Math 7 Common Core Standards Map

Proficiency with Ratios and Proportional Relationships
Understand, Analyze and Apply Ratios and Proportions to Solve Real-World Situations
7.RP.1
7.RP.3
7.NS.3
7.RP.2
7.NS.1
7.NS.2
Understand and Apply Percents in Real-World Situations
7.RP.2
7.RP.3
7.EE.2
7.EE.3
7.NS.2
7.NS.3
7.NS.1
7.NS.2

Proficiency with the Number System
Develop an Understanding of Integers by Applying and Extending Previous Understandings Operations with Numbers
7.NS.1
7.NS.2
7.NS.3
7.EE.3
7.RP.1
7.NS.1
7.NS.2
Develop an Understanding of Rational Numbers by Applying and Extending Previous Understandings of Operations with Numbers
7.NS.1
7.NS.2
7.NS.3
7.RP.3
7.EE.3
7.RP.1
7.NS.1
7.NS.2

Proficiency with Expressions and Linear Equations
Simplify, Expand and Evaulate Expressions by Using Properities of Operations
7.EE.1
7.EE.2
7.EE.3
7.NS.1
7.NS.2
7.NS.3
Create, Solve and Graph Equations and Inequalities
7.EE.3
7.EE.4 (F)
7.NS.1
7.NS.2

Proficiency with Geometry
Draw, Construct and Describe Geometric Figures and the Relationships Between Them
7.G.1
7.G.2
7.G.3
7.NS.1
7.NS.2
Use Facts About Angles to Write and Solve Simple Equations
7.G.5
7.RP.2
7.EE.3
7.EE.4
Work with Real-Life Area, Surface Area and Volume and Known the Formulas
7.G.4
7.G.6
7.RP.1
7.RP.2
7.EE.3
7.EE.4
7.NS.1
7.NS.2
7.NS.3

Proficiency with Probability Statistics
Use random sampling to draw inferences about a population.
7.SP.1
7.SP.2
7.RP.2
Draw informal comparative inferences about two populations based on samples.
7.SP.3
7.SP.4
Investigate chance processes and develop, use, and evaluate probability models.
7.SP.5
7.SP.6
7.SP.7
7.SP.8
7.RP.1
7.RP.2
7.NS.1

Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:33PM

Standard/Module: Mathematics Practices (Week 1, 39 Weeks)

Stage 1: Desired Results

Standards Focus

- Major (70%)
- Supporting (20%)
- Additional (10%)

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

- 1. Make sense of problems and persevere in solving them.
- 2. Reason abstractly and quantitatively.
- 3. Construct viable arguments and critique the reasoning of others.
- 4. Model with mathematics.
- 5. Use appropriate tools strategically.
- 6. Attend to precision.
- 7. Look for and make use of structure.
- 8. Look for and express regularity in repeated reasoning.

Enduring Understandings	Essential Questions

Critical Content

Skills	Vocabulary

Stage 2: Assessment Evidence

Assessments

Stage 3: Learning Plan

Learning Activities	Resources

Differentiation Opportunities

<< Previous Year

Last Updated: Wednesday, June 27, 2012, 2:15PM

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:34PM

Standard/Module: Proficiency with the Number System 7.NS.1 (Week 1, 39 Weeks)

Stage 1: Desired Results

Standards Focus

- Major (70%) 7.RP.1

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , The Number System

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

- 1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
- 1a. Describe situations in which opposite quantities combine to make 0.
- 1b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
- 1c. Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
- 1d. Apply properties of operations as strategies to add and subtract rational numbers.

Enduring Understandings

1. Rational numbers can either be negative, positive or zero.
2. Adding the opposite results in the identity element of addition, 0.
3. All subtraction expressions can be written with an equivalent addition expression.

Essential Questions

1. How can you model the addition and subtraction of rational numbers on a number line?
2. Explain and justify real world situations that result in positive sum, negative sum, and zero sum.
3. How are addition and subtraction related?
4. Are there multiple ways to write addition or subtraction problems using the additive inverse?

Critical Content

Properties of Real Numbers

- Additive inverse
- identity element of 0

- Additive identity

Graphical Representations

- View a number line both horizontally and vertically
- Perform multiplication using repeated addition

Operations

- Add and subtract fractions and decimals

Absolute Value

- Define
- Find

Skills	Vocabulary
▪ Add and subtract rational numbers with both negative and positive signs. ▪ Find the absolute value of a rational number. ▪ Represent/show the absolute value of a number on a number line. ▪ Apply order of operations to multi-step integer problems. ▪ Be able to identify and eliminate number pairs equal to zero. ▪ Interpret what constitutes a negative or positive number in real world applications. ▪ Find the distance between two numbers on a number line. ▪ Model rational number addition and subtraction problems on both vertical and horizontal number lines.	Tier 2: term, distribute, expression, rational, linear, expand, factor, equivalent, simplify, horizontal, vertical, opposite, difference, rational, identity, element Tier 3: coefficient, like terms, absolute value, positive, negative, number line, additive inverse, sum, zero pair, fractions, decimals

Stage 2: Assessment Evidence

Assessments

Adding & Subtracting with Positive and Negative Numbers
Formative: Test: Standardized

Students show addition and subtraction using number lines and properties of operations. Students generalize those operations with whole numbers to include positive and negative fractions and decimals.

Stage 3: Learning Plan	
Learning Activities	**Resources**
Use manipulatives to represent positive and negative numbers. One simple manipulative is tile spacer that can be purchased at any hardware store. Buy two bags--leave one as + signs and use a straight razor to cut off the top and bottom of the tile spacers to make - signs. Students can make zero pairs using one + and one -. Once they understand zero pairs, then begin activities where they use the + and - to add. For example, -3 + 4 would be represented by - - - and + + + + where three zero pairs can be made and one + remains. -3 + -4 would be represented by - - - and - - - - where no zero pairs can be made and therefore you would find the sum of the negatives. Students add and subtract rational numbers using a number line. For example, to add -5 + 7, students would find -5 on the number line and move 7 in a positive direction (to the right). The stopping point of 2 is the sum of this expression. Students also add negative fractions and decimals and interpret solutions in given contexts. Visual representations may be helpful as students begin this work; they become less necessary as students become more fluent with the operations. **Examples:** ☐ Use a number line to illustrate: *p - q* *p + (- q)* Is this equation true $p - q = p + (-q)$ ☐ -3 and 3 are shown to be opposites on the number line because they are equal distance from zero and therefore have the same absolute value	www.illustrativemathematics.org www.illuminations.nctm.org

and the sum of the number and it's opposite is zero. ☐ You have $4 and you need to pay a friend $3. What will you have after paying your friend? 4 + (-3) = 1 or (-3) + 4 = 1 This cluster builds upon the understandings of rational numbers in Grade 6: • quantities can be shown using + or – as having opposite directions or values, • points on a number line show distance and direction, • opposite signs of numbers indicate locations on opposite sides of 0 on the number line, • the opposite of an opposite is the number itself, • the absolute value of a rational number is its distance from 0 on the number line, • the absolute value is the magnitude for a positive or negative quantity, and • locating and comparing locations on a coordinate grid by using negative and positive numbers. Learning now moves to exploring and ultimately formalizing rules for operations (addition, subtraction, multiplication and division) with integers. Using both contextual and numerical problems, students should explore what happens when negatives and positives are combined. Number lines present a visual image for students to explore and record addition and subtraction results. Two-color counters or colored chips can be used as a physical and kinesthetic model for adding and subtracting integers. With one color designated to represent positives and a second color for negatives, addition/subtraction can be represented by placing the appropriate numbers of chips for the addends and their signs on a board. Using the notion of opposites, the board is simplified by removing pairs of opposite colored chips. The answer is the total of	

the remaining chips with the sign representing the appropriate color. Repeated opportunities over time will allow students to compare the results of adding and subtracting pairs of numbers, leading to the generalization of the rules. Fractional rational numbers and whole numbers should be used in computations and explorations. Students should be able to give contextual examples of integer operations, write and solve equations for real world problems and explain how the properties of operations apply. Real-world situations could include: profit/loss, money, weight, sea level, debit/credit, football yardage, etc. Using what students already know about positive and negative whole numbers and multiplication with its relationship to division, students should generalize rules for multiplying and dividing rational numbers. Multiply or divide the same as for positive numbers, then designate the sign according to the number of negative factors. Students should analyze and solve problems leading to the generalization of the rules for operations with integers. For example, beginning with known facts, students predict the answers for related facts, keeping in mind that the properties of operations apply. Using the language of "the opposite of" helps some students understand the multiplication of negatively signed numbers (-4 x -4 = 16, the opposite of 4 groups of -4). Discussion about the tables should address the patterns in the products, the role of the signs in the products and commutativity of multiplication. Then students should be asked to answer these questions and prove their responses: • Is it always true that multiplying a negative factor by a positive factor results in a negative product? • Does a positive factor times a positive factor always result in a positive product? • What is the sign of the product of two negative factors? • When three factors are multiplied, how is the sign	

of the product determined? • How is the numerical value of the product of any two numbers found? Students can use number lines with arrows and hops, groups of colored chips or logic to explain their reasoning. When using number lines, establishing which factor will represent the length, number and direction of the hops will facilitate understanding. Through discussion, generalization of the rules for multiplying integers would result. Division of integers is best understood by relating division to multiplication and applying the rules.In time, students will transfer the rules to division situations. (Note: In 2b, this algebraic language ($-(p/q) = (-p)/q = p/(-q)$) is written for the teacher's information, not as an expectation for students.) Ultimately, students should solve other mathematical and real-world problems requiring the application of these rules with fractions and decimals. In Grade 7 the awareness of rational and irrational numbers is initiated by observing the result of changing fractions to decimals. Students should be provided with families of fractions, such as, sevenths, ninths, thirds, etc. to convert to decimals using long division. The equivalents can be grouped and named (terminating or repeating). Students should begin to see why these patterns occur. Knowing the formal vocabulary *rational* and *irrational* is not expected.	

Differentiation Opportunities

Eventually students need to be weaned off of the manipulatives into more abstract forms, but the tile spacers help them to visualize the zero pairs so that when larger numbers are introduced, conceptually they understand.

Use ideas of repeated addition to help students understand multiplication and repeated subtraction to understand division of integers.

<< Previous Year

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:37PM

Standard/Module: Proficiency with the Number System 7.NS.2 (Week 1, 39 Weeks)

Stage 1: Desired Results

Standards Focus

- Major (70%) 7.RP.1

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , The Number System

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

- 2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
- 2a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (−1)(−1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
- 2b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then −(p/q) = (−p)/q = p/(−q). Interpret quotients of rational numbers by describing real-world contexts.
- 2c. Apply properties of operations as strategies to multiply and divide rational numbers.
- 2d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

Enduring Understandings

- Understand that the when multiplying a number and its reciprocal, its result is 1.
- Understand that the when multiplying a number and its negative reciprocal, its result is -1.
- Multiplication represents repeated addition.
- Exponents represent repeated multiplication.
- Why division of rationals can be written as multiplying by its reciprocal.
- Numbers can be divided, provided that the divisor is not zero.
- The decimal form of a rational number either ends in zero or eventually repeats.
- Every quotient of integers (non-zero divisors) will result in a rational number.

Essential Questions

1. How can you prove that when you divide, you are really multiplying by the reciprocal?
2. How can you model the multiplication of rational numbers on a number line?
3. Why is the quotient of integers always a rational number?

Critical Content

Properties of Real Numbers

- Multiplicative inverse
- identity element of 1
- Multiplicative identity

Graphical Representations

- View a number line both horizontally and vertically
- Perform multiplication of signed numbers using repeated addition

Operations

- Multiply and divide fractions and decimals
- Squaring both positive and negative numbers

Skills	**Vocabulary**
▪ Convert a rational number using long division. ▪ Multiply and divide rational numbers with both negative and positive signs. ▪ Apply order of operations to simplify multi-step integer problems involving multiplication and division. ▪ Apply the distributive property when the number being distributed is negative. ▪ Model integer multiplication problems on both vertical and horizontal number lines. ▪ Be able to identify and simplify the multiplicative inverse. ▪ Interpret products and quotients of rational numbers by describing real-world contexts.	Tier 2: term, distribute, expression, rational, linear, expand, factor, equivalent, simplify, horizontal, vertical, opposite, difference, rational, inverse, identity Tier 3: divisor, product, quotient, distributive property, multiplicative inverse, multiplicative identity, identity element of multiplication, term, integer, additive inverse, commutative property, associative property, terminating decimal

Stage 2: Assessment Evidence

Assessments

Multiply and Divide with Positive and Negative Numbers
Formative: Test: Written

Students compute products and quotients of positive and negative rational numbers including whole numbers, decimals, and fractions. Students justify their answers citing properties in their explanations.

Stage 3: Learning Plan

Learning Activities	**Resources**

Students recognize that when division of rational numbers is represented with a fraction bar, each number can have a negative sign. Using long division from elementary school, students understand the difference between terminating and repeating decimals. This understanding is foundational for work with rational and irrational numbers in 8th grade. For example, identify which fractions will terminate (the denominator of the fraction in simplified form only has factors of 2 and/or 5). Multiplication and division of integers is an extension of multiplication and division of whole numbers. **Examples**: ☐ Examine the family of equations. What patterns do you see? Create a model and context for each of the products. Write and model the family of equations related to 3 x 4 = 12. 2 x 3 = 6 Selling two packages of apples at $3.00 per pack.	www.illustrativemathematics.org www.illuminations.nctm.org

2 x -3 = -6 Spending 3 dollars each on 2 packages of apples. -2 x 3 = -6 Owing 2 dollars to each of your three friends. -2 x -3 = 6 Forgiving 3 debts of $2.00 each This cluster builds upon the understandings of rational numbers in Grade 6: • quantities can be shown using + or – as having opposite directions or values, • points on a number line show distance and direction, • opposite signs of numbers indicate locations on opposite sides of 0 on the number line, • the opposite of an opposite is the number itself, • the absolute value of a rational number is its distance from 0 on the number line, • the absolute value is the magnitude for a positive or negative quantity, and • locating and comparing locations on a coordinate	

grid by using negative and positive numbers. Learning now moves to exploring and ultimately formalizing rules for operations (addition,subtraction, multiplication and division) with integers. Using both contextual and numerical problems, students should explore what happens when negatives and positives are combined. Number lines present a visual image for students to explore and record addition and subtraction results. Two-color counters or colored chips can be used as a physical and kinesthetic model for adding and subtracting integers. With one color designated to represent positives and a second color for negatives, addition/subtraction can be represented by placing the appropriate numbers of chips for the addends and their signs on a board. Using the notion of opposites, the board is simplified by removing pairs of opposite colored chips. The answer is the total of the remaining chips with the sign representing the appropriate color. Repeated opportunities over time will allow students to compare the results of adding and subtracting pairs of numbers, leading to the generalization of the rules. Fractional rational numbers and whole numbers should be used in computations and explorations. Students should be able to give contextual examples of integer operations, write and solve equations for real world problems and explain how the properties of operations apply. Real-world situations could include: profit/loss, money, weight, sea level, debit/credit, football yardage, etc. Using what students already know about positive and negative whole numbers and multiplication with its relationship to division, students should generalize rules for multiplying and dividing rational numbers. Multiply or divide the same as for positive numbers, then designate the sign according to the number of negative factors. Students should analyze and solve problems leading to the generalization of the rules for operations with integers. For example, beginning with known facts, students predict the answers for related facts, keeping in mind that the properties of operations apply. Using the language of “the opposite of” helps some students understand the multiplication of negatively signed numbers (-4 x -4 = 16, the opposite of 4	

groups of -4). Discussion about the tables should address the patterns in the products, the role of the signs in the products and commutativity of multiplication. Then students should be asked to answer these questions and prove their responses. • Is it always true that multiplying a negative factor by a positive factor results in a negative product? • Does a positive factor times a positive factor always result in a positive product? • What is the sign of the product of two negative factors? • When three factors are multiplied, how is the sign of the product determined? • How is the numerical value of the product of any two numbers found? Students can use number lines with arrows and hops, groups of colored chips or logic to explain their reasoning. When using number lines, establishing which factor will represent the length, number and direction of the hops will facilitate understanding. Through discussion, generalization of the rules for multiplying integers would result. Division of integers is best understood by relating division to multiplication and applying the rules. In time, students will transfer the rules to division situations. Ultimately, students should solve other mathematical and real-world problems requiring the application of these rules with fractions and decimals. In Grade 7 the awareness of rational and irrational numbers is initiated by observing the result of changing fractions to decimals. Students should be provided with families of fractions, such as, sevenths, ninths, thirds, etc. to convert to decimals using long division. The equivalents can be grouped and named (terminating or repeating). Students should begin to see why these	

patterns occur. Knowing the formal vocabulary *rational* and *irrational* is not expected.	

Differentiation Opportunities

DO NOT JUST TEACH STUDENTS A SET OF "RULES" FOR INTEGERS OPERATIONS! More often than not, those rules get confused and jumbled and students have misconceptions that have to be "undone" prior to applying operations with positive and negative numbers. Using what students already know about positive and negative whole numbers and multiplication with its relationship to division, students should generalize rules for multiplying and dividing rational numbers. Multiply or divide the same as for positive numbers, then designate the sign according to the number of negative factors. Students should analyze and solve problems leading to the generalization of the rules for operations with integers. For example, beginning with known facts, students predict the answers for related facts, keeping in mind that the properties of operations apply.

<< Previous Year

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:37PM

Standard/Module: Proficiency with the Number System 7.NS.3 (Week 1, 39 Weeks)

Stage 1: Desired Results

Standards Focus

- Major (70%) 7.RP.1

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , The Number System

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

- 3. Solve real-world and mathematical problems involving the four operations with rational numbers.

Enduring Understandings	Essential Questions
▪ Real life situations can be represented using positive and negative rational numbers.	1. How can you determine which operation to use given a real world situation?

Critical Content

Graphical Representations

- Model a real world situation on either a vertical or horizontal number line

Operations

- Add, subtract, multiply and divide rational numbers
- Use and apply order of operations

Skills	Vocabulary
▪ Choose the appropriate operation given a math problem in context. ▪ Translate real world situations into mathematical sentences. ▪ Perform all four basic operations within the	Tier 2: increase, decrease, model

set of rational numbers.	Tier 3: sum, difference, product, quotient

Stage 2: Assessment Evidence

Assessments

Operations with Rational Numbers
Formative: Test: Written

Students write rational number expressions and equations based on a word context and simplify or solve them.

Students show addition and subtraction using number lines and properties of operations. Students generalize those operations with whole numbers to include positive and negative fractions and decimals.

Students compute products and quotients of positive and negative rational numbers including whole numbers, decimals, and fractions. Students justify their answers citing properties in their explanations

Stage 3: Learning Plan

Learning Activities	Resources
Students use order of operations from 6th grade to write and solve problem with all rational numbers. **Examples:** ☐ Your cell phone bill is automatically deducting $32 from your bank account every month. How much will the deductions total for the year? -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 + -32 = 12 (-32) ☐ It took a submarine 20 seconds to drop to 100 feet below sea level from the surface. What was the rate of the descent? This cluster builds upon the understandings of rational numbers in Grade 6: • quantities can be shown using + or – as having	www.illustrativemathematics.org www.illuminations.nctm.org

opposite directions or values, • points on a number line show distance and direction, • opposite signs of numbers indicate locations on opposite sides of 0 on the number line, • the opposite of an opposite is the number itself, • the absolute value of a rational number is its distance from 0 on the number line, • the absolute value is the magnitude for a positive or negative quantity, and • locating and comparing locations on a coordinate grid by using negative and positive numbers. Learning now moves to exploring and ultimately formalizing rules for operations (addition, subtraction, multiplication and division) with integers. Using both contextual and numerical problems, students should explore what happens when negatives and positives are combined. Number lines present a visual image for students to explore and record addition and subtraction results. Two-color counters or colored chips can be used as a physical and kinesthetic model for adding and subtracting integers. With one color designated to represent positives and a second color for negatives, addition/subtraction can be represented by placing the appropriate numbers of chips for the addends and their signs on a board. Using the notion of opposites, the board is simplified by removing pairs of opposite colored chips. The answer is the total of the remaining chips with the sign representing the appropriate color. Repeated opportunities over time will allow students to compare the results of adding and subtracting pairs of numbers, leading to the generalization of the rules. Fractional rational numbers and whole numbers should be used in computations and explorations. Students should be able to give contextual examples of integer operations, write and solve equations for real world problems and explain how the properties of operations apply. Real-world situations could include: profit/loss, money, weight, sea level, debit/credit, football yardage, etc. Using what students already know about positive and negative whole numbers and multiplication with its relationship to division, students should generalize	

rules for multiplying and dividing rational numbers. Multiply or divide the same as for positive numbers, then designate the sign according to the number of negative factors. Students should analyze and solve problems leading to the generalization of the rules for operations with integers. For example, beginning with known facts, students predict the answers for related facts, keeping in mind that the properties of operations apply. Using the language of "the opposite of" helps some students understand the multiplication of negatively signed numbers (-4 x -4 = 16, the opposite of 4 groups of -4). Discussion about the tables should address the patterns in the products, the role of the signs in the products and commutatively of multiplication. Then students should be asked to answer these questions and prove their responses. • Is it always true that multiplying a negative factor by a positive factor results in a negative product? • Does a positive factor times a positive factor always result in a positive product? • What is the sign of the product of two negative factors? • When three factors are multiplied, how is the sign of the product determined? • How is the numerical value of the product of any two numbers found? Students can use number lines with arrows and hops, groups of colored chips or logic to explain their reasoning. When using number lines, establishing which factor will represent the length, number and direction of the hops will facilitate understanding. Through discussion, generalization of	

the rules for multiplying integers would result. Division of integers is best understood by relating division to multiplication and applying the rules.	

Differentiation Opportunities

DO NOT JUST TEACH STUDENTS A SET OF "RULES" FOR INTEGERS OPERATIONS! More often than not, those rules get confused and jumbled and students have misconceptions that have to be "undone" prior to applying operations with positive and negative numbers. Using what students already know about positive and negative whole numbers and multiplication with its relationship to division, students should generalize rules for multiplying and dividing rational numbers. Multiply or divide the same as for positive numbers, then designate the sign according to the number of negative factors. Students should analyze and solve problems leading to the generalization of the rules for operations with integers. For example, beginning with known facts, students predict the answers for related facts, keeping in mind that the properties of operations apply.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:38PM

Standard/Module: Proficiency with Expressions & Equations 7.EE.1 (Week 7, 5 Weeks)

Stage 1: Desired Results

Standards Focus

- Major (70%) 7.NS.1, 7.NS.2

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Expressions & Equations

7.EE Use properties of operations to generate equivalent expressions.

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

Enduring Understandings

- A variable is a symbol used to represent a numerical value.
- Equivalent linear expressions can be written in a variety of different ways.
- The opposite of distribution is factoring.
- Linear expressions can be added and subtracted like rational numbers.
- Properties of real numbers can also be applied to linear expressions.

Essential Questions

1. How can it be determined that two or more linear expressions are equivalent?
2. How can you rewrite a linear expression to make it more usable?

Critical Content

Properties of Real Numbers

- Commutative property of addition and multiplication
- Associative property of addition and multiplication
- Additive inverse
- Additive identity
- Multiplicative inverse
- Multiplicative identity
- Zero property of multiplication
- Distributive property

Operations

- Order of operations
- Exponents (whole numbers only)

- With integers/rational numbers (add, subtract, divide, multiply)
- Prime factoring (including variables with exponents of 1 only)

Polynomial Basics

- Combine like terms with single variables
- Distribute with rational coefficients

Perimeter

- Formulas of regular polygons

Skills	**Vocabulary**
1. Evaluate expressions with whole number exponents. (ex: $2^3 = 8$) 2. Distribute a rational coefficient to a linear expression. 3. Factor a linear expression with rational coefficients. (reverse distributive property) 4. Evaluate expressions (all four operations) using substitution of rational numbers. 5. Combine like terms with rational .coefficients with a single variable with an exponent of 1. (ex: 3x – 0.7x + 2) 6. Combine (add/subtract) linear equations, also involving rational coefficients. (ex: .5(2x + 1) – 3(x – 4)) 7. Write equivalent linear expressions with rational coefficients using expansions. (ex: 3x + 5 is the same as x + x + x + 1 + 4 OR 2x + x + 3 + 2)	Tier 2: variable, terms, distribute, expression, rational, linear, expand, factor, equivalent, simplify, inverse, identity Tier 3: expression, coefficient, like terms, polygon, exponent

Stage 2: Assessment Evidence

Assessments

Expanding Expressions
Formative: Test: Written

Examples:

☐ Write an equivalent expression for _____

☐ Suzanne thinks the two expressions: _____ and _____are equivalent? Is she correct? Explain why or why not?

☐ Write equivalent expressions for: _____.

Possible solutions might include factoring

☐ A rectangle is twice as long as wide. One way to write an expression to find the perimeter would be $w + w + 2w + 2w$. Write the expression in two other ways.

Stage 3: Learning Plan

Learning Activities	Resources
Have students build on their understanding of order of operations and use the properties of operations to rewrite equivalent numerical expressions that were developed in Grade 6. Students continue to use properties that were initially used with whole numbers and now develop the understanding that properties hold for integers, rational and real numbers.	www.illustrativemathematics.org www.illuminations.nctm.org
Provide opportunities to build upon this experience of writing expressions using variables to represent situations and use the properties of operations to generate equivalent expressions. These expressions may look different and use different numbers, but the values of the expressions are the same.	
Provide opportunities for students to experience expressions for amounts of increase and decrease. In Standard 2, the expression is rewritten and the variable has a different coefficient. In context, the coefficient aids in the understanding of the situation. Another example is this situation which represents a 10% decrease: b - 0.10b = 1.00b - 0.10b which equals 0.90b or 90% of the amount.	
One method that students can use to become convinced that expressions are equivalent is by substituting a numerical value for the variable and evaluating the expression. For example 5(3 +2x) is equal to 5 •3 + 5 • 2x Let x = 6 and substitute 6 for x in both equations.	

Provide opportunities for students to use and understand the properties of operations. These include: the commutative, associative, identity, and inverse properties of addition and of multiplication, and the zero property of multiplication. Another method students can use to become convinced that expressions are equivalent is to justify each step of simplification of an expression with an operation property. This is a continuation of work from 6th grade using properties of operations and combining like terms. Students apply properties of operations and work with rational numbers (integers and positive / negative fractions and decimals) to write equivalent expressions. **Examples:** ☐ Write an equivalent expression for _____ ☐ Suzanne thinks the two expressions: _____ and _____are equivalent? Is she correct? Explain why or why not? ☐ Write equivalent expressions for: _____. Possible solutions might include factoring ☐ A rectangle is twice as long as wide. One way to write an expression to find the perimeter would be $w + w + 2w + 2w$. Write the expression in two other ways. ☐ An equilateral triangle has a perimeter of $6x + 15$. What is the length of each of the sides of the triangle?	

Differentiation Opportunities

As students begin to build and work with expressions containing more than two operations, students tend to set aside the order of operations. For example having a student simplify an expression like 8 + 4(2x - 5) + 3x can bring to light several misconceptions. Do the students immediately add the 8 and 4 before distributing the 4? Do they only multiply the 4 and the 2x and not distribute the 4 to both terms in the parenthesis? Do they collect all like terms 8 + 4 – 5, and 2x + 3x? Each of these show gaps in students' understanding of how to simplify numerical expressions with multiple operations.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:45PM

Standard/Module: Proficiency with Expressions & Equations 7.EE.2 (Week 7, 5 Weeks)

Stage 1: Desired Results

Standards Focus

- Major (70%) 7.NS.1, 7.NS.2, 7.NS.3

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Expressions & Equations

7.EE Use properties of operations to generate equivalent expressions.

- 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.

Enduring Understandings

- A variable is a symbol used to represent a numerical value.
- There is more than one way to answer a problem.
- Problems can often be made simpler by rewriting it.

Essential Questions

1. When should we rewrite a linear expression?

Critical Content

Translating

- Linear expressions to real world situations
- Real world situations to expressions

Skills

1. Translate verbal expressions and real world problems into linear expressions.
2. Choose the appropriate operation(s) in a real world problem.

Vocabulary

Tier 2: translate, distribute, expression, rational, linear, expand, factor, equivalent, simplify

Tier 3: terms, coefficient, like terms

Stage 2: Assessment Evidence

Assessments

Rewriting Expressions
Formative: Test: Written

Examples:

☐ Write an equivalent expression for _____

☐ Suzanne thinks the two expressions: _____ and _____are equivalent? Is she correct? Explain why or why not?

☐ Write equivalent expressions for: _____.

Possible solutions might include factoring

☐ A rectangle is twice as long as wide. One way to write an expression to find the perimeter would be $w + w + 2w + 2w$. Write the expression in two other ways.

Stage 3: Learning Plan

Learning Activities	Resources
Have students build on their understanding of order of operations and use the properties of operations to rewrite equivalent numerical expressions that were developed in Grade 6. Students continue to use properties that were initially used with whole numbers and now develop the understanding that properties hold for integers, rational and real numbers. Provide opportunities to build upon this experience of writing expressions using variables to represent situations and use the properties of operations to generate equivalent expressions. These expressions may look different and use different numbers, but the values of the expressions are the same. Provide opportunities for students to experience expressions for amounts of increase and decrease. In Standard 2, the expression is rewritten and the	www.illustrativemathematics.org www.illuminations.nctm.org

variable has a different coefficient. In context, the coefficient aids in the understanding of the situation. Another example is this situation which represents a 10% decrease: b - 0.10b = 1.00b - 0.10b which equals 0.90b or 90% of the amount. One method that students can use to become convinced that expressions are equivalent is by substituting a numerical value for the variable and evaluating the expression. For example 5(3 + 2x) is equal to 5 •3 + 5 • 2x Let x = 6 and substitute 6 for x in both equations. Provide opportunities for students to use and understand the properties of operations. These include: the commutative, associative, identity, and inverse properties of addition and of multiplication, and the zero property of multiplication. Another method students can use to become convinced that expressions are equivalent is to justify each step of simplification of an expression with an operation property. Students understand the reason for rewriting an expression in terms of a contextual situation. For example, students understand that a 20% discount is the same as finding 80% of the cost (.80c). All varieties of a brand of cookies are $3.50. A person buys 2 peanut butter, 3 sugar and 1 chocolate. Instead of multiplying 2 x $3.50 to get the cost of the peanut butter cookies, 3 x $3.50 to get the cost of the sugar cookies and 1 x $3.50 for the chocolate cookies and then adding those totals together, student recognize that multiplying $3.50 times 6 will give the same total. **Examples** ☐ Jamie and Ted both get paid an equal hourly wage of $9 per hour. This week, Ted made an additional $27 dollars in overtime. Write an expression that	

represents the weekly wages of both if J = the number of hours that Jamie worked this week and T = the number of hours Ted worked this week? Can you write the expression in another way? Students may create several different expressions depending upon how they group the quantities in the problem. One student might say: To find the total wage, I would first multiply the number of hours Jamie worked by 9. Then I would multiply the number of hours Ted worked by 9. I would add these two values with the $27 overtime to find the total wages for the week. The student would write the expression: 9J + 9T + 27. Another student might say: To find the total wages, I would add the number of hours that Ted and Jamie worked. I would multiply the total number of hours worked by 9. I would then add the overtime to that value to get the total wages for the week. The student would write the expression: 9(J +T) + 27. A third student might say: To find the total wages, I would need to figure out how much Jamie made and add that to how much Ted made for the week. To figure out Jamie's wages, I would multiply the number of hours she worked by 9. To figure out Ted's wages, I would multiply the number of hours he worked by 9 and then add the $27 he earned in overtime. My final step would be to add Jamie and Ted wages for the week to find their combined total wages. The student would write the expression: (9J) + (9T +27). ☐ Given a square pool with a tile border (1 tile wide all the way around), write four different expressions to find the total number of tiles in the border. Explain how each of the expressions relates	

to the diagram and demonstrate that the expressions are equivalent. Which expression do you think is most useful? Explain your thinking.	

Differentiation Opportunities

As students begin to build and work with expressions containing more than two operations, students tend to set aside the order of operations. For example having a student simplify an expression like 8 + 4(2x - 5) + 3x can bring to light several misconceptions. Do the students immediately add the 8 and 4 before distributing the 4? Do they only multiply the 4 and the 2x and not distribute the 4 to both terms in the parenthesis? Do they collect all like terms 8 + 4 – 5, and 2x + 3x? Each of these show gaps in students' understanding of how to simplify numerical expressions with multiple operations.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:47PM

Standard/Module: Proficiency with Expressions & Equations 7.EE.3 (Week 7, 18 Weeks)

Stage 1: Desired Results

Standards Focus

- Major (70%) 7.NS.1, 7.NS.2

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Expressions & Equations

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

- 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.

Enduring Understandings

- Estimation can be used to determine the reasonableness of an answer.
- Mistakes can be made using technology (inadvertently leaving off a digit) and therefore we should be conscientious of our work and our answers to real life problems.

Essential Questions

1. Does your answer make sense?
2. What is the most efficient method to solve a real-life problem?
3. What would a negative number solution indicate to you in a specific problem?

Critical Content

Number Sense

- Convert between fractions, decimals and percents
- Commonly used fraction to decimal conversions (ex: ½ = 0.5)
- Communicating decimals and fractions mathematically (0.5 is not point five, rather five tenths)
- Multiplication and division facts
- Mental math of integers

Skills

1. Perform operations within the rational number

Vocabulary

system. 2. Convert fluently between fractions, decimals and percents. 3. Fluency of multiplication and division facts. 4. Combine like terms, distribute and factor linear expressions. 5. Re-write linear expressions. 6. Apply properties of operations and real numbers. 7. Use estimation to find a reasonable answer (percents included).	Tier 2 – estimate, reasonable, solution Tier 3 – rational number

Stage 2: Assessment Evidence

Assessments

Real World Problems With Rational Numbers
Formative: Test: Written

Students solve rational number real-world situations. Students use appropriate tools to help them solve these problems

Students show addition and subtraction using number lines and properties of operations. Students generalize those operations with whole numbers to include positive and negative fractions and decimals.

Students compute products and quotients of positive and negative rational numbers including whole numbers, decimals, and fractions. Students justify their answers citing properties in their explanations.

Students justify the reasonableness of their answers.

Stage 3: Learning Plan

Learning Activities	Resources
To assist students' assessment of the reasonableness of answers, especially problem situations involving fractional or decimal numbers, use whole-number approximations for the computation and then compare to the actual computation. Connections between performing the inverse operation and undoing the operations are appropriate here. It is appropriate to expect students to show the steps in their work. Students should be able to explain their thinking using the correct terminology for the	www.illustrativemathematics.org www.illuminations.nctm.org

properties and operations. Continue to build on students' understanding and application of writing and solving one-step equations from a problem situation to multi-step problem situations. This is also the context for students to practice using rational numbers including: integers, and positive and negative fractions and decimals. As students analyze a situation, they need to identify what operation should be completed first, then the values for that computation. Each set of the needed operation and values is determined in order. Finally an equation matching the order of operations is written. ***For example****, Bonnie goes out to eat and buys a meal that costs $12.50 that includes a tax of $.75. She only wants to leave a tip based on the cost of the food.* In this situation, students need to realize that the tax must be subtracted from the total cost before being multiplied by the percent of tip and then added back to obtain the final cost. C = (12.50 - .75)(1 + T) + .75 = 11.75(1 +T) + .75 where C = cost and T = tip. Provide multiple opportunities for students to work with multi-step problem situations that have multiple solutions and therefore can be represented by an inequality. Students need to be aware that values can satisfy an inequality but not be appropriate for the situation, therefore limiting the solutions for that particular problem. Students solve contextual problems using rational numbers. Students convert between fractions, decimals, and percents as needed to solve the problem. Students use estimation to justify the reasonableness of answers. Estimation strategies for calculations with fractions and decimals extend from students' work with whole number operations. Estimation strategies include, but are not limited to:	

☐ front-end estimation with adjusting (using the highest place value and estimating from the front end making adjustments to the estimate by taking into account the remaining amounts), ☐ clustering around an average (when the values are close together an average value is selected and multiplied by the number of values to determine an estimate), ☐ rounding and adjusting (students round down or round up and then adjust their estimate depending on how much the rounding affected the original values), ☐ using friendly or compatible numbers such as factors (students seek to fit numbers together - i.e., rounding to factors and grouping numbers together that have round sums like 100 or 1000), and ☐ using benchmark numbers that are easy to compute (student's select close whole numbers for fractions or decimals to determine an estimate). **Example:** ☐ The youth group is going on a trip to the state fair. The trip costs $52. Included in that price is $11 for a concert ticket and the cost of 2 passes, one for the rides and one for the game booths. Each of the passes cost the same price. Write an equation representing the cost of the trip and determine the price of one pass. $2x + 11 = 52$ $2x = 41$ $x = \$20.5$	

Differentiation Opportunities

As students begin to build and work with expressions containing more than two operations, students tend to set aside the order of operations. For example having a student simplify an expression like 8 + 4(2x - 5) + 3x can bring to light several misconceptions. Do the students immediately add the 8 and 4 before distributing the 4? Do they only multiply the 4 and the 2x and not distribute the 4 to both terms in the parenthesis? Do they collect all like terms 8 + 4 – 5, and 2x + 3x? Each of these show gaps in students' understanding of how to simplify numerical expressions with multiple operations.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:48PM

Standard/Module: Proficiency with Expressions & Equations 7.EE.4 (Week 7, 33 Weeks)

Stage 1: Desired Results

Standards Focus

- Major (70%) 7.NS.1, 7.NS.2

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Expressions & Equations

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

- 4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- 4a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
- 4b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

Enduring Understandings

- A variable is a symbol that represents a value.
- The reasonableness of an answer to an equation.
- There is a sequence of operations used when solving algebraic equations and inequalities.
- An equation that may require distribution to solve can also be referred to as a problem in factored form.
- Answers to real-life questions can be interpreted based on what the question is asking.
- Fractions can also be viewed as a division problem.

Essential Questions

1. Why do you need to change the inequality sign when dividing or multiplying by a negative rational number?
2. Why are there different ways to solve an equation?
3. Why might estimation be better than giving an exact answer?

Critical Content

Number Sense

- Inverse of a number
- Inverse operations
- Properties of real numbers

- Operations with rational numbers

Translating Expressions

- Words associated with inequality symbols
- Words associated with equality
- Words associated with the four basic operations

Skills	Vocabulary
1. Translate and solve verbal situations into equations or inequalities using variables. 2. Solve one-step, two-step and equations involving distribution fluently. (rational numbers – positive and negative coefficients) 3. Solve one-step and two-step inequalities. (rational numbers – positive and negative coefficients) 4. Determine using substitution if a value of a given variable is a solution to an equation. (checking your work) 5. Identify and perform inverse operations within an equation (operation properties of equality). 6. Identify reciprocal of a number. 7. Graph the solution of an equation and an inequality on a number line. 8. Use key vocabulary words to determine an inequality symbol. 9. Interpret the meaning of a solution to an equation and an inequality and be able to relate this to real-life situations. 10. Equations and inequalities can be written in many different ways. 11. Create a problem that would result in a specific answer to an equation or inequality.	Tier 2 – inequality, at most, at least, less than, greater than Tier 3 - algebraic, equation, inverse operations, solution set

Stage 2: Assessment Evidence

Assessments

Steven's Spending
Formative: Test: Written

Steven has $25 dollars. He spent $10.81, including tax, to buy a new DVD. He needs to set aside $10.00 to pay for his lunch next week. If peanuts cost $0.38 per package including tax, what is the maximum number of packages that Steven can buy? Write an equation or inequality to model the situation. Explain how you determined whether to write an equation or inequality and the properties of the real number

system that you used to find a solution.

Stage 3: Learning Plan	
Learning Activities	**Resources**
Students solve multi-step equations and inequalities derived from word problems. Students use the arithmetic from the problem to generalize an algebraic solution. Students graph inequalities and make sense of the inequality in context. Inequalities may have negative coefficients. Problems can be used to find a maximum or minimum value when in context. **Examples:** ☐ Amie had $26 dollars to spend on school supplies. After buying 10 pens, she had $14.30 left. How much did each pen cost? ☐ The sum of three consecutive even numbers is 48. What is the smallest of these numbers? ☐ Solve: 5/4n + 5 =20 ☐ Florencia has at most $60 to spend on clothes. She wants to buy a pair of jeans for $22 dollars and spend the rest on t-shirts. Each t-shirt costs $8. Write an inequality for the number of t-shirts she can purchase. ☐ Steven has $25 dollars. He spent $10.81, including tax, to buy a new DVD. He needs to set aside $10.00 to pay for his lunch next week. If peanuts cost $0.38 per package including	www.illuminations.nctm.org wwww.illustrativemathematics.org

tax, what is the maximum number of packages that Steven can buy? Write an equation or inequality to model the situation. Explain how you determined whether to write an equation or inequality and the properties of the real number system that you used to find a solution. ☐ Solve: 1/2x + 3 > 2 and graph your solution on a number line.	

Differentiation Opportunities

As students begin to build and work with expressions containing more than two operations, students tend to set aside the order of operations. For example having a student simplify an expression like 8 + 4(2x - 5) + 3x can bring to light several misconceptions. Do the students immediately add the 8 and 4 before distributing the 4? Do they only multiply the 4 and the 2x and not distribute the 4 to both terms in the parenthesis? Do they collect all like terms 8 + 4 – 5, and 2x + 3x? Each of these show gaps in students' understanding of how to simplify numerical expressions with multiple operations.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:53PM

Standard/Module: Proficiency with Ratios and Proportions 7.RP.1 (Week 14, 8 Weeks)

Stage 1: Desired Results

Standards Focus

- Major (70%) 7.NS.2

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Ratios & Proportional Relationships

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

- 1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

Enduring Understandings	Essential Questions
▪ A rate is a ratio which compares two measures. ▪ A unit rate has a denominator of one. ▪ A unit rate may be used to find equivalent rates with denominators other than one. ▪ Unit rates can be used to compare two quantities. ▪ Students should understand the many ways to represent a rational number.	1. What is difference between a rate and a ratio? 2. How can you use unit rates?

Critical Content

Fractions

- simplify, reciprocal, and equivalents

Measurement conversions

Ratio/Rate/Proportion

Unit Rate

Properties of Real Numbers

Skills	Vocabulary
1. Simplify fractions including complex fractions. 2. Define a unit rate. 3. Compute a unit rate. 4. Apply the multiplicative property of one. 5. Students will convert units of measurement.	Tier 2: area, quantity, simplify, reciprocal Tier 3: rate, unit rate, equivalent ratios, complex fraction, numerator, denominator, rational number

Stage 2: Assessment Evidence

Assessments

Unit Rates and Ratios
Formative: Test: Written

Students solve problems that involve simplify fractions to show an equivalent unit rate, defining a unit rate and computing a unit rate.

This may include finding the ratio of the length of a rectangle to the area of the rectangle or a similar type of problem.

Stage 3: Learning Plan

Learning Activities	Resources
Students continue to work with unit rates from 6th grade; however, the comparison now includes fractions compared to fractions. For example, if 1/2 gallon of paint covers 1/6 of a wall, then the amount of paint needed for the entire wall can be computed by 1/2 gal divided by 1/6 wall. This calculation gives 3 gallons. This standard requires only the use of ratios as fractions. Fractions may be proper or improper.	www.illustrativemathematics.org www.illuminations.nctm.org

Building from the development of rate and unit concepts in Grade 6, applications now need to focus on solving unit-rate problems with more sophisticated numbers: fractions per fractions. Proportional relationships are further developed through the analysis of graphs, tables, equations and diagrams. Ratio tables serve a valuable purpose in the solution of proportional problems. This is the time to push for a deep understanding of what a representation of a proportional relationship looks like and what the characteristics are: a straight line through the origin on a graph, a "rule" that applies for all ordered pairs, an equivalent ratio or an expression that describes the situation, etc. **This is not the time for students to learn to cross multiply to solve problems.** Because percents have been introduced as rates in Grade 6, the work with percents should continue to follow the thinking involved with rates and proportions. Solutions to problems can be found by using the same strategies for solving rates, such as looking for equivalent ratios or based upon understandings of decimals. Previously, percents have focused on "out of 100"; now percents above 100 are encountered. Providing opportunities to solve problems based within contexts that are relevant to seventh graders will connect meaning to rates, ratios and proportions. Examples include: researching newspaper ads and constructing their own question(s), keeping a log of prices (particularly sales) and determining savings by purchasing items on sale, timing students as they walk a lap on the track and figuring their rates, creating open-ended problem scenarios with and without numbers to give students the opportunity to demonstrate mastery.	

Differentiation Opportunities

This is the time to push for a deep understanding of what a representation of a proportional relationship looks like and what the characteristics are: a straight line through the origin on a graph, a "rule" that applies for all ordered pairs, an equivalent ratio or an expression that describes the situation, etc. **This is**

not the time for students to learn to cross multiply to solve problems.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:54PM

Standard/Module: Proficiency with Ratios and Proportions 7.RP.2 (Week 14, 8 Weeks)

Stage 1: Desired Results

Standards Focus

- Major (70%) 7.NS.2

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Ratios & Proportional Relationships

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

- 2. Recognize and represent proportional relationships between quantities.
- 2a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
- 2b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
- 2c. Represent proportional relationships by equations.
- 2d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.

Enduring Understandings	Essential Questions
▪ Linear situations can be represented in multiple formats. (do not always cross multiply) ▪ When graphed, a proportional relationship creates a linear function. ▪ Understand what the points on a graph of a proportional relationship means in terms of a specific situation. ▪ The slope of a line is the constant of proportionality. ▪ The constant of proportionality will affect the steepness of a line.	1. How can we represent a real life situation in multiple ways mathematically? 2. How do you know when a situation is a proportional relationship? 3. How does knowing the constant of proportionality help us to make predictions about situations?

Critical Content

Proportion

- Define what a proportion is
- Define constant of proportionality as a unit rate
- Prove if two ratios are proportional or not

- Use cross product rule appropriately

Multiple Representations of Linear Situations

- y-intercept should be (0, 0)
- view situation in multiple ways (table, graph and equation)

Slope

- as a rate of change
- as a constant of proportionality

Skills	Vocabulary
1. Identify the constant of proportionality. 2. Test for equivalent ratios. 3. Compare unit rates. 4. Plot an ordered pair on a coordinate plane. 5. Identify unit rate on a coordinate plane, table, and function. 6. Represent proportional relationships by equations. 7. Identify the slope of a line using tables and graphs.	Tier 2: line, equation, origin Tier 3: Constant rate of change (infers linear relationships), proportional relationships, constant of proportionality, linear, equivalent ratios, unit rate, slope, ordered pair, coordinate plane

Stage 2: Assessment Evidence

Assessments

Proportional or Not Proportional?
Formative: Test: Written

Students are given a verbal problem and they are prompted to create a table of values, a graph, and if possible write an equation. Using that information, students will determine whether a proportional relationship exists and describe the proportional relationship if there is one.

Stage 3: Learning Plan

Learning Activities	Resources
Students' understanding of the multiplicative reasoning used with proportions continues from 6th grade. Students determine if two quantities are in a proportional relationship from a table.	www.illustrativemathematics.org

For example, a table might give the price for different number of books. Students would determines, do the numbers in the table represent a proportional relationship? For example, students can examine the numbers to see that 1 book at 3 dollars is equivalent to 4 books for 12 dollars since both sides of the tables can be multiplied by 4. What if the table indicates that 7 books are $18? The 7 and 18 are not proportional since 1 book times 7 and 3 dollars times 7 will not give 7 books for 18 dollars. Seven books for $18 are not proportional to the other amounts in the table; therefore, there is not a constant of proportionality. Students graph relationships to determine if two quantities are in a proportional relationship and interpret the ordered pairs. If the amounts from the table above are graphed (number of books, price), the pairs (1, 3), (3, 9), and (4, 12) will form a straight line through the origin (0 books cost 0 dollars), indicating that these pairs are in a proportional relationship. The ordered pair (4, 12) means that 4 books cost $12. However, the ordered pair (7, 18) would not be on the line, indicating that it is not proportional to the other pairs. The ordered pair (1, 3) indicates that 1 book is $3, which is the unit rate. The y-coordinate when x =1 will be the unit rate. The constant of proportionality is the unit rate. Students identify this amount from tables, graphs, equations and verbal descriptions of proportional relationships. A graph represents the price of the bananas at one store. What is the constant of proportionality? From the graph, it might be determined that 4 pounds of bananas is $1.00; therefore, 1 pound of bananas is $0.25, which is the constant of proportionality for the graph. Note: Any point on the	www.illuminations.nctm.org

graph will yield this constant of proportionality.

This standard focuses on the representations of proportions. Solving proportions is addressed in 7.SP.3. Students may use a content web site and/or interactive white board to create tables and graphs of proportional or non-proportional relationships. Graphing proportional relationships represented in a table helps students recognize that the graph is a line through the origin (0,0) with a constant of proportionality equal to the slope of the line.

Examples:

☐ A student is making trail mix. Create a graph to determine if the quantities of nuts and fruit are proportional for each serving size listed in the table (you would create the table for students). If the quantities are proportional, what is the constant of proportionality or unit rate that defines the relationship? Explain how you determined the constant of proportionality and how it relates to both the table and graph.

The relationship is proportional. For each of the other serving sizes there are 2 cups of fruit for every 1 cup of nuts (2:1).

The constant of proportionality is shown in the first column of the table and by the slope of the line on the graph.

☐ The graph below (you provide the graph for students)represents the cost of gum packs as a unit rate of $2 dollars for every pack of gum. The unit rate is represented as $2/pack. Represent the relationship using a table and an equation.

Equation: $d = 2g$, where d is the cost in dollars and g is the packs of gum.

Differentiation Opportunities

In the gum problem above, a common error is to reverse the position of the variables when writing equations. Students may find it useful to use variables specifically related to the quantities rather than using x and y. Constructing verbal models can also be helpful. A student might describe the situation as "the number of packs of gum times the cost for each pack is the total cost in dollars". They can use this verbal model to construct the equation. Students can check their equation by substituting values and comparing their results to the table. The checking process helps student revise and recheck their model as necessary. The number of packs of gum times the cost for each pack is the total cost: (g x 2 = d).

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:55PM

Standard/Module: Proficiency with Ratios and Proportions 7.RP.3 (Week 16, 6 Weeks)

Stage 1: Desired Results

Standards Focus

- Major (70%) 7.NS.1, 7.NS.2

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Ratios & Proportional Relationships

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

- 3. Use proportional relationships to solve multistep ratio and percent problems.

Enduring Understandings

- Understand that proportional reasoning is a means to answers problems involving percent.
- When completing compound percent problems (ex: markup and discount), understand that you need to use two calculations as opposed to one simple addition/subtraction step initially.
- Understand the procedure of our society with respect to calculating compound percent. (ex: finding discount before calculating tax)
- Understand when to use different forms of a number given specific situations.

Essential Questions

1. How can mathematics be used to help us answer real world problems involving percents?
2. When is it appropriate to use percents as opposed to fractions (and vice versa) when working with real life applications?

Critical Content

Conversions

- Work fluently among fractions, decimals, and percents

Place Value

- Identify
- Rounding

Fractions

- Writing equivalent fractions
- Simplify

Proportions

- Set-up
- Solve

Skills	Vocabulary

1. Use the percent proportion (part/whole = percent/100) and equation (percent = part/whole)
2. Calculate percent applications:
  1. percent increase/decrease
  2. simple interest
  3. percent error
  4. tax
  5. gratuities and commissions
  6. fees
  7. markup/markdown
3. Use proportional relationships to solve problems
4. Identify the different components of a proportion given a real world example
5. Create problems to illustrate different percent answers. (ex: Write several percent problems in which the solution is x%.)
	Tier 2: percent, gratuity, commission, mark up, mark down, simple interest, tax, fee, principal, rate, time, cross product, difference, solve, simplify, round
	
	Tier 3: percent error, percent increase, percent decrease, proportional relationship, ratio, absolute value, fraction, decimal, percent

Stage 2: Assessment Evidence

Assessments

Solving ratio and percent problems
Formative: Test: Written

Use tasks like the ones described in the "Learning Activities" to assess students' understanding of this standard.

Stage 3: Learning Plan

Learning Activities	Resources
In 6th grade, students used ratio tables and unit rates to solve problems. Students expand their understanding of proportional reasoning to solve	www.illustrativemathematics.org

problems that are easier to solve with an algorithm. **Cross multiplication should only be used IF students understand the mathematical foundation for cross-multiplication.** **For example**, a recipe calls for 3/4 teaspoon of butter for every 2 cups of milk. If you increase the recipe to use 3 cups of milk, how many teaspoons of butter are needed? Using these numbers to find the unit rate may not be the most efficient method. Students can set up the following proportion to show the relationship between butter and milk. The use of proportional relationships is also extended to solve percent problems involving tax, markups and markdowns simple interest (I = prt, I = interest, p = principal, r = rate, and t = time), gratuities and commissions, fees, percent increase and decrease, and percent error. **For example**, Games Unlimited buys video games for $10. The store increases the price 300%? What is the price of the video game? Using proportional reasoning, if $10 is 100% then what amount would be 300%? Since 300% is 3 times 100%, $30 would be $10 times 3. Thirty dollars represents the amount of increase from $10 so the new price of the video game would be $40. Finding the percent error is the process of expressing the size of the error (or deviation) between two measurements. To calculate the percent error, students determine the absolute deviation (positive difference) between an actual measurement and the accepted value and then divide by the accepted	www.illuminations.nctm.org

value. Multiplying by 100 will give the percent error. **For example**, you need to purchase a countertop for your kitchen. You measured the countertop as 5 ft. The actual measurement is 4.5 ft. What is the percent error? Several problem situations have been represented with this standard; however, every possible situation cannot be addressed here. Students should be able to explain or show their work using a representation (numbers, words, pictures, physical objects, or equations) and verify that their answer is reasonable. Models help students to identify the parts of the problem and how the values are related. For percent increase and decrease, students identify the starting value, determine the difference, and compare the difference in the two values to the starting value. **Examples:** ☐ Gas prices are projected to increase 124% by April 2015. A gallon of gas currently costs $4.17. What is the projected cost of a gallon of gas for April 2015? A student might say: "The original cost of a gallon of gas is $4.17. An increase of 100% means that the cost will double. I will also need to add another 24% to figure out the final projected cost of a gallon of gas. Since 25% of $4.17 is about $1.04, the projected cost of a gallon of gas should be around $9.40." ☐ A sweater is marked down 33%. Its original price was $37.50. What is the price of the sweater before sales tax? The discount is 33% times 37.50. The sale price of the sweater is the original price minus the discount or 67% of the original price of the sweater, or Sale Price = 0.67 x Original Price.	

☐ A shirt is on sale for 40% off. The sale price is $12. What was the original price? What was the amount of the discount? ☐ At a certain store, 48 television sets were sold in April. The manager at the store wants to encourage the sales team to sell more TVs and is going to give all the sales team members a bonus if the number of TVs sold increases by 30% in May. How many TVs must the sales team sell in May to receive the bonus? Justify your solution. ☐ A salesperson set a goal to earn $2,000 in May. He receives a base salary of $500 as well as a 10% commission for all sales. How much merchandise will he have to sell to meet his goal? ☐ After eating at a restaurant, your bill before tax is $52.60 The sales tax rate is 8%. You decide to leave a 20% tip for the waiter based on the pre-tax amount. How much is the tip you leave for the waiter? How much will the total bill be, including tax and tip? Express your solution as a multiple of the bill. The amount paid = 0.20 x $52.50 + 0.08 x $52.50 = 0.28 x $52.50	

Differentiation Opportunities

Students should be able to explain or show their work using a representation (numbers, words,

pictures, physical objects, or equations) and verify that their answer is reasonable. Models help

students to identify the parts of the problem and how the values are related.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:55PM

Standard/Module: Proficiency with Geometry 7.G.1 (Week 19, 3 Weeks)

Stage 1: Desired Results

Standards Focus

- Additional (10%) 7.NS.1, 7.NS.2

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Geometry

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

- 1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Enduring Understandings

- Proportions can be used to solve problems involving scale drawing of geometric figures, however, should not be limited to this method.
- Objects drawn to scale should have a proportional relationship with one another.
- A constant of proportionality embraces multiplication, not addition.

Essential Questions

1. How do you know when a proportional relationship exists?
2. How does a scale factor affect length, area, perimeter, angle measure, and volume?
3. Is there a geometric figure for any given set of characteristics?

Critical Content

Proportions

- Set-up and solve

Operations

- Four operations of rational numbers

Geometry

- Identify regular polygons
- Correspondence of side lengths

Skills	Vocabulary
1. Set-up a unit ratio. 2. Identify and use a scale factor appropriately. 3. Use a proportion to find an unknown length or area. 4. Recognize like and unlike units of measure and convert when necessary.	Tier 2: scale, Tier 3: scale factor, scale drawing, scale model

Stage 2: Assessment Evidence

Assessments

Scale Drawings
Formative: Performance: Skill Demonstration

Students create scale drawings (either by scaling up or down) and showing the scale factor as well as the measurements for both the original and new images. Students should either generate their own measurement data or figure out the scale factor. One of those would be provided by the teacher.

For example:

Choose an object in your desk-- it must fit on an 8.5 x 11 piece of paper. Measure its dimensions. Make a sketch of the object and label the original dimensions on your sketch. If you were to scale up that object to make it 5 times larger, what would the new dimensions be? Make a second sketch of the object and label the new dimensions. The sketch should be drawn to it's actual size at 5 times the original (see the teacher for paper options available to you). At 5 times it's original size, would the object be larger or smaller than a Twinkie? What about a bicycle? Explain your reasoning.

or

"The Alice in Wonderland Project:"

Record your height, the length of your arms and legs and the height of your head. If you were 5 times larger, what would your new measurements be? If you were 1/5 of your original size, what would your measurements be?

Stage 3: Learning Plan

Learning Activities	Resources
This cluster focuses on the importance of visualization in the understanding of Geometry. Being able to visualize and then represent geometric figures on paper is essential to solving	See "Rubber Band Enlargements" from AIMS

geometric problems. Scale drawings of geometric figures connect understandings of proportionality to geometry and lead to future work in similarity and congruence. As an introduction to scale drawings in geometry, students should be given the opportunity to explore scale factor as the number of time you multiple the measure of one object to obtain the measure of a similar object. It is important that students first experience this concept concretely progressing to abstract contextual situations. Pattern blocks (not the hexagon) provide a convenient means of developing the foundation of scale. Choosing one of the pattern blocks as an original shape, students can then create the next-size shape using only those same-shaped blocks. Questions about the relationship of the original block to the created shape should be asked and recorded. This can be repeated for multiple iterations of each shape by comparing each side length to the original's side length. An extension would be for students to compare the later iterations to the previous. Students should also be expected to use side lengths equal to fractional and decimal parts. In other words, if the original side can be stated to represent 2.5 inches, what would be the new lengths and what would be the scale? Provide opportunities for students to use scale drawings of geometric figures with a given scale that requires them to draw and label the dimensions of the new shape. Initially, measurements should be in whole numbers, progressing to measurements expressed with rational numbers. This will challenge students to apply their understanding of fractions and decimals. After students have explored multiple iterations with a couple of shapes, ask them to choose and replicate a shape with given scales to find the new side lengths, as well as both the perimeters and areas. Starting with simple shapes and whole-number side lengths allows all students access to discover and understand the relationships. An interesting discovery is the relationship of the scale of the side lengths to the scale of the respective perimeters (same scale) and areas (scale squared). Students should move on to drawing scaled figures on grid paper with proper figure labels, scale and dimensions. Provide word problems that require finding missing side lengths, perimeters or areas. For	www.illustrativemathematics.org www.illuminations.nctm.org Rubber Band Enlargements

example, *if a 4 by 4.5 cm rectangle is enlarged by a scale of 3, what will be the new perimeter? What is the new area?* or *If the scale is 6, what will the new side length look like?* or *Suppose the area of one triangle is 16 sq units and the scale factor between this triangle and a new triangle is 2.5. What is the area of the new triangle?* Reading scales on maps and determining the actual distance (length) is an appropriate contextual situation. Constructions facilitate understanding of geometry. Provide opportunities for students to physically construct triangles with straws, sticks, or geometry apps prior to using rulers and protractors to discover and justify the side and angle conditions that will form triangles. Explorations should involve giving students: three side measures, three angle measures, two side measures and an included angle measure, and two angles and an included side measure to determine if a unique triangle, no triangle or an infinite set of triangles results. Through discussion of their exploration results, students should conclude that triangles cannot be formed by any three arbitrary side or angle measures. They may realize that for a triangle to result the sum of any two side lengths must be greater than the third side length, or the sum of the three angles must equal 180 degrees. Students should be able to transfer from these explorations to reviewing measures of three side lengths or three angle measures and determining if they are from a triangle justifying their conclusions with both sketches and reasoning. This cluster is related to the following Grade 7 cluster "Solve real-life and mathematical problems involving angle measure, area, surface area, and volume." Further construction work can be replicated with quadrilaterals, determining the angle sum, noticing the variety of polygons that can be created with the same side lengths but different angle measures, and ultimately generalizing a method for finding the angle sums for regular polygons and the measures of individual angles. For example, subdividing a polygon into triangles using a vertex (N-2)180° or	

subdividing a polygons into triangles using an interior point 180°N - 360° where N = the number of sides in the polygon. An extension would be to realize that the two equations are equal. Slicing three-dimensional figures helps develop three-dimensional visualization skills. Students should have the opportunity to physically create some of the three-dimensional figures, slice them in different ways, and describe in pictures and words what has been found. For example, use clay to form a cube, then pull string through it in different angles and record the shape of the slices found. Challenges can also be given: "See how many different two-dimensional figures can be found by slicing a cube" or "What three-dimensional figure can produce a hexagon slice?" This can be repeated with other three-dimensional figures using a chart to record and sketch the figure, slices and resulting two-dimensional figures.Students determine the dimensions of figures when given a scale and identify the impact of a scale on actual length (one-dimension) and area (two-dimensions). Students identify the scale factor given two figures. Using a given scale drawing, students reproduce the drawing at a different scale. Students understand that the lengths will change by a factor equal to the product of the magnitude of the two size transformations. **Example:** ☐ Julie showed you the scale drawing of her room. If each 2 cm on the scale drawing equals 5 ft, what are the actual dimensions of Julie's room? Reproduce the drawing at 3 times its current size.	

Differentiation Opportunities

Students may have misconceptions about correctly setting up proportions, how to read a ruler, and doubling side measures but does not double perimeter. These may need to be explored and reinforced prior to or within the geometry instruction.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:56PM

Standard/Module: Proficiency with Geometry 7.G.4 (Week 22, 3 Weeks)

Stage 1: Desired Results

Standards Focus

- Additional (10%) 7.RP.1, 7.RP.2, 7.EE.3, 7.EE.4

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Geometry

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

- 4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

Enduring Understandings

- The area and circumference of a circle are both approximations because of pi.
- The only information you need in order to find both the area and circumference of a circle is its radius.
- Area and circumference are two different entities.
- There are three major geometric measurements: perimeter, area and volume.

Essential Questions

1. How are the circumference and area impacted by changing a radius of a circle?
2. How can you represent pi in terms of circumference?
3. Why do we use an estimation of pi?
4. Why is the radius squared in the area formula of a circle and not in the circumference formula?
5. How are perimeter and circumference related?

Critical Content

Formulas

- Area and circumference of a circle
- Define the formula's variables

Number Sense

- Take square roots
- Rational and irrational numbers
- Pi
- Rounding and estimating

Skills	Vocabulary
1. Identify the inverse of squaring is taking the square root. 2. Solve one-step equations. 3. Evaluate variable expressions. 4. Substitute for the radius, diameter, circumference and area. 5. Find the diameter given a radius and vice versa. 6. Find the radius, diameter, circumference and area given all critical information. 7. Describe the difference between area and circumference. 8. Use proportional reasoning. 9. Identify pi is irrational and therefore is often approximated.	Tier 2: circle, center, estimate Tier 3: circumference, diameter, radius, pi

Stage 2: Assessment Evidence

Assessments

Circles
Formative: Test: Written

Solve problems involving the area and circumference of a circle when given certain measurements. Explain how the diameter and radius are related to the circumference of the circle.

Stage 3: Learning Plan

Learning Activities	Resources
This is the students' initial work with circles. Knowing that a circle is created by connecting all the points equidistant from a point (center) is essential to understanding the relationships between radius, diameter, circumference, pi and area. Students can observe this by folding a paper plate several times, finding the center at the intersection, then measuring the lengths between the center and several points on the circle, the radius. Measuring the folds through the center, or diameters leads to the realization that a diameter is two times a radius. Given multiple-size circles, students should then explore the relationship between the radius and the length measure of the circle (circumference) finding an approximation of pi and ultimately deriving a formula for circumference. String or yarn laid over the circle and compared to a	http://mathworld.wolfram.com/Circle.html

ruler is an adequate estimate of the circumference. This same process can be followed in finding the relationship between the diameter and the area of a circle by using grid paper to estimate the area. Another visual for understanding the area of a circle can be modeled by cutting up a paper plate into at least 16 pieces along diameters and reshaping the pieces into a parallelogram. In figuring area of a circle, the squaring of the radius can also be explained by showing a circle inside a square. Again, the formula is derived and then learned. After explorations, students should then solve problems, set in relevant contexts, using the formulas for area and circumference. In previous grades, students have studied angles by type according to size: acute, obtuse and right, and their role as an attribute in polygons. Now angles are considered based upon the special relationships that exist among them: supplementary, complementary, vertical and adjacent angles. Provide students the opportunities to explore these relationships first through measuring and finding the patterns among the angles of intersecting lines or within polygons, then utilize the relationships to write and solve equations for multi-step problems. Real-world and mathematical multi-step problems that require finding area, perimeter, volume, surface area of figures composed of triangles, quadrilaterals, polygons, cubes and right prisms should reflect situations relevant to seventh graders. The computations should make use of formulas and involve whole numbers, fractions, decimals, ratios and various units of measure with same system conversions. Students understand the relationship between radius and diameter. Students also understand the ratio of circumference to diameter can be expressed as Pi. Building on these understandings, students generate the formulas for circumference and area. If a circle is cut into at least 16 equal "wedges" and laid out as	

shown, a parallelogram results. Half of an end wedge can be moved to the other end a rectangle results. The height of the rectangle is the same as the radius of the circle. The base length is 1 2 the circumference (2*Пr)*. The area of the rectangle (and therefore the circle) is found by the following calculations: A r e a = B a s e x H e ig h t A r e a = ½ (2 *П r)* x r A r e a = *П r* x r A r e a = $П r^2$ Students solve problems (mathematical and real-world) including finding the area of left-over materials when circles are cut from squares and triangles or from cutting squares and triangles from circles. "Know the formula" does not mean memorization of the formula. To "know" means to have an understanding of why the formula works and how the formula relates to the measure (area and circumference) and the figure. This understanding should be for all students. **Examples:** ☐ The seventh grade class is building a mini golf game for the school carnival. The end of the putting green will be a circle. If the circle is 10 feet in diameter, how many square feet of grass carpet will they need to buy to cover the circle? How might you communicate this information to the salesperson to make sure you receive a piece of carpet that is the correct size? ☐ Students measure the circumference and diameter	

of several circular objects in the room (clock, trash can, door knob, wheel, etc.). Students organize their information and discover the relationship between circumference and diameter by noticing the pattern in the ratio of the measures. Students write an expression that could be used to find the circumference of a circle with any diameter and check their expression on other circles. ☐ Students will use a circle as a model to make several equal parts as you would in a pie model. The greater number the cuts, the better. The pie pieces are laid out to form a shape similar to a parallelogram. Students will then write an expression for the area of the parallelogram related to the radius (note: the length of the base of the parallelogram is half the circumference, or πr, and the height is r, resulting in an area of πr Extension: If students are given the circumference of a circle, could they write a formula to determine the circle's area or given the area of a circle, could they write the formula for the circumference?	

Differentiation Opportunities

Pi is an exact number rather than understanding that 3.14 is just an approximation of pi. 22/7 is generally not accepted by mathematicians because pi is irrational and the form of writing 22/7 shows it as rational.

Many students are confused when dealing with circumference (linear measurement) and area. This confusion is about an attribute that is measured using linear units (surrounding) vs. an attribute that is measured using area units (covering). Use tape measures and other linear models to show how a circumference is measured with linear measurement.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:57PM

Standard/Module: Proficiency with Probability Statistics 7.SP.1 (Week 25, 7 Weeks)

Stage 1: Desired Results

Standards Focus

- Supporting (20%)

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Statistics & Probability

7.SP Use random sampling to draw inferences about a population.

- 1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

Enduring Understandings	Essential Questions
▪ When sampling a population, it is important to understand that data can be biased or unbiased. ▪ After statistical data is collected, it can be analyzed using probability. ▪ Data can be illustrated/modeled in a variety of different ways.	1. How will the sample of a survey affect the results of a survey? 2. How can you determine if a sample is biased? 3. What are valid methods that can be used to create a sample? 4. Why would someone want to portray biased data to the public?

Critical Content

Graphs

- Box and whisker
- Line
- Bar
- Histogram
- Circle

Probability

Skills	Vocabulary

1. Determine the difference between biased and unbiased data. 2. Identify an unbiased random sampling of data. 3. Understand that generalizations about a population from a sample are valid only if the sample is representative of that population. 4. Create a graphical representation of data. 5. Determine what type of graph should be used to portray data in an unbiased way.	Tier 2: sample, simulation, fair, outcome, random Tier 3: biased, unbiased, simple random sample, systematic random sample, convenience sample, voluntary response sample

Stage 2: Assessment Evidence

Assessments

Sampling
Formative: Performance: Skill Demonstration

Use the learning activities as your assessment in this case.

Stage 3: Learning Plan

Learning Activities	Resources
In Grade 6, students used measures of center and variability to describe data. Students continue to use this knowledge in Grade 7 as they use random samples to make predictions about an entire population and judge the possible discrepancies of the predictions. Providing opportunities for students to use real-life situations from science and social studies shows the purpose for using random sampling to make inferences about a population. Make available to students the tools needed to develop the skills and understandings required to produce a representative sample of the general population. One key element of a representative sample is understanding that a random sampling guarantees that each element of the population has an equal opportunity to be selected in the sample. Have students compare the random sample to population, asking questions like "Are all the elements of the entire population represented in the sample?" and "Are the elements represented proportionally?" Students can then continue the process of analysis by determining the measures of center and variability to make inferences about the	www.illustrativemathematics.org www.illuminations.nctm.org

general population based on the analysis. Provide students with random samples from a population, including the statistical measures. Ask students guiding questions to help them make inferences from the sample. Students recognize that it is difficult to gather statistics on an entire population. Instead, a random sample can be representative of the total population and will generate valid results. Students use this information to draw inferences from data. A random sample must be used in conjunction with the population to get accuracy. For example, a random sample of elementary students cannot be used to give a survey about a high school prom. **Example:** ☐ The school food service wants to increase the number of students who eat hot lunch in the cafeteria. The student council has been asked to conduct a survey of the student body to determine the students' preferences for hot lunch. They have determined two ways to do the survey. The two methods are listed below. Identify the type of sampling used in each survey option. Which survey option should the student council use and why? 1. Write all of the students' names on cards and pull them out in a draw to determine who will complete the survey. 2. Survey the first 20 students that enter the lunch room.	

Differentiation Opportunities

Students may believe:

One random sample is not representative of the entire population. Many samples must be taken in order to

make an inference that is valid. By comparing the results of one random sample with the results of

multiple

random samples, students can correct this misconception.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:58PM

Standard/Module: Proficiency with Probability Statistics 7.SP.2 (Week 25, 7 Weeks)

Stage 1: Desired Results

Standards Focus

- Supporting (20%) 7.RP.2

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Statistics & Probability

7.SP Use random sampling to draw inferences about a population.

- 2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

Enduring Understandings	Essential Questions
▪ Data can be used to make predictions. ▪ Statistical data is used frequently in the real world, however, can sometimes be misleading (ex: advertising).	1. How can you use data to make predictions and comparisons?

Critical Content

Estimation

Definitions of biased and unbiased

Proportional Relationships

Skills	Vocabulary
1. Create an unbiased random sampling of data. 2. Use data to form a random, unbiased sample	Tier 2: sample, simulation, fair, outcome, random

to draw inferences about a population. 3. Generate multiple samples of the same size to gauge the variation in estimates or predictions.	Tier 3: biased, unbiased, simple random sample, systematic random sample, convenience sample, voluntary response sample

Stage 2: Assessment Evidence

Assessments

Sampling and Data
Formative: Performance: Skill Demonstration

Use the learning activity to assess in this case.

Stage 3: Learning Plan

Learning Activities	Resources
In Grade 6, students used measures of center and variability to describe data. Students continue to use this knowledge in Grade 7 as they use random samples to make predictions about an entire population and judge the possible discrepancies of the predictions. Providing opportunities for students to use real-life situations from science and social studies shows the purpose for using random sampling to make inferences about a population. Make available to students the tools needed to develop the skills and understandings required to produce a representative sample of the general population. One key element of a representative sample is understanding that a random sampling guarantees that each element of the population has an equal opportunity to be selected in the sample. Have students compare the random sample to population, asking questions like "Are all the elements of the entire population represented in the sample?" and "Are the elements represented proportionally?" Students can then continue the process of analysis by determining the measures of center and variability to make inferences about the general population based on the analysis. Provide students with random samples from a population, including the statistical measures. Ask students guiding questions to help them make inferences from the sample.	www.illustrativemathematics.org www.illuminations.nctm.org

Students collect and use multiple samples of data to answer question(s) about a population. Issues of variation in the samples should be addressed. **Example:** ☐ Collect the data from two random samples of 100 students regarding student's school lunch preference. Make at least two inferences based on the results.	

Differentiation Opportunities

Students may believe:

One random sample is not representative of the entire population. Many samples must be taken in order to

make an inference that is valid. By comparing the results of one random sample with the results of multiple

random samples, students can correct this misconception.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:58PM

Standard/Module: Proficiency with Probability Statistics 7.SP.3 (Week 25, 7 Weeks)

Stage 1: Desired Results

Standards Focus

- Additional (10%)

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Statistics & Probability

7.SP Draw informal comparative inferences about two populations.

- 3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.

Enduring Understandings	Essential Questions
▪ When comparing data, it is recommended to view both data in the same type of graph using the same scale.	1. What is the best type of graph to use to display a set data?

Critical Content

Construct Graphs

- Double bar graph
- Double box and whisker
- Double line
- Double line plot
- Stem and leaf
- Circle

Measure of Variability

Measures of Central Tendency

Skills	Vocabulary

1. Draw conclusions from two graphs with similar variabilities (ex: heights of players from a basketball team versus a soccer team).	Tier 2: mean, median, mode, range, Tier 3: mean absolute deviation, dot plot, box plot, statistics

Stage 2: Assessment Evidence

Assessments

Assessing overlap between two data groups
Formative: Performance: Skill Demonstration

Use the learning task as your assessment.

Stage 3: Learning Plan

Learning Activities	Resources
In Grade 6, students used measures of center and variability to describe sets of data. In the cluster "Use random sampling to draw inferences about a population" of Statistics and Probability in Grade 7, students learn to draw inferences about one population from a random sampling of that population. Students continue using these skills to draw informal comparative inferences about two populations. Provide opportunities for students to deal with small populations, determining measures of center and variability for each population. Then have students compare those measures and make inferences. The use of graphical representations of the same data (Grade 6) provides another method for making comparisons. Students begin to develop understanding of the benefits of each method by analyzing data with both methods. When students study large populations, random sampling is used as a basis for the population inference. This build on the skill developed in the Grade 7 cluster "Use random sampling to draw inferences about a population" of Statistics and Probability. Measures of center and variability are used to make inferences on each of the general populations. Then the students have make comparisons for the two populations based on those	www.illustrativemathematics.org www.illuminations.nctm.org

inferences. This is a great opportunity to have students examine how different inferences can be made based on the same two sets of data. Have students investigate how advertising agencies uses data to persuade customers to use their products. Additionally, provide students with two populations and have them use the data to persuade both sides of an argument. Students can readily find data as described in the example on sports team or college websites. Other sources for data include American Fact Finder (Census Bureau), Fed Stats, Ecology Explorers, USGS, or CIA World Factbook. Researching data sets provides opportunities to connect mathematics to their interests and other academic subjects. Students can utilize statistic functions in graphing calculators or spreadsheets for calculations with larger data sets or to check their computations. Students calculate mean absolute deviations in preparation for later work with standard deviations. Example: Jason wanted to compare the mean height of the players on his favorite basketball and soccer teams. He thinks the mean height of the players on the basketball team will be greater but doesn't know how much greater. He also wonders if the variability of heights of the athletes is related to the sport they play. He thinks that there will be a greater variability in the heights of soccer players as compared to basketball players. He used the rosters and player statistics from the team websites to generate the following lists: *Basketball Team – Height of Players in inches for 2010-2011 Season* *75, 73, 76, 78, 79, 78, 79, 81, 80, 82, 81, 84, 82, 84, 80, 84* *Soccer Team – Height of Players in inches for 2010* *73, 73, 73, 72, 69, 76, 72, 73, 74, 70, 65, 71, 74,*	

76, 70, 72, 71, 74, 71, 74, 73, 67, 70, 72, 69, 78, 73, 76, 69 To compare the data sets, Jason creates a two dot plots on the same scale. The shortest player is 65 inches and the tallest players are 84 inches. In looking at the distribution of the data, Jason observes that there is some overlap between the two data sets. Some players on both teams have players between 73 and 78 inches tall. Jason decides to use the mean and mean absolute deviation to compare the data sets. Jason sets up a table for each data set to help him with the calculations. The height of the players ofr each team goes in the first column. The mean height of the basketball players is 79.75 inches as compared to the mean height of the soccer players at 72.07 inches, a difference of 7.68 inches. The mean absolute deviation (MAD) is calculated by taking the mean of the absolute deviations for each data point. The difference between each data point and the mean is recorded in the second column of the table. Jason used rounded values (80 inches for the mean height of basketball players and 72 inches for the mean height of soccer players) to find the differences. The absolute deviation, absolute value of the deviation, is recorded in the third column. The absolute deviations are summed and divided by the number of data points in the set. The mean absolute deviation is 2.14 inches for the basketball players and 2.53 for the soccer players. These values indicate moderate variation in both data sets. There is slightly more variability in the height of the soccer players. The difference between the heights of the teams is approximately 3 times the variability of the data sets (7.68 ÷ 2.53 = 3.04).	

Differentiation Opportunities

Provide opportunities for students to deal with small populations, determining measures of center and variability for each population. Then have students compare those measures and make inferences.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 12:59PM

Standard/Module: Proficiency with Probability Statistics 7.SP.4 (Week 25, 7 Weeks)

Stage 1: Desired Results

Standards Focus

- Additional (10%)

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Statistics & Probability

7.SP Draw informal comparative inferences about two populations.

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

Enduring Understandings

- It is important to compare the same measures from different data sets.
- Measures of variability and measures of center allow us to make reliable predictions without accounting for every piece of data.

Essential Questions

1. Why is it useful to find the mean, median, mode, range, mean absolute deviation and interquartile range?
2. What do measures of variability and measures of center tell us about a population?

Critical Content

Find Information from Graphs

- Double bar graph
- Double box and whisker
- Double line
- Double line plot
- Stem and leaf
- Circle
- Any other way data can be organized

Operations

- Absolute Value

Skills

Vocabulary

1. Interpret graphs. 2. Calculate the measures of variability: range, mean absolute deviation, interquartile range. 3. Calculate the mean, median and mode. 4. Use the measures of variability and measures of center from random samples to draw informal comparative inferences about two populations.	Tier 2: mean, median, mode Tier 3: absolute value, comparative inferences, interquartile range

Stage 2: Assessment Evidence

Assessments

Measures of Center and Variability
Formative: Performance: Skill Demonstration

Use the learning activity as your assessment.

Stage 3: Learning Plan

Learning Activities	Resources
Students are expected to compare two sets of data using measures of center and variability. Measures of center include mean, median, and mode. The measures of variability include range, mean absolute deviation, and interquartile range. Provide opportunities for students to deal with small populations, determining measures of center and variability for each population. Then have students compare those measures and make inferences. The use of graphical representations of the same data (Grade 6) provides another method for making comparisons. Students begin to develop understanding of the benefits of each method by analyzing data with both methods. When students study large populations, random sampling is used as a basis for the population inference. This build on the skill developed in the Grade 7 cluster "Use random sampling to draw inferences about a population" of Statistics and Probability. Measures of center and variability are used to make inferences on each of the general populations. Then the students have make comparisons for the two populations based on those inferences. This is a great opportunity to have students examine how different inferences can be made based on the same two sets of data. Have students investigate how advertising agencies uses data to	www.illustrativemathematics.org www.illuminations.nctm.org

persuade customers to use their products. Additionally, provide students with two populations and have them use the data to persuade both sides of an argument. **Example:** ☐ The two data sets below depict random samples of the housing prices sold in the King River and Toby Ranch areas of Arizona. Based on the prices below which measure of center will provide the most accurate estimation of housing prices in Arizona? Explain your reasoning. o King River area {1.2 million, 242000, 265500, 140000, 281000, 265000, 211000} o Toby Ranch homes {5million, 154000, 250000, 250000, 200000, 160000, 190000}	

Differentiation Opportunities

This is a great opportunity to have students examine how different inferences can be made based on the same two sets of data. Have students investigate how advertising agencies uses data to persuade customers to use their products. Additionally, provide students with two populations and have them use the data to persuade both sides of an argument.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 1:00PM

Standard/Module: Proficiency with Probability Statistics 7.SP.5 (Week 25, 7 Weeks)

Stage 1: Desired Results

Standards Focus

- Supporting (20%) 7.RP.1, 7.RP.2, 7.NS.1

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Statistics & Probability

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

- 5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Enduring Understandings	Essential Questions
▪ Probability can be expressed in terms such as: impossible, unlikely, likely, or certain. ▪ The probability of an event occurring is $0 \leq x \leq 1$. ▪ Probabilities can be written as decimals, fractions and percents.	1. What causes events to have different probabilities? 2. What real life events can be placed on the continuum from impossible to certain? 3. In the real world, when would you want a probability of 1 to occur? 0 to occur? 4. When would it be appropriate to simplify a fraction when comparing probabilities? 5. When would it be best to write the probability as a fraction? decimal? percent?

Critical Content

Number Sense

- Convert between fractions, decimals and percents
- Simplify fractions
- Add/subtract rational numbers

Graph/Plot numbers on number line

Skills	Vocabulary

1. Identify and find the probability of a random event occurring. 2. Identify and find the probability of the complement of an event. 3. Compare rational numbers $0 \leq x \leq 1$. 4. A probability of 0 is impossible. 5. A probability near 0 is unlikely. 6. Probabilities near 0.5 are equally likely as unlikely. 7. Probabilities near 1 are likely to occur. 8. A probability of 1 is certain. 9. Identify the sample space and be able to quantify it.	Tier 2: chance, outcome, random Tier 3: probability, simple event, complementary events, sample space, tree diagram

Stage 2: Assessment Evidence

Assessments

How Likely?
Formative: Test: Written

Student classify and justify how likely an event is based on an indicated probability. Students generate statements that would be considered "likely," "50-50" or "unlinkely" and justify why those statements fit the likelihood.

