Richmond Public Schools

Curriculum Framework
Grade 5

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<tr><th colspan="2">Strand: Number Sense</th></tr>
<tr><td colspan="2">5.1 The student, given a decimal through thousandths, will round to the nearest whole number, tenth, or hundredth.</td></tr>
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<tr><td colspan="2">1st Nine Weeks</td></tr>
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<tr><td><u>Spiral Down</u>

4.1 The student will
a) read, write, and identify the place and value of each digit in a nine-digit whole number;
b) compare and order whole numbers expressed through millions; and
c) round whole numbers expressed through millions to the nearest thousand, ten thousand, and hundred thousand.</td><td><u>Spiral Up</u></td></tr>
<tr><th>Essential Questions</th><th>Common Misconceptions</th></tr>
<tr><td>● How is rounding numbers with decimal places similar to/different from rounding whole numbers?
● When is it useful to round decimal numbers?
● How do you determine the place to round a number?</td><td>● Students misapply the procedure for rounding whole numbers when rounding decimals. Students round to the nearest ten instead of the nearest tenth, etc.
● Students misapply the rule for which number to change when rounding.</td></tr>
<tr><th>Understanding the Standard</th><th>Essential Knowledge and Skills</th></tr>
<tr><td>● The structure of the base-ten number system is based upon a simple pattern of tens in which each place is ten times the value of the place to its right. This is known as a ten-to-one</td><td>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</td></tr>
</table>

place value relationship. To investigate this relationship, use base-ten proportional manipulatives, such as place value mats/charts, decimal squares, base-ten blocks, meter sticks, as well as the ten-to-one non-proportional model, and money.
● A decimal point separates the whole number places from the places less than one. Place values extend infinitely in two directions from a decimal point. A number containing a decimal point is called a *decimal number* or simply a *decimal*.
● To read decimals,
  ● read the whole number to the left of the decimal point;
  ● read the decimal point as "and";
  ● read the digits to the right of the decimal point just as you would read a whole number; and
  ● say the name of the place value of the digit in the smallest place.
● Any decimal less than one will include a leading zero (e.g., 0.125). This number may be read as "zero and one hundred twenty-five thousandths" or as "one hundred twenty-five thousandths."
● Decimals can be rounded in situations when exact numbers are not needed. Strategies for rounding whole numbers can be applied to rounding decimals.
● Number lines are tools that can be used in developing a conceptual understanding of rounding decimals. One strategy includes creating a number line that shows the decimal that is to be rounded. Locate it on the number line. Next, determine the closest multiples of whole numbers, tenths, or hundredth, it is between. Then, identify to which it is closer.
	● Given a decimal through thousandths, round to the nearest whole number, tenth, or hundredth.

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Curriculum Framework
Grade 5

Vocabulary	Instructional Activities Organized by Learning Objective
decimal place value tenth hundredth thousandth whole number round decimal point leading zero number line digit	**Textbook** **enVision Math** ● Lesson 2.2 Rounding Whole Numbers and Decimals ● Differentiated Center Activities: 2.2 **Eureka Math** ● GRADE 5 MODULE 1 Topic C: Place Value and Rounding Decimal Fractions **Notes** ● Interactive Notebook Math Grade 5 ○ Rounding Decimals, pages 24-25
Assessment	
Powerschool – Exam identifier	**Resources** ● Print o 5.1 VDOE Released Test Items ○ Smaller to Larger ○ Models of Decimals on Grid ○ Grade 5 Rounding Decimal Strips ○ Grade 5 Rounding Decimal Practice ○ Grade 5 Rounding Decimal Spinner Activity ○ Grade 5 Number Line Rounding ○ Grade 5 Math VDOE Sample Items ○ Grade 5 Decimal Round Up- Round Down ○ Grade 5 Decimal Rounding ○ Grade 5 Decimal Rounding TEIs ○ Grade 5 Decimal Grids to Thousandths ○ Grade 5 Decimal Cards for Rounding Station

	○ Grade 5 Blank 10x10 Grid ● Technology-based o BrainPop- Rounding Decimals -interactive skill practice o Sheppard Software-Scooter Quest-Rounding o Study Jams- Rounding Decimals **Station Activities/ Manipulatives** ● Base 10 Magnetic Kits: Given a decimal number created using the Base 10 Magnetic Kits, students will round the given number to the nearest whole number, tenth, or hundredth. ● Foam Base 10s: Using Foam Base 10 blocks, the students will create a given number, rounding the created number to the nearest whole number, tenth, or hundredth. ● Place Value Cubes: Students will roll place value cubes to generate numbers and then round the number to the nearest whole number, tenth, and hundredth. ● Decimal Cubes: Students will a roll decimal cube to generate a number and then round the number to the nearest whole number, tenth, or hundredth. ● Decimal Tiles: The students will use decimal tiles to create a given number as well as the 2 options the number can be rounded to in order to determine which estimate is closest.
Cross-Curricular Connections	**Differentiation**

Lunch Money and Other Poems about School by Carol Shields Use the poem *Lunch Money* and have students come up with their own amounts and practice rounