesson 21 Students develop formulas involving multiplication and addition from real-world problems and evaluate for given values. . **CPalms** • Chairs Around the Table This lesson allows exploration into the use of variables, linear patterns, and writing expressions from real-world situations. • How Much Was Lunch? This lesson explores using substitution to solve real-world problems involving variables. **MARS/Shell** • Interpreting Equations This lesson is intended to help students uncover and address misconceptions concerning the meaning of variables in equations **McGraw-Hill** Course 1, Chapter 6 Lesson 4, Embed this standard with other sections in the chapter with real world problems.

Grade 6 Math Adv Semester 1	**Unit 7: Equations**	Projected Time Allotment: **6 Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.6.EE.2.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	• Numbers in items must be nonnegative rational numbers. • One-variable linear equations and inequalities. • An equation or inequality should be given if a context is included. • Inequalities are restricted to < or >. Calculator: **NO** • Equation Editor • Matching Item • Multiple Choice • Multiselect • Open Response
MAFS.6.EE.2.7 Solve real-world and mathematical problems by writing and solving equations of the form *x+p=q and px=q* for cases in which *p*, *q*, and *x* are all non-negative rational numbers.	• Numbers in items must be nonnegative rational numbers. • Items must be one-step linear equations with one variable. Calculator: **NO** • Equation Editor • Multiple Choice
MAFS.6.EE.3.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d=65t to represent the relationship between distance and time.*	• Equation of the form y=px or y=x+p. • Numbers in items must be positive rational numbers (zero can be used in graph and table). • Variables need to be defined. • Relationships are to be continuous. • Calculator: **NO** • Editing Task Choice • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect • Open Response • Table Item

Decoded Standard

MAFS.6.EE.2.5 (focus on equations)

The center for attention for this standard is solving an equation or inequality as a process of answering the following question: *Which values from a specified set make the equation or inequality true?* Students simplify numerical expressions by substituting values for given variables and use substitution to determine whether a given number in a specified set makes an equation true or which set of numbers makes an inequality true. Limit solving inequalities to selecting values from a given set that would make the inequality true. For example, find the value(s) of *y* that will make $7.2 + y \geq 9$. Select your value(s) from the set $=\{1, 1.3, 1.8, 2, 3\}$. (*Common Core Mathematics Companion*, Pg. 92)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Solutions of Equations Students are asked to explain what it means for a number to be a solution of an equation.
- Finding Solutions of Equations Students are given three

Lesson Resources

Engage NY

- Grade 6, Module 4, Topic G, Lesson 25 Students learn the definition of solution in the context of placing a value into a variable to see if it makes the equation true.

equations and asked to determine if any numbers from a given set are solutions.	**Illuminations** • Algebra in Balance In this lesson, students begin with an exploration of Balance Pans to discover the balance of the left and right side of an equation. **CPalms** • Solving One-Step Equations Using Mental Math In this lesson students will solve one-step equations using mental math and guess-and-check. Students will use number cubes to generate random numbers to test as solutions to the equations. • Bake Sale This lesson challenges student to develop and solve equations for mathematical and real-world situations. **McGraw-Hill** Course 1, Chapter 7 Lesson 1

ecoded Standard

MAFS.6.EE.2.7

Attention for this standard is placed with solving equations for real-world and mathematical problems that involve positive rational numbers and zero. To solve the equation, students can draw pictures such as this example: *"Juan spent $48.99 on three T-shirts. If each shirt is the same amount, write an algebraic equation that represents this situation and solve to determine how much one T-Shirt costs. The picture created is a bar model chart."* Each bar is labeled *S* for T-shirt, so each shirt costs the same amount of money. The bar model represents the equation $3S = \$48.99$. To solve the problem, students divide the total cost of $48.99 by 3.

$48.99		
S	*S*	*S*

(*Common Core Mathematics Companion*, Pg. 94)

Instructional Resources

Formative Tasks	**Lesson Resources**
Mathematics Formative Assessments (MFAS) • Equally Driven Students are asked to solve a real-world problem involving distance driven by writing and solving an equation. • Center Section Students are asked to solve a real-world problem involving seats in an auditorium by writing and solving an equation. • University Park Students are asked to solve a real-world problem involving parking spaces by writing and solving an equation. • Solar Solutions Students are asked to solve a real-world problem involving solar panels by writing and solving an equation. **Illustrative Mathematics Assessment Tasks** • Firefighter Allocation Write and solve an equation to determine the number of firefighters a town can employ while staying within a budget. • Fruit Salad Determine the amounts of different kinds of fruits in a fruit salad using ratio reasoning or a linear equation. • Morning Walk Write and solve an equation to determine how long a girl walks her dog in the morning using the total number of miles she walks the dog in a week.	**Engage NY** • Grade 6, Module 4, Topic G, Lesson 26 Students solve one-step addition & subtraction equations by relating to a diagram. • Grade 6, Module 4, Topic G, Lesson 27 Students solve one-step multiplication & division equations by relating to a diagram. • Grade 6, Module 4, Topic G, Lesson 28 Students employ tape diagrams to determine the solution to one-step equations. • Grade 6, Module 4, Topic G, Lesson 29 Students use their knowledge of simplifying expressions, order of operations and properties of equality to calculate the solution of multi-step equations using a diagram. • Grade 6, Module 4, Topic H, Lesson 30 Students calculate missing angle measures by writing and solving equations. **CPalms** • Solving Equations with Beans Students will use dried white and black beans to solve one-step equations with integer operations. • Writing and Solving Equations from Real World Problems Students will learn to write equations for given real world problems. They will write their own problem, the equation, then solve. **McGraw-Hill** Course 1, Chapter 7 Inquiry Labs: Solve and Write Addition Equations, Subtraction Equations, Multiplication Equations & Division Equations: Lessons 2, 3, 4 & 5.

Decoded Standard

MAFS.6.EE.3.9

This standard accents using variables to represent two quantities in real-world scenarios. Students recognize that a change in the independent variable creates a change in the dependent variable, such as the following: As *x* changes, *y* also changes. Emphasis is placed on writing an equation to express the quantity in terms of the dependent and independent variables. Students also identify relationships between tables, graphs, and equations and relate these back to the equation. (*Common Core Mathematics Companion*, Pg. 97)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Bicycling Equation Students are asked to write an equation from a real-world context and identify and describe the independent and dependent variables.
- Grinding Equations Students are asked to write equations from real-world contexts and identify the independent and dependent variables.
- Analyzing the Relationship Students are given an equation and asked to make a table of values and a graph, and asked to explain the relationship between the independent and dependent variables.
- Table to Equation Students are asked to write an equation that represents the relationship between two variables and to explain how the equation reflects the relationship.

Illustrative Mathematics Assessment Tasks

- Chocolate Bar Sales Complete a table of values, write an equation from the table, identify the independent and dependent variables, graph the equation, and make calculations using the equation.

Lesson Resources

Engage NY

- Grade 6, Module 4, Topic H, Lesson 31 Students analyze an equation in two variables to choose an independent variable and dependent variable. Students create a table and compute entries in the table by choosing arbitrary values for the independent variable (no constraints) and then determine what the dependent variable must be.
- Grade 6, Module 4, Topic H, Lesson 32 Students analyze an equation in two variables, choose an independent variable and a dependent variable, make a table and make a graph for the equation by plotting the points in the table.

CPalms

- Everything Balances Out in the End Allows students to simplify numerical expressions using a balance scale applet.
- I'll Fly Today This lesson allows students to use the distance, rate, and time formula to calculate distances and total costs of different trips.

MARS/Shell

- Modeling: Car Skid Marks This lesson is intended to help students use variables to represent quantities and analyze the relationship between these variables using tables, graphs, and equations.

McGraw-Hill

Course 1, Chapter 8

Lesson 1, 3 & 4. Focus on independent and dependent variables in terms of equations.

Grade 6 Math Adv Semester 2	**Unit 8: Inequalities**	Projected Time Allotment: **8 Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.6.EE.2.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	• Numbers in items must be nonnegative rational numbers. • One-variable linear equations and inequalities. • An equation or inequality should be given if a context is included. • Inequalities are restricted to < or >. Calculator: **NO** • Equation Editor • Matching Item • Multiple Choice • Multiselect • Open Response
MAFS.6.EE.2.8 Write an inequality of the form $x>c$ or $x<c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x>c$ or $x<c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.	• Numbers in items must be nonnegative rational numbers. • Context in real-world items should be continuous or close to continuous. • Inequalities are limited to < or >. Calculator: **NO** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect • Open Response

Decoded Standard

MAFS.6.EE.2.5 (focus on inequalities)
The center for attention for this standard is solving an equation or inequality as a process of answering the following question: *Which values from a specified set make the equation or inequality true?* Students simplify numerical expressions by substituting values for given variables and use substitution to determine whether a given number in a specified set makes an equation true or which set of numbers makes an inequality true. Limit solving inequalities to selecting values from a given set that would make the inequality true. For example, find the value(s) of *y* that will make $7.2 + y \geq 9$. Select your value(s) from the set $=\{1, 1.3, 1.8, 2, 3\}$. (*Common Core Mathematics Companion*, Pg. 92)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Solutions of Inequalities Students are asked to explain what it means for a number to be a solution of an inequality.
- Finding Solutions of Inequalities Students are given three inequalities and asked to determine if any numbers from a given set are solutions.

Illustrative Mathematics Assessment Tasks

- Log Ride Solve an inequality to determine how many children can safely ride a log ride.

Lesson Resources

Engage NY

- Grade 6, Module 4, Topic H, Lesson 23 Students explain what equality and inequality symbols stand for and determine if a number sentence is true or false based on the given symbol.
- Grade 6, Module 4, Topic G, Lesson 24 Students identify values for the variable in an inequality that result in either true or false number sentences
- Grade 6, Module 4, Topic H, Lesson 33 Students understand that an inequality with numerical expressions is true if the numbers calculated on each side of the inequality sign result in a correct statement.

CPalms

- How Much Was Lunch? This lesson explores using substitution to solve real-world problems involving variables.

MARS/Shell

- Evaluating Statements about Number Operations This lesson is intended to assess how well students understand the properties of number operations and can substitute values into

	inequality statements to assess their validity. **McGraw-Hill** Course 1, Chapter 8 Inquiry Lab: Inequalities; Lesson 5

Decoded Standard

MAFS.6.EE.2.8

The essence of this standard is graphing inequalities on a number line and writing inequalities to solve real-world mathematical problems. Students check by substitution to determine if the graph of an inequality is correct. (*Common Core Mathematics Companion*, Pg. 95)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Acres and Altitudes Students are given a context from which to write an inequality statement about acres and altitudes.
- Roadway Inequalities Students are given a context from which to write an inequality statement about lane widths and gas prices.
- Transportation Number Lines Students are given an inequality to graph and asked to list sample solutions.
- Rational Number Lines Students are given an inequality to graph and asked to select sample solutions.

Illustrative Mathematics Assessment Tasks

- Fishing Adventures 1 Write and graph inequalities to represent the total number of people and the total weight that a boat can hold.
- Height Requirements Write and graph inequalities to represent the height requirements of different rides at an amusement park.

Lesson Resources

Engage NY

- Grade 6, Module 4, Topic H, Lesson 34 Students recognize that inequalities of the form $x < c$ and $x > c$, where x is a variable and c is a fixed number have infinitely many solutions when the values of x come from a set of rational numbers.

CPalms

- Writing Inequalities to Represent Situations In this lesson, students will learn how to write inequalities to represent situations and compare the solutions of inequalities to that of equations.

MARS/Shell

- Evaluating Statements about Number Operations This lesson is intended to assess how well students understand the properties of number operations and can substitute values into inequality statements to assess their validity.

McGraw-Hill

Course 1, Chapter 8

Inquiry Lab: Solving One Step Inequalities; Lesson 6

Grade 6 Math Adv Semester 1 & 2	**Unit 9: Statistical Measures and Displays**	Projected Time Allotment: **16 Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.6.SP.1.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*	• N/A Calculator: **NO** • Editing Task Choice • Hot Text • Multiple Choice • Multiselect • Open Response
MAFS.6.SP.1.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.	• Numbers in items must be rational numbers. • Dot/line plots, histograms, and box plots are allowed. Calculator: **NO** • Equation Editor • GRID • Multiple Choice • Multiselect
MAFS.6.SP.1.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.	• Numbers in items must be rational numbers. • Data sets in items must be numerical data sets. Calculator: **NO** • Equation Editor • Multiple Choice • Multiselect
MAFS.6.SP.2.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.	• Numbers in items must be rational numbers. • Displays should include only dot/line plots, box plots, or histograms. Calculator: **NO** • GRID • Multiple Choice • Multiselect
MAFS.6.SP.2.5 Summarize numerical data sets in relation to their context, such as by: b. Reporting the number of observations. c. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. d. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. e. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.	• Numbers in items must be rational numbers. • Displays should include only dot/line plots, box plots, or histograms. Calculator: **NO** • Editing Task Choice • Equation Editor • GRID • Hot Text • Multiple Choice • Multiselect

Decoded Standard

MAFS.6.SP.1.1

The focus for this standard is identifying the difference between statistical and non-statistical questions and formulating/writing simple questions to provide differences in responses. A statistical question must be stated so that responses will allow for differences. In the example, *"What color are the shoes I am wearing?"* only one response can be given. However, with the example, *"What color of shoes are the students in our class wearing?"* a variety of responses can be collected. Students recognize responses to statistical questions have variation that may be used to draw conclusions about the data set. (*Common Core Mathematics Companion*, Pg. 202)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

Questions About a Class Students are asked to determine whether or not questions are statistical and justify their responses.

TV Statistics Students are asked to write a statistical question and explain why it is statistical.

Illustrative Mathematics Assessment Tasks

Identifying Statistical Questions Help students learn to distinguish between statistical questions and questions that are not statistical.

Buttons: Statistical Questions Provide questions related to a particular context (a jar of buttons) so that students can identify which are statistical questions. Also provides students with an opportunity to write a statistical question that pertains to the context.

Statistical Questions Promote a discussion of what makes a statistical question.

Lesson Resources

Engage NY

- Grade 6, Module 6, Topic A, Lesson 1 Students distinguish between statistical questions and those that are not statistical.

CPalms

- What is a Question? Students recognize and formulate a statistical question. Then collect data from their classmates.
- Survey Says Lesson addresses statistical and non-statistical questions. Students talk about what is exciting about "The Family Feud" and how the questions on the show are examples of statistical questions.
- Statistical Question Sort Students will explore statistical questions, create statistical questions and understand when a question is non-statistical.

McGraw-Hill

Course 1, Chapter 11

Inquiry Lab: Statistical Questions

Decoded Standard

MAFS.6.SP.1.2

This standard focuses on the understanding that data collected to answer a statistical question can be analyzed by their distribution. A distribution is the arrangement of their values of a data set and is described as using its center (median or mean) and spread. The single value for each of the measures of center (mean, median, or mode) and measures of spread (range) is used to summarize the data. By finding the measures of center for a set of data, students used the value to describe the data in words. Students use histograms and box plots to describe a set of data using its center (mean, median, and mode), spread (range), and overall shape. (*Common Core Mathematics Companion*, Pg. 203)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Pet Frequency Students are asked to describe the distribution of data given in raw form.
- Math Test Center Students are asked to describe the center of distributions of data given in dot plot format.
- Math Test Spread Students are asked to describe the spread of distributions of data given in dot plot format.
- Math Test Shape Students are asked to describe the shape of distributions of data given in dot plot format.

Illustrative Mathematics Assessment Tasks

- Electoral College Help students understand that a distribution can be described in terms of shape and center, and also to provide practice in selecting and calculating measures of center.
- Average Number of Siblings Compare the mean and median

Lesson Resources

Engage NY

- Grade 6, Module 6, Topic A, Lesson 2 Given a dot plot, students begin describing the distribution of the points on the dot plot in terms of center and variability.

Illuminations

- Exploring Mean and Median Using Box Plots 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.

CPalms

- Statistically Speaking Part I: An Investigation of Statistical Questions and Data Distribution Through cooperative learning activities, the students will develop an understanding of how to analyze the data collected to answer a statistical question.

in a context where the data is slightly skewed to the right.	• Statistically Speaking Part II: An Investigation of Statistical Questions and Data Distribution This lesson focuses on math concepts related to identifying clusters, gaps, outliers and overall shape of a line plot, it will help students build a strong foundation for future concepts in the statistics and probability domain. • Puppy Weights Using the information provided, create an appropriate graphical display and answer the questions regarding shape, center and variability. **MARS/Shell** • Mean, Median, Mode and Range Use a frequency chart to describe a possible data set, given information on the mean, median, mode, and range. **McGraw-Hill** Course 1, Chapter 11 Lessons 1, 2, & 3

Decoded Standard

MAFS.6.SP.1.3

This standard helps students understand that a data distribution may not have a definite center. Sixth graders discover that different ways to measure center produce different values. The median measures center as the middle value. The mean measures center as the value that each data point would take on if the total of the data values were redistributed equally. It is a balance point. Students recognize that a measure of variability can also summarize data because two very different sets of data can have the same median and mean but differ by their variability. (*Common Core Mathematics Companion*, Pg. 205)

Instructional Resources

Formative Tasks	Lesson Resources
Mathematics Formative Assessments (MFAS) • Explain Measures of Center Students are asked to list measures of center and explain what they indicate about a set of data. • Explain Measures of Variability Students are asked to list measures of variability and explain what they indicate about a set of data. • Compare Measures of Center and Variability Students are asked to explain the difference between measures of center and measures of variability. • Analyzing Physical Activity Students are asked to calculate measures of center and variability, identify outliers, and interpret the meaning of each in context.	**Engage NY** • Grade 6, Module 6, Topic B, Lesson 6 Students define the center of a data distribution by a "fair share" value called the mean. Can combine with Lesson 7 & Lesson 8 • Grade 6, Module 6, Topic B, Lesson 9 Students calculate the mean absolute deviation (MAD) for a given data set and interpret it as the average distance of data values from the mean. • Grade 6, Module 6, Topic B, Lesson 10 Students calculate the mean and MAD for a data distribution and use the mean and MAD to describe a data distribution in terms of center and variability. Can be combined with Lesson 11 to describe the similarities and differences between two distributions. • Grade 6, Module 6, Topic C, Lesson 12 Given a data set, students calculate the median of the data. • Grade 6, Module 6, Topic C, Lesson 13 Students calculate the median of the data and describe the variability in the data by calculating the interquartile range. **Illuminations** • Why is California So Important? Students learn about the mechanics of the Electoral College and use data on population and electoral votes for each state. **CPalms** • Data Detectives Students will become "Data Detectives" as they investigate that a measure for the center of a numerical data set summarizes all of its values with a single number. • Universal GPA This lesson incorporates examples that are relevant to students' interests and uses diverse methods of presentation to demonstrate how changes in measures of variation can affect the measure of central tendency.

	• Play Like you "MEAN" It! Students will investigate how a measure of center, the mean, summarizes a numerical data set of all the values with a single number. **McGraw-Hill** Course 1, Chapter 11 Lesson 5

Decoded Standard

MAFS.6.SP.2.4

Students learn how to display data on dot plots, histograms, and box plots (also known as box and whisker plots). A dot plot is appropriate for small- to moderate-size data sets of up to 25 numbers and is useful for highlighting the distribution and spread of the data, including clusters, gaps, and outliers. Histograms display the distribution of continuous data using intervals on a number line. Box plots display the distribution of values in a data set by dividing the set into quartiles. After creating the plots students interpret them, giving meaning to the context with statements such as, *"There is little variation in these data because the range on this box plot is 3."* Sixth graders learn to select the most appropriate display to represent the given data. (*Common Core Mathematics Companion*, Pg. 208)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Shark Attack Data Students are asked to construct a box plot corresponding to a given set of data.
- Chores Data Students are asked to display numerical data on a dot plot.
- Basketball Histogram Students are asked to construct a histogram corresponding to a given set of data.

Illustrative Mathematics Assessment Tasks

- Puzzle Times Assess students' ability to construct a dot plot and to calculate and compare measures of center.
- Average Number of Siblings Compare the mean and median in a context where the data is slightly skewed to the right.
- Comparing Test Scores Critically compare the center and spread of two data sets.

Lesson Resources

Engage NY

- Grade 6, Module 6, Topic A, Lesson 3 Students create a dot plot of a given data set and describe the distribution.
- Grade 6, Module 6, Topic A, Lesson 4 Students construct a frequency histogram and recognize that the number of intervals may affect the shape of a histogram.
- Grade 6, Module 6, Topic C, Lesson 14 Students construct a box plot from a given set of data.
- Grade 6, Module 6, Topic C, Lesson 16 Students summarize a data set using box plots and use them to compare two data distributions.

Illuminations

- Where is Everybody? Using two online activities (State Data Map and Canada Data Map), students use ratios and percents to compare population density and explore various statistical measures.
- Using NBA Statistics for Box and Whisker Plots Students use information from NBA statistics to make and compare box and whisker plots.

CPalms

- Hista what, hista who Students begin by creating a Venn diagram to compare/contrast bar graphs and histograms.
- Box Plots are Easy!! Hands-on activity that introduces students to the concepts of number summaries, interquartile ranges and box plots.
- Dot Plots and Histograms Students will be exploring numeric displays including dot plots and histogram.
- Plotting Our Scores Students will create two box plots on the same number line and interpret the data.
- Histogram (Virtual Manipulative) In this activity, students can create and view a histogram using existing data sets or original data entered.
- Bar Chart (Virtual Manipulative) This virtual manipulative is intended to introduce users to the idea of visual representation of data by means of a bar chart.
- Box Plotter (Virtual Manipulative) Users select a data set or enter their own data to generate a box plot.

	• Histogram vs. Box Plot (Virtual Manipulative) This simulation allows the student to create a box plot and a histogram for the same set of data and toggle between the two displays. • Eat Your Veggies: Alphabet Soup Students will participate in a human box plot and then determine the mean, mode, median, and range of the data set. **McGraw-Hill** Course 1, Chapter 12 Lessons 1, 2, 3 & 6

Decoded Standard
MAFS.6.SP.2.5 This standard emphasizes summarizing data. Students communicate a deep understanding of (1) observations (sample size, sometimes labeled as the *n* of the data), (2) appropriate measure of center and spread for a particular data set, (3) appropriate section of a graph to represent data collected, and (4) overall patterns in a distribution, including outliers, through statistical investigation. (*Common Core Mathematics Companion*, Pg. 210)

Instructional Resources

Formative Tasks	**Lesson Resources**
Mathematics Formative Assessments (MFAS) • Quiz Mean and Deviation Students are asked to calculate measures of center and variability, identify outliers, and interpret the meaning of each in context. • Florida Lakes Students are asked to interpret a histogram by describing the variable under investigation and the number of observations. • Select the Better Measure Students are asked to select the better measure of center and variability for each of two distributions of the data. **Illustrative Mathematics Assessment Tasks** • Math Homework Problems Calculate and interpret the Mean Absolute Deviation in a context. • Mean or Median? Examine advantages and disadvantages of the mean and median for summarizing a given data set.	**Engage NY** • Grade 6, Module 6, Topic C, Lesson 16 Students summarize a data set using box plots, the median, and the interquartile range and use box plots to compare two data distributions. • Grade 6, Module 6, Topic D, Lesson 17 Students construct a statistical question, collect and use data to construct appropriate graphical & numerical summaries. (This addresses the four step statistical process that can be used to summarize the standard). • Grade 6, Module 6, Topic D, Lesson 18 Students match the graphical representations and numerical summaries of a distribution. • Grade 6, Module 6, Topic D, Lesson 19 Given box plots of at least two data sets, students will comment on similarities and differences in the distributions. • Grade 6, Module 6, Topic D, Lesson 20 Given a frequency histogram, students describe the data collected, including an estimate of the mean or median, and an estimate of the interquartile range (IQR) or the mean absolute deviation (MAD). • Grade 6, Module 6, Topic D, Lesson 21 Given a data set, students are able to describe the data collected, including the number of responses, mean or median, and the MAD or the interquartile range (IQR). • Grade 6, Module 6, Topic D, Lesson 22 Based on the data collected or on a sample set of data, they communicate conclusions based on the data distribution (This lesson addresses the four step statistical process that can be used to summarize the statistics standards). **CPalms** • Exploring Central Tendency Student will work in small groups to apply central tendency to a real world scenario to finally answer the age old question of "when will I ever use this." **McGraw-Hill** Course 1, Chapter 11 Lesson 4 Course 1, Chapter 12 Lesson 4

Grade 6 Math Adv Semester 2	**Unit 10: Area, Surface Area, and Volume**	Projected Time Allotment: **14Days**

Standards/Learning Goals:	**Content Limits, Assessment Types, Calculator**
MAFS.6.G.1.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	• Numbers in items must be positive rational numbers. • Limit shapes to those that can be decomposed or composed into rectangles and/or right triangles. Calculator: **NO** • Equation Editor • GRID • Multiple Choice • Multiselect • Open Response
MAFS.6.G.1.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas *V= lwm* and *V= Bh* to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	• Prisms in items must be right rectangular prisms. • Unit fractional edge lengths for the unit cubes used for packing must have a numerator of 1. Calculator: **NO** • Equation Editor • GRID • Multiple Choice
MAFS.6.G.1.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	• Numbers on items must be rational numbers. • Items may use all four quadrants. • When finding side length, limit polygons to traditional orientation (side lengths perpendicular to axes). Calculator: **NO** • Equation Editor • Grid • Multiple Choice
MAFS.6.G.1.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.	• Numbers in items must be positive rational numbers. • 3D figures are limited to rectangular prisms, triangular prisms, rectangular pyramids, and triangular pyramids. Calculator: **NO** • Equation Editor • GRID • Matching Item • Multiple Choice • Multiselect

Decoded Standard
MAFS.6.G.1.1 Students take triangles and quadrilaterals and form rectangles, or take rectangles and/or other quadrilaterals and decompose them (take apart) into familiar shapes to find the area of the composite shape. A composite shape is a shape formed from other shapes. Students study composite shapes that are unfamiliar and decompose them into familiar shapes such as triangles and rectangles (which they know how to calculate the areas of) to find the area. This practice with familiar and irregular composite shapes and decomposition is applied to real-world situations. (*Common Core Mathematics Companion*, Pg. 156)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Swimming Pool Walkway Solve a problem involving finding the area of a composite plane figure.
- Lost Key Find the square feet of a garden by composing or decomposing the composite figure into rectangles.
- Area of Quadrilaterals Find the area of a trapezoid and a parallelogram by composing or decomposing into triangles and rectangles.
- Area of Kite Find the area of a kite by composing it into rectangles or decomposing it into triangles.
- Area of Triangles Find the area of two different triangles.

Illustrative Mathematics Assessment Tasks

- Same Base and Height, Variation 1 Find the areas of triangles that have the same base and height (first variation/ most concrete).
- Same Base and Height, Variation 2 Find the area of triangles that have the same base and height (second variation/ more abstract).
- Finding Areas of Polygons Students work on a sequence of area problems that shows the advantage of increasingly abstract strategies in preparation for developing general area formulas for parallelograms and triangles.
- Base and Height Students understand what is meant by a base and its corresponding height in a triangle and to be able to correctly identify all three base-height pairs.

Lesson Resources

Engage NY

- Grade 6, Module 5, Topic A, Lesson 1 Students show the area formula for the region bounded by a parallelogram by composing it into rectangles.
- Grade 6, Module 5, Topic A, Lesson 2 Students justify the area formula for a right triangle by viewing the right triangle as part of a rectangle composed of two right triangles.
- Grade 6, Module 5, Topic A, Lesson 3 Students show the area formula for a triangular region by decomposing a triangle into right triangles.
- Grade 6, Module 5, Topic A, Lesson 4 Students construct the altitude for three different cases and deconstruct triangles to justify that the area of a triangle is exactly one half the area of a parallelogram.
- Grade 6, Module 5, Topic A, Lesson 5 Students find area of a region bounded by a polygon by decomposing the region into triangles and other polygons.
- Grade 6, Module 5, Topic A, Lesson 6 Students determine the area of composite figures in real-life contextual situations using composition and decomposition of polygons.

Illuminations

- Discovering the Area formula for Triangles Students develop the area formula for a triangle. Students find the area of rectangles and squares, and compare them to the areas of triangles derived from the original shape.
- Finding the Area of Parallelograms Students will use their knowledge of rectangles to discover the area formula for parallelograms.

CPalms

- Area of a Triangle Students will derive the area formula for a triangle using the relationship between a rectangle and triangle. Students will be able to apply the area formula to find the area of a triangle.
- Area of a Right Triangle Students will compose triangles into rectangles and decompose rectangles into triangles to determine their areas, and justify and find relationships among the formulas for the areas of different polygons .
- Enrique's Ruined Carpet Students use an apartment layout to find the area of carpeted floor by decomposing complex shapes into rectangles and triangles.

McGraw-Hill

Course 1, Chapter 9

Inquiry Labs: Area of Parallelograms, Triangles and Trapezoids. Area of Irregular Figures; Lessons 1, 2, 3 & 6

Decoded Standard

MAFS.6.G.1.2

With this standard students build on their background knowledge of volume of right rectangular prisms with whole number dimensions by using manipulative to determine the volume of a right rectangular prism with fractional side lengths. Students relate this experience to the formulas for volume ($V=lwh$ and $V=Bh$) and find that their experience of counting the unit cubes yields the same result as using the formulas. Students then solve real-world and mathematical problems by applying volume formulas appropriately. (*Common Core Mathematics Companion*, Pg. 157)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Bricks Students are asked to determine the volume of a right rectangular prism given fractional edge lengths.
- Clay Blocks Students are asked to calculate and explain the relationship between two approaches to finding the volume of a right rectangular prism.
- Moving Truck Students are asked to determine the volume of a right rectangular prism (truck) given fractional edge lengths.
- Prism Packing Students are asked to determine the number of unit prisms needed to fill a larger prism with fractional dimensions.

Illustrative Mathematics Assessment Tasks

- Computing Volume Progression 1 Students explore the relationship between the side-lengths of a cube and its volume.
- Computing Volume Progression 2 Students are asked to calculate volume through a real word multi-step problem.
- Computing Volume Progression 3 Students are given the volume and are asked to find the height.
- Computing Volume Progression 4 This tasks builds on a more abstract understanding of volume. This problem is based on Archimedes' Principle that the volume of an immersed object is equivalent to the volume of the displaced water.
- Banana Bread Provides students with a multi-step problem involving volume and discuss the difference between exact calculations and their meaning in a context.

Lesson Resources

Engage NY

- Grade 6, Module 5, Topic C, Lesson 11 Students apply the formula $V = lwh$ to find the volume of a right rectangular prism and use the correct volume units when writing the answer.
- Grade 6, Module 5, Topic C, Lesson 12 Students extend the volume formula for a right rectangular prism to the formula $V =$ Area of base times height.
- Grade 6, Module 5, Topic C, Lesson 13 Students develop, understand, and apply formulas for finding the volume of right rectangular prisms and cubes.
- Grade 6, Module 5, Topic C, Lesson 14 Students understand that volume is additive and apply volume formulas to determine the volume of composite solid figures in real-world contexts, and given the volume, they determine missing dimension.
- Grade 6, Module 5, Topic B, Lesson 19 Students choose appropriate formulas to solve real-life volume and surface area problems.
- Grade 6, Module 5, Topic B, Lesson 19a Students apply the formulas for surface area and volume to determine missing dimensions.

Illuminations

- Finding surface Area and Volume Students use the isometric drawing tool to explore volume and surface area.

CPalms

- Fill to Believe Students work cooperatively to find the volume of a right rectangular prism, using whole and fraction units of measurement, using the volume formula, and using manipulatives to count the number of units necessary to fill the prisms, and compare it with the formula results.
- How Many Rubik's Cubes Can You Pack? A hands-on problem solving approach to find the volume of a right rectangular prism with fractional edges. Students design boxes and fill with Rubik's Cubes, create a formula from the patterns they found and apply fractional units to their formula.
- How Much Can It Hold? The students will utilize math cubes as they construct and analyze the relationship between the length, width, and height to the total amount of cubes. They will be able to apply it to real world applications of other right rectangular prisms and compare to determine which will hold the most volume.
- How Many Small Boxes? Students will extend their knowledge of volume from using whole numbers to using fractional units. Students will work with adding, multiplying, and dividing fractions to find the volume of right rectangular prisms, as well as, determining the number of fractional unit cubes in a rectangular prism.
- Sound Is Not the Only Place You Hear About Volume! Students will design their own data collection and organizing the data that they collect. They will apply the skill of finding volume to using fractional parts of a number (decimals) and finding the product using the volume formula.

MARS/Shell

- Optimizing: Packing It In Students Use mathematics to model a real world scenario concerning volume.

LearnZillion

- Finding the volume of a right rectangular prism with fractional edge lengths A set of two videos that show how to find the volume of a rectangular prism by filling it with unit cubes and by developing a formula

Shodor

- Volume of Prisms Interactive lesson designed to introduce the concept of finding volume of a rectangular prism.

McGraw-Hill

Course 1, Chapter 10

Inquiry Lab: Volume of Rectangular Prisms; Lessons 1 & 2

Decoded Standard

MAFS.6.G.1.3

Students plot points in all four quadrants of the coordinate plane. Coordinates are the vertices of polygons. Students connect the points and name the polygons. By giving students coordinates of vertices of the polygon that have the same first and same second coordinate (examples: (3,4) and (3,9) or (7,6) and (15,6)), students are challenged to find a technique to determine the length of a side of the polygon (subtract same coordinates). Students then apply this knowledge to solve real-world and mathematical problems. (*Common Core Mathematics Companion*, Pg. 158)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Polygon Grid Draw a polygon given the coordinates of its vertices and determine the length of the polygon's diagonals.
- Polygon Coordinates Draw a polygon given the coordinates of its vertices and determine both the lengths of sides and if any sides are parallel.
- Fence Length Draw a polygon given the coordinates of its vertices and determine the perimeter of the polygon in a real-world context.
- Patio Area Draw a polygon given the coordinates of its vertices and determine the area of the polygon in a real-world context.

Illustrative Mathematics Assessment Tasks

- Polygons in the Coordinate Plane Students practice plotting points in the coordinate plane and finding the areas of polygons.
- Walking the Block Students apply the calculation of distances on a coordinate plane to a real life context.

Lesson Resources

Engage NY

- Grade 6, Module 5, Topic B, Lesson 7
  Students use absolute value to determine distance between integers on the coordinate plane in order to find side lengths of polygons.
- Grade 6, Module 5, Topic B, Lesson 8
  Students connect points on the coordinate plane with characteristics and properties of polygons.
- Grade 6, Module 5, Topic B, Lesson 9
  Students find the perimeters and areas of irregular regions on a coordinate plane by decomposing into smaller polygons.
- Grade 6. Module 5, Topic B, Lesson 10
  Students determine distance, perimeter, and area in real-world contexts.

Illuminations

- Finding Your Way Around Students explore two-dimensional space via an activity in which they navigate the coordinate plane.

CPalms

- Plotting Polygons Students are challenged to plot coordinates on a graph, in order to create a mystery polygon, and find the length of its horizontal and vertical sides using the coordinates.
- Plotting Polygons with GeoGebra Guide students through the process of graphing polygons on the coordinate plane and finding vertical and horizontal side lengths.
- Profit Plaza Students use mathematical data and logic/reasoning to place vendors into retail spaces in a shopping plaza. They also find the area of each space and calculate the total leasing charges. The plans are given on a coordinate plane, so students will find the lengths of horizontal and vertical line segments (using the coordinates) to calculate the areas of the rectangular and composite spaces.

- The Mystery of Crop Circles...on a coordinate plane Students will use their knowledge of plotting points on quadrant I of the coordinate plane to figure out other coordinate pairs within quadrants II, III, and IV. Students are challenged to match description cards to the matching "map" (four-coordinate grid). Students will draw their own polygons on the four-coordinate grid and provide the coordinates for each.
- What Is Your Point? In this game, a student challenges a partner to recreate his or her quadrilateral or other shape on a geoboard by calling out the ordered pairs of the quadrilateral's vertices.

McGraw-Hill

Course 1, Chapter 9

Lesson 5

Decoded Standard

MAFS.6.G.1.4

Students begin learning about nets by cutting and folding nets of prisms. Nets are two-dimensional diagrams of three-dimensional shapes that can be folded into the three-dimensional shape. Building on students' previous knowledge of area, students can find the area of the rectangles and triangles that make up given nets. This leads to defining surface area as the sum of the area of the faces of the three-dimensional figure. Once students understand this concept, they solve real-world and mathematical problems involving surface area. (*Common Core Mathematics Companion*, Pg. 159)

Instructional Resources

Formative Tasks

Mathematics Formative Assessments (MFAS)

- Skateboard Ramp Given a real world context, students are asked to draw a net of a three-dimensional figure (triangular prism).
- Pyramid Project Given a real world context, students are asked to draw a net of a three-dimensional figure (square pyramid).
- Windy Pyramid Given a real world context, students are asked to use a net to find the surface area of a triangular pyramid.
- Rust Protection Given a real world context, students are asked to use a net to find the surface area of a rectangular prism.

Illustrative Mathematics Assessment Tasks

- Nets for Pyramid and Prisms Students work with nets for three-dimensional shapes and use them to calculate surface area.

Lesson Resources

Engage NY

- Grade 6, Module 5, Topic D, Lesson 15 Students construct three-dimensional figures using nets, determine which nets make specific solid figures, and determine whether nets can make a solid figure.
- Grade 6, Module 5, Topic D, Lesson 16 Students construct nets of three-dimensional objects using the measurements of a solid's edges.
- Grade 6, Module 5, Topic D, Lesson 17 Students use nets to determine the surface area of three-dimensional figures.
- Grade 6, Module 5, Topic D, Lesson 18 Students study characteristics of right rectangular prisms and develop formulas for the surface area of right rectangular prisms and cubes.
- Grade 6, Module 5, Topic B, Lesson 19 Students choose appropriate formulas to solve real-life volume and surface area problems.
- Grade 6, Module 5, Topic B, Lesson 19a Students apply the formulas for surface area and volume to determine missing dimensions.

Illuminations

- Building A Box Students will create, compare and describe different two-dimensional nets that can be folded into a three-dimensional cube and examine the properties of the nets and resulting cubes, including surface area.
- Finding surface Area and Volume Students use the isometric drawing tool to explore volume and surface area.

CPalms

- Box It Up, Wrap It Up (Surface Area of Rectangular Prisms) Students will make connections between area of two

	dimensional figures and calculating the surface area of rectangular prisms using nets, within the context of wrapping birthday presents. • Formula Detective: Finding the Surface Area of a 3D Figure Students derive the formulas for 3D figures by building models for nets. • How Much Paint Will It Take? Students create right rectangular and triangular prisms and problem-solve how to find the flat 2-dimensional surface area. • Surface Area of Prisms and Pyramids Students will use nets made up of rectangles and triangles to calculate the surface area of rectangular prisms, triangular prisms, and square pyramids.. • Wrapping Up Geometry (1 of 3) • Wrapping Up Geometry (2 of 3) • Wrapping Up Geometry (3 of 3) A series of 3 Lessons on Understanding and Finding the surface area of rectangular and triangular prisms. **MARS/Shell** • Designing: Candy Cartons Students are given a real world problem of designing a candy carton involving capacity and surface area. **LearnZillion** • Use nets to represent 3D figures and find surface area A series of videos for representing three-dimensional figures using nets and finding surface area of three-dimensional figures made up of rectangles and triangles. • Show 3D figures as being composed of rectangles and triangles; find surface area A series of videos that show three-dimensional figures as being composed of rectangles and triangles; find surface area. **McGraw-Hill** Course 1, Chapter 10 Inquiry Labs: Surface Area of: Rectangular Prisms, Triangular Prisms, Pyramids; Lessons 3, 4, 5

Grade 6 Math Adv Semester 2	**Unit 11: Ratios and Proportional Reasoning**	Projected Time Allotment: **10 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 6 Math Adv Semester 2	**Unit 12: Multi-Step Percent Problems**	Projected Time Allotment: **10 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

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)

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 6 Math Adv Semester 2	**Unit 13: Rational Numbers**	Projected Time Allotment: **14 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 rounding discrepancies when arithmetic is performed on rounded numbers and would be a good problem for classroom discussion.

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.
- Math Match Review math concepts, including shapes, shape names, addition, multiplication, negative numbers, and equivalent

- 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

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: $-4\big(4 + (-3)\big) = \big((-4) \times 4\big) + \big((-4) \times (-3)\big)$

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

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.
- 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

Lesson Resources

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.

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.

of differences of signed numbers.	**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 6 Math Adv Semester 2	**Unit 14: Expressions**	Projected Time Allotment: **8 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.