Stage 3: Learning Plan

Learning Activities	Resources
Grade 7 is the introduction to the formal study of probability. Through multiple experiences,students begin to understand the probability of chance (simple and compound), develop and use sample spaces, compare experimental and theoretical probabilities, develop and use graphical organizers, and use information from simulations for predictions. Help students understand the probability of chance is using the benchmarks of probability: 0, 1 and ½. Provide students with situations that have	Marble Mania http://www.sciencenetlinks.com/interactives/marble/marblemania.html Random Drawing Tool - http://illuminations.nctm.org/activitydetail.aspx?id=67

clearly defined probability of never happening as zero, always happening as 1 or equally likely to happen as to not happen as 1/2. Then advance to situations in which the probability is somewhere between any two of these benchmark values. This builds to the concept of expressing the probability as a number between 0 and 1. Use this to build the understanding that the closer the probability is to 0, the more likely it will not happen, and the closer to 1, the more likely it will happen. Students learn to make predictions about the relative frequency of an event by using simulations to collect, record, organize and analyze data. Students also develop the understanding that the more the simulation for an event is repeated, the closer the experimental probability approaches the theoretical probability. Have students develop probability models to be used to find the probability of events. Provide students with models of equal outcomes and models of not equal outcomes are developed to be used in determining the probabilities of events. Students should begin to expand the knowledge and understanding of the probability of simple events, to find the probabilities of compound events by creating organized lists, tables and tree diagrams. This helps students create a visual representation of the data; i.e., a sample space of the compound event. From each sample space, students determine the probability or fraction of each possible outcome. Students continue to build on the use of simulations for simple probabilities and now expand the simulation of compound probability. Providing opportunities for students to match situations and	

sample spaces assists students in visualizing the sample spaces for situations. This is students' first formal introduction to probability. Students recognize that all probabilities are between 0 and 1, inclusive, the sum of all possible outcomes is 1. For example, there are three choices of jellybeans – grape, cherry and orange. If the probability of getting a grape is 3/10 and the probability of getting cherry is 1/5, what is the probability of getting oranges? The probability of any single event can be recognized as a fraction. The closer the fraction is to 1, the greater the probability the event will occur. Larger numbers indicate greater likelihood. For example, if you have 10 oranges and 3 apples, you have a greater likelihood of getting an orange. Probability can be expressed in terms such as impossible, unlikely, likely, or certain or as a number between 0 and 1 as illustrated on the number line. Students can use simulations such as Marble Mania on AAAS or the Random Drawing Tool on NCTM's Illuminations to generate data and examine patterns. **Example:** ☐ A container contains 2 gray, 1 white, and 4 black marbles. Without looking, if you choose a marble from the container, will the probability be closer to 0 or to 1 that you will select a white marble? A gray marble? A black marble? Justify each of your predictions.	
Differentiation Opportunities	

Providing opportunities for students to match situations and sample spaces assists students in visualizing the sample spaces for situations.

Students often struggle making organized lists or trees for a situation in order to determine the theoretical probability. Having students start with simpler situations that have fewer elements enables them to have successful experiences with organizing lists and trees diagrams. Ask guiding questions to help students create methods for creating organized lists and trees for situations with more elements.

Students often see skills of creating organized lists, tree diagrams, etc. as the end product. Provide students with experiences that require the use of these graphic organizers to determine the theoretical probabilities. Have them practice making the connections between the process of creating lists, tree diagrams, etc. and the interpretation of those models.

Additionally, students often struggle when converting forms of probability from fractions to percents and vice versa. To help students with the discussion of probability, don't allow the symbol manipulation/conversions to detract from the conversations. By having students use technology such as a graphing calculator or computer software to simulate a situation and graph the results, the focus is on the interpretation of the data. Students then make predictions about the general population based on these probabilities.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 1:00PM

Standard/Module: Proficiency with Probability Statistics 7.SP.6 (Week 25, 7 Weeks)

Stage 1: Desired Results

Standards Focus

- Supporting (20%) 7.RP.1, 7.RP.2, 7.NS.1

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Statistics & Probability

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

- 6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.

Enduring Understandings	Essential Questions
▪ Probability can be classified as either theoretical or experimental. ▪ If an experiment is accurate, the experimental probability should approach theoretical probability the more trials that occur.	1. How can the theoretical probability differ from the experimental probability? 2. What would be an appropriate number of trials that should be conducted in order to find an accurate probability?

Critical Content

Number Sense

- Convert between fractions, decimals and percents
- Simplify fractions
- Add/subtract rational numbers

Proportional Reasoning

Skills	Vocabulary

1. Predict the probability of an event occurring based on an experiment. 2. Find the theoretical probability of an event occurring. 3. Recognize that when the theoretical probability differs greatly from the experimental probability, you may need to conduct more trials in order to make a valid prediction. 4. Compare theoretical to experimental probability to make inferences. 5. Set-up and solve a proportion.	Tier 2: predict, trials Tier 3: theoretical probability, experimental probability, simulation

Stage 2: Assessment Evidence

Assessments

Pulling marbles
Formative: Performance: Skill Demonstration

Use the learning activity as the assessment.

Stage 3: Learning Plan

Learning Activities	Resources
Grade 7 is the introduction to the formal study of probability. Through multiple experiences, students begin to understand the probability of chance (simple and compound), develop and use sample spaces, compare experimental and theoretical probabilities, develop and use graphical organizers, and use information from simulations for predictions. Help students understand the probability of chance is using the benchmarks of probability: 0, 1 and ½. Provide students with situations that have clearly defined probability of never happening as zero, always happening as 1 or equally likely to happen as to not happen as 1/2. Then advance to situations in which the probability is somewhere between any two of these benchmark values. This builds to the concept of expressing the probability as	www.illustrativemathematics.org www.illuminationsnctm.org

a number between 0 and 1. Use this to build the understanding that the closer the probability is to 0, the more likely it will not happen, and the closer to 1, the more likely it will happen. Students learn to make predictions about the relative frequency of an event by using simulations to collect, record, organize and analyze data. Students also develop the understanding that the more the simulation for an event is repeated, the closer the experimental probability approaches the theoretical probability. Have students develop probability models to be used to find the probability of events. Provide students with models of equal outcomes and models of not equal outcomes are developed to be used in determining the probabilities of events. Students should begin to expand the knowledge and understanding of the probability of simple events, to find the probabilities of compound events by creating organized lists, tables and tree diagrams. This helps students create a visual representation of the data; i.e., a sample space of the compound event. From each sample space, students determine the probability or fraction of each possible outcome. Students continue to build on the use of simulations for simple probabilities and now expand the simulation of compound probability. Providing opportunities for students to match situations and sample spaces assists students in visualizing the sample spaces for situations. Students often struggle making organized lists or trees for a situation in order to determine the theoretical probability. Having students start with simpler situations that have fewer elements enables them to have successful experiences with organizing lists and trees diagrams. Ask guiding questions to help students create methods for creating organized lists and trees for situations with more elements. Students often see skills of creating organized lists, tree diagrams, etc. as the end product. Provide students with experiences that require the use of these graphic organizers to determine the theoretical probabilities. Have them practice making the connections between the process of creating lists, tree diagrams, etc. and the interpretation of those	

models. Additionally, students often struggle when converting forms of probability from fractions to percents and vice versa. To help students with the discussion of probability, don't allow the symbol manipulation/conversions to detract from the conversations. By having students use technology such as a graphing calculator or computer software to simulate a situation and graph the results, the focus is on the interpretation of the data. Students then make predictions about the general population based on these probabilities. Students collect data from a probability experiment, recognizing that as the number of trials increase, the experimental probability approaches the theoretical probability. The focus of this standard is relative frequency -the relative frequency is the observed number of successful events for a finite sample of trials. Relative frequency is the observed proportion of successful events. Students can collect data using physical objects or graphing calculator or web-based simulations. Students can perform experiments multiple times, pool data with other groups, or increase the number of trials in a simulation to look at the long-run relative frequencies. **Example:** Each group receives a bag that contains 4 green marbles, 6 red marbles, and 10 blue marbles. Each group performs 50 pulls, recording the color of marble drawn and replacing the marble into the bag before the next draw. Students compile their data as a group and then as a class. They summarize their data as experimental probabilities and make conjectures about theoretical probabilities (How many green draws would you expect if you were to conduct 1000 pulls? 10,000 pulls?). Students create another scenario with a different ratio of marbles in the bag and make a conjecture about the outcome of 50 marble pulls with replacement. (An example would be 3 green marbles, 6 blue marbles, and 3 blue marbles.)	

Students try the experiment and compare their predictions to the experimental outcomes to continue to explore and refine conjectures about theoretical probability.	

Differentiation Opportunities

Students often expect the theoretical and experimental probabilities of the same data to match.

By providing multiple opportunities for students to experience simulations of situations in order to find and compare the experimental probability to the theoretical probability, students discover that rarely are those probabilities the same.

Students often expect that simulations will result in all of the possibilities. All possibilities may occur in a simulation, but not necessarily. Theoretical probability does use all possibilities. Note examples in simulations when some possibilities are not shown.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 1:02PM

Standard/Module: Proficiency with Probability Statistics 7.SP.8 (Week 25, 7 Weeks)

Stage 1: Desired Results

Standards Focus

- Supporting (20%) 7.RP.1, 7.RP.2, 7.NS.1

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Statistics & Probability

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

- 8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
- 8a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
- 8b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.
- 8c. Design and use a simulation to generate frequencies for compound events.

Enduring Understandings

- The probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs (same as simple events).
- There are many ways to represent a sample space.

Essential Questions

1. How can you portray data so that it is organized and usable?
2. How can you predict the outcome of future events?
3. How would probabilities differ with and without replacement?
4. What are important things to consider when designing a simulation?

Critical Content

Number Sense

- Multiply rational numbers
- Convert between fractions decimals and percents

Probability

- Single event

Skills	Vocabulary
1. Create a tree diagram, sample space, list, and table given data. 2. Interpret and calculate probabilities from given or created tree diagrams, sample spaces, lists and tables. 3. Calculate and represent the probability of a compound event (both independent and dependent) as a fraction, decimal and percent. 4. Use the fundamental counting principle. 5. Represent sample spaces for compound events using the methods listed in skill 1. 6. Identify the number of outcomes in the sample space that compose a compound event for an event described in everyday language. 7. Design and use a simulation to generate frequencies for compound events.	Tier 3: Fundamental Counting principle, dependent events, independent events, permutations

Stage 2: Assessment Evidence

Assessments

Probabilities
Formative: Performance: Skill Demonstration

Use the learning activity as a form of assessment in this case.

Stage 3: Learning Plan

Learning Activities	Resources
Help students understand the probability of chance is using the benchmarks of probability: 0, 1 and ½. Provide students with situations that have clearly defined probability of never happening as zero, always happening as 1 or equally likely to happen as to not happen as 1/2. Then advance to situations in which the probability is somewhere between any two of these benchmark values. This builds to the	www.illustrativemathematics.org www.illuminations.nctm.org

concept of expressing the probability as a number between 0 and 1. Use this to build the understanding that the closer the probability is to 0, the more likely it will not happen, and the closer to 1, the more likely it will happen. Students learn to make predictions about the relative frequency of an event by using simulations to collect, record, organize and analyze data. Students also develop the understanding that the more the simulation for an event is repeated, the closer the experimental probability approaches the theoretical probability. Have students develop probability models to be used to find the probability of events. Provide students with models of equal outcomes and models of not equal outcomes are developed to be used in determining the probabilities of events. Students should begin to expand the knowledge and understanding of the probability of simple events, to find the probabilities of compound events by creating organized lists, tables and tree diagrams. This helps students create a visual representation of the data; i.e., a sample space of the compound event. From each sample space, students determine the probability or fraction of each possible outcome. Students continue to build on the use of simulations for simple probabilities and now expand the simulation of compound probability. Providing opportunities for students to match situations and sample spaces assists students in visualizing the sample spaces for situations. Students often struggle making organized lists or trees for a situation in order to determine the theoretical probability. Having students start with simpler situations that have fewer elements enables them to have successful experiences with organizing lists and trees diagrams. Ask guiding questions to help students create methods for creating organized lists and trees for situations with more elements. Students often see skills of creating organized lists, tree diagrams, etc. as the end product. Provide students with experiences that require the use of these graphic organizers to determine the theoretical probabilities. Have them practice making the connections between the process of creating lists, tree diagrams, etc. and the interpretation of those models. Additionally, students often struggle when converting forms of probability from fractions to percents and vice versa. To help students with the discussion of probability, don’t allow the symbol manipulation/conversions to detract from the	

conversations. By having students use technology such as a graphing calculator or computer software to simulate a situation and graph the results, the focus is on the interpretation of the data. Students then make predictions about the general population based on these probabilities. Students use tree diagrams, frequency tables, and organized lists, and simulations to determine the probability of compound events. Probabilities are useful for predicting what will happen over the long run. Using theoretical probability, students predict frequencies of outcomes. Students recognize an appropriate design to conduct an experiment with simple probability events, understanding that the experimental data give realistic estimates of the probability of an event but are affected by sample size. **Examples:** ☐ Students conduct a bag pull experiment. A bag contains 5 marbles. There is one red marble, two blue marbles and two purple marbles. Students will draw one marble without replacement and then draw another. What is the sample space for this situation? Explain how you determined the sample space and how you will use it to find the probability of drawing one blue marble followed by another blue marble. ☐ Show all possible arrangements of the letters in the word FRED using a tree diagram. If each of the letters is on a tile and drawn at random, what is the probability that you will draw the letters F-R-E-D in that order? What is the probability that your "word" will have an F as the first letter?	
Differentiation Opportunities	

Students often expect the theoretical and experimental probabilities of the same data to match. By providing multiple opportunities for students to experience simulations of situations in order to find and compare the experimental probability to the theoretical probability, students discover that rarely are those probabilities the same.

Students often expect that simulations will result in all of the possibilities. All possibilities may occur in a simulation, but not necessarily. Theoretical probability does use all possibilities. Note examples in simulations when some possibilities are not shown.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 1:03PM

Standard/Module: Proficiency with Geometry 7.G.2 (Week 32, 8 Weeks)

Stage 1: Desired Results

Standards Focus

- Additional (10%)

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Geometry

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

- 2. Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

Enduring Understandings

- There are many different ways to categorize triangles.
- It is important to use rulers and protractors when constructing figures in order to ensure accuracy.
- All triangles interior angles have a sum of 180 degrees.

Essential Questions

1. What criteria limits the construction of a triangle?
2. If we are given three acute angles of a triangle, how many different triangles can be drawn?
3. Why is the use of a protractor and ruler important when constructing polygons?

Critical Content

Triangles

- Draw and identify acute, right, obtuse, scalene, isosceles and equilateral
- Congruence and similarity

Geometry

- Identify and construct regular polygons
- Correspondence of side lengths

Skills

1. Use a protractor appropriately.
2. Use a ruler appropriately.

Vocabulary

Tier 3: acute triangle, right triangle, obtuse triangle, scalene triangle, isosceles triangle, equilateral

3. Use technology appropriately. 4. Sketch the different types of triangles freehand. 5. Draw geometric shapes with given conditions. (focus on triangles) 6. Identify angles as acute, right, and obtuse 7. Categorize triangles as acute, right and obtuse given their angle measures (either numbers or a diagram). 8. Identify triangles as scalene, isosceles or equilateral given side lengths or a diagram. 9. Find a missing angle of a triangle given two angles. (can also be applied to other regular polygons)	triangle, triangle, congruent segments

Stage 2: Assessment Evidence

Assessments

Drawing triangles
Formative: Performance: Skill Demonstration

Use the learning activities as assessment.

Stage 3: Learning Plan

Learning Activities	Resources
This cluster focuses on the importance of visualization in the understanding of Geometry. Being able to visualize and then represent geometric figures on paper is essential to solving geometric problems. Scale drawings of geometric figures connect understandings of proportionality to geometry and lead to future work in similarity and congruence. As an introduction to scale drawings in geometry, students should be given the opportunity to explore scale factor as the number of times you multiple the measure of one object to obtain the measure of a similar object. It is important that students first experience this concept concretely progressing to abstract contextual situations. Pattern blocks (not the hexagon) provide a convenient means of developing the foundation of scale. Choosing one of the pattern blocks as an original shape, students can then create the next-size shape using only those same-shaped blocks. Questions about the relationship of the original block to the created shape should be asked and recorded.	www.illustrativemathematics.org www.illuminations.nctm.org

This can be repeated for multiple iterations of each shape by comparing each side length to the original's side length. An extension would be for students to compare the later iterations to the previous. Students should also be expected to use side lengths equal to fractional and decimal parts. In other words, if the original side can be stated to represent 2.5 inches, what would be the new lengths and what would be the scale? Students should move on to drawing scaled figures on grid paper with proper figure labels, scale and dimensions. Provide word problems that require finding missing side lengths, perimeters or areas. For example, if a 4 by 4.5 cm rectangle is enlarged by a scale of 3, what will be the new perimeter? What is the new area? or If the scale is 6, what will the new side length look like? or Suppose the area of one triangle is 16 sq units and the scale factor between this triangle and a new triangle is 2.5. What is the area of the new triangle? Reading scales on maps and determining the actual distance (length) is an appropriate contextual situation. Constructions facilitate understanding of geometry. Provide opportunities for students to physically construct triangles with straws, sticks, or geometry apps prior to using rulers and protractors to discover and justify the side and angle conditions that will form triangles. Explorations should involve giving students: three side measures, three angle measures, two side measures and an included angle measure, and two angles and an included side measure to determine if a unique triangle, no triangle or an infinite set of triangles results. Through discussion of their exploration results, students should conclude that triangles cannot be formed by any three arbitrary side or angle measures. They may realize that for a triangle to result the sum of any two side lengths must be greater than the third side length, or the sum of the three angles must equal 180 degrees. Students should be able to transfer from these explorations to reviewing measures of three side lengths or three angle measures and determining if they are from a triangle justifying their conclusions with both sketches and reasoning. This cluster is related to the following Grade 7 cluster "Solve real-life and mathematical problems involving angle measure, area, surface area, and volume." Further construction work can be replicated with quadrilaterals, determining the	

angle sum, noticing the variety of polygons that can be created with the same side lengths but different angle measures, and ultimately generalizing a method for finding the angle sums for regular polygons and the measures of individual angles. For example, subdividing a polygon into triangles using a vertex (N-2)180° or subdividing a polygons into triangles using an interior point 180°N - 360° where N = the number of sides in the polygon. An extension would be to realize that the two equations are equal. Students understand the characteristics of angles that create triangles. For example, can a triangle have more than one obtuse angle? Will three sides of any length create a triangle? Students recognize that the sum of the two smaller sides must be larger than the third side. Conditions may involve points, line segments, angles, parallelism, congruence, angles, and perpendicularity. **Examples:** ☐ Is it possible to draw a triangle with a 90°angle and one leg that is 4 inches long and one leg that is 3 inches long? If so, draw one. Is there more than one such triangle? ☐ Draw a triangle with angles that are 60 degrees. Is this a unique triangle? Why or why not? ☐ Draw an isosceles triangle with only one 80 degree angle. Is this the only possibility or can you draw another triangle that will also meet these conditions? ☐ Can you draw a triangle with sides that are 13 cm, 5 cm and 6cm?	

☐ Draw a quadrilateral with one set of parallel sides and no right angles.	

Differentiation Opportunities

Provide opportunities for students to use scale drawings of geometric figures with a given scale that requires them to draw and label the dimensions of the new shape. Initially, measurements should be in whole numbers, progressing to measurements expressed with rational numbers. This will challenge students to apply their understanding of fractions and decimals.

After students have explored multiple iterations with a couple of shapes, ask them to choose and replicate a shape with given scales to find the new side lengths, as well as both the perimeters and areas. Starting with simple shapes and whole-number side lengths allows all students access to discover and understand the relationships. An interesting discovery is the relationship of the scale of the side lengths to the scale of the respective perimeters (same scale) and areas (scale squared).

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 1:03PM

Standard/Module: Proficiency with Geometry 7.G.3 (Week 32, 8 Weeks)

Stage 1: Desired Results

Standards Focus

- Additional (10%)

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Geometry

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

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

Enduring Understandings

- There are different ways to look at 3D figures.
- Three dimensional figures have many different characteristics.
- The cross section of a 3D figure is a 2D figure.
- The cross section of a 2D shape results in a line segment.
- The net of a 3D object can have several variations, yet its faces and bases will remain constant.

Essential Questions

1. Why does a cross section of a 3D figure create only a 2D figure?
2. Can different 3D shapes create the same cross section?
3. How can you relate a 3D figure to its 2D cross section?
4. Does the angle of a cross section affect the 2D shape that is created?

Critical Content

3D Solids

- Pyramids
- Prisms
- Cylinder
- Cone
- Cube
- Sphere

Notation

- Labeling objects and angles
- Line, line segment, ray, parallel, perpendicular

Skills	Vocabulary
1. Label 2D shapes using correct notation. 2. Describe the attributes of different 3D figures. 3. Identify the faces and bases of 3D figures. 4. Identify the 3D figure given all of its faces or a net of the figure. 5. From a 3D shape, draw a 2D shape that is visible given different viewpoints. 6. Draw and identify the shape of a cross sections of a 3D figure.	Tier 2: Plane, face, edge, vertex, diagonal, cone Tier 3: Coplanar, parallel, polyhedron, cylinder, cross section

Stage 2: Assessment Evidence

Assessments

Slicing 3D shapes
Formative: Performance: Skill Demonstration

Use the learning activity as the assessment.

Stage 3: Learning Plan

Learning Activities	Resources
Slicing three-dimensional figures helps develop three-dimensional visualization skills. Students should have the opportunity to physically create some of the three-dimensional figures, slice them in different ways, and describe in pictures and words what has been found. For example, use clay to form a cube, then pull string through it in different angles and record the shape of the slices found.	Straws, clay, angle rulers, protractors, rulers, grid paper www.illustrativemathematics.org www.illuminations.nctm.org

Differentiation Opportunities

Challenges can also be given: “See how many different two-dimensional figures can be found by slicing a cube” or “What three-dimensional figure can produce a hexagon slice?” This can be repeated with other three-dimensional figures using a chart to record and sketch the figure,

slices and resulting two-dimensional figures.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 1:04PM

Standard/Module: Proficiency with Geometry 7.G.5 (Week 32, 8 Weeks)

Stage 1: Desired Results

Standards Focus

- Additional (10%) 7.RP.2, 7.EE.3, 7.EE.4

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Geometry

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

- 5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

Enduring Understandings

- Different angles relationships are formed when lines, segments and rays intersect.
- Complementary and supplementary angle relationships can exist when you have two or more angles.
- Adjacent angles describe two angles that share a common ray and do not always have specific measure relationship.
- The angles formed when multiple lines intersect will always have measure relationships with one another.

Essential Questions

1. How can geometric relationships among lines and angles be generalized, described and quantified?
2. How do line relationships affect angle relationships?
3. What is the difference between a right angle and complementary angles?
4. What is the difference between a straight angle and supplementary angles?
5. Where can we find complementary and supplementary angles in the world around us?

Critical Content

Polygon Facts

- Triangle: sum of interior angles = 180 degrees
- Triangle: sum of exterior angles = 360 degrees
- Circle = 360 degrees

Angles

- Name and read angles
- Definition of: acute, obtuse, right and straight angle
- Definition of: complementary, supplementary, vertical and adjacent angles

Skills	Vocabulary
1. Locate angles given their notation. 2. Name angles given their measure. 3. Understand the notation associated with angles. (ex: m<3 means the measure of angle 3) 4. Recognize the differences between acute, right, obtuse and straight angles. 5. Identify complementary, supplementary, vertical and adjacent angles and their differences/similarities in multi-step problems. 6. Solve multi-step equations. 7. Write multi-step equations. 8. Identify perpendicular lines. 9. Understand that the measure of an exterior angle of a triangle is equal to the sum of the measures of the non-adjacent interior angles. 10. Know that when two lines intersect, the sum of the 4 angles created is 360 degrees.	Tier 2: vertex, ray, congruent, perpendicular lines Tier 3: adjacent angles, complementary angles, supplementary angles, vertical angles

Stage 2: Assessment Evidence

Assessments

Find the unknown angle
Formative: Test: Written

Students should write and solve an equation to find the measure of angle *x* when other information is presented in a sketch involving supplementary, complementary, vertical, and adjacent angles in a multi-step problem

Stage 3: Learning Plan

Learning Activities	Resources
This cluster builds from understandings of Geometry and in Measurement and Data Grades 3-6. It also utilizes the scope of the number system experienced thus far and begins the formal use of equations, formulas and variables in representing and solving mathematical situations. Students use understandings of angles to write and solve equations. Angle relationships that can be explored include but	www.illustrativemathematics.org www.illuminations.nctm.org

are not limited to same-side (consecutive) interior and same-side (consecutive) exterior angles are supplementary. Students should write and solve an equation to find the measure of angle *x* when other information is presented in a sketch involving supplementary, complementary, vertical, and adjacent angles in a multi-step problem.	

Differentiation Opportunities

Start with very simple sketches with only one concept and gradually build to problems with multiple concepts. Use vocabulary graphic organizers to help students remember the vocabulary for this standard.

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Unit Map 2012-2013

Monroe #2 - Orleans BOCES (Regional Collaboration)

Collaboration / Math 7* / Grade 7 (Math Regional Curriculum)

Wednesday, October 31, 2012, 1:04PM

Standard/Module: Proficiency with Geometry 7.G.6 (Week 32, 8 Weeks)

Stage 1: Desired Results

Standards Focus

- Additional (10%) 7.NS.1, 7.NS.2, 7.NS.3, 7.EE.3, 7.EE.4

7th Grade Map.pdf

Standards

NYS: CCLS:Mathematics, NYS: 7th Grade , Geometry

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

- 6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Enduring Understandings

- Complex polygons can be viewed as a composition of basic polygons.
- Understand the differences and similarities between area, surface area and volume.
- Understand how the net (or face breakdown) of a 3D object is related to its composition.

Essential Questions

1. Are you able to view a complex polygon in more than one way?
2. What is the purpose of finding area, surface area, and volume with respect to cost?
3. What are examples of how surface area and volume are used in the real world.
4. How can you determine when to use/find surface area versus volume when given real-life situations?

Critical Content

Formulas

- area
  - circle
  - triangle
  - square
  - rectangle/parallelogram
  - trapezoid
- volume
  - rectangular prism
  - right triangular prism
  - cube
  - supplement: pyramid (triangular and rectangular)
- surface area

- rectangular prism
- right triangular prism

Rounding and Estimation

- difference and similarities between the two

Skills	Vocabulary
1. Find the area, surface area and volume of complex figures. 2. Solve equations. 3. Substitute for variables in formulas 4. Calculate surface area and volume of 3D objects (cubes, prisms and cylinders) 5. Solve algebraically for variables other than surface area and volume (Ex: radius or width) 6. Relate the net of an object to its surface area. 7. Apply background knowledge of 2D and 3D objects to solve real-life problems involving area, surface area and volume. 8. Recognize when estimation and/or rounding is appropriate.	Tier 2: volume, composite figure Tier 3: surface area, lateral surface area, slant height, regular pyramid

Stage 2: Assessment Evidence

Assessments

Geometry in the Real World
Formative: Project: Visual Arts

Students make models out of 3D shapes and find the volume and surface area of the model. Set parameters for what students will need ot use in their project (ie. at least 3 different right prisms, at least one prism with at least one triangular face, etc.). These models might include robots, space ships, animals, characters, etc.

Stage 3: Learning Plan

Learning Activities	Resources
In previous grades, students have studied angles by type according to size: acute, obtuse and right, and their role as an attribute in polygons. Now angles are considered based upon the special relationships that exist among them: supplementary, complementary, vertical and adjacent angles. Provide students the opportunities to explore these relationships first through measuring and finding the patterns among	www.illuminations.nctm.org www.illustrativemathematics.org

the angles of intersecting lines or within polygons, then utilize the relationships to write and solve equations for multi-step problems. Real-world and mathematical multi-step problems that require finding area, perimeter, volume, surface area of figures composed of triangles, quadrilaterals, polygons, cubes and right prisms should reflect situations relevant to seventh graders. The computations should make use of formulas and involve whole numbers, fractions, decimals, ratios and various units of measure with same system conversions. Students continue work from 5th and 6th grade to work with area, volume and surface area of two-dimensional and three-dimensional objects. (composite shapes) Students will not work with cylinders, as circles are not polygons. "Know the formula" does not mean memorization of the formula. To "know" means to have an understanding of why the formula works and how the formula relates to the measure (area and volume) and the figure. This understanding should be for all students. Surface area formulas are not the expectation with this standard. Building on work with nets in the 6th grade, students should recognize that finding the area of each face of a three-dimensional figure and adding the areas will give the surface area. No nets will be given at this level. Students understanding of volume can be supported by focusing on the area of base times the height to calculate volume. Students understanding of surface area can be supported by focusing on the sum of the area of the faces. Nets can be used to evaluate surface area calculations. **Examples:** ☐ Choose one of the figures shown below and write a step by step procedure for determining the area. Find another person that chose the same figure as you did. How are your procedures the same and different? Do they yield the same result? ☐ A cereal box is a rectangular prism. What is the volume of the cereal box? What is the surface area of the cereal box? (Hint: Create a net of the cereal box and use the net to calculate the surface area.)	

Make a poster explaining your work to share with the class. ☐ Find the area of a triangle with a base length of three units and a height of four units. ☐ Find the area of a trapezoid using the formulas for rectangles and triangles.	

Differentiation Opportunities

Students need to do as many hands-on activities as possible with this standard. 3D geometry cannot be adequately conceptualized through 2D drawings and examples. Students need to be able to cut things out, fold them up and make conjectures about their work.

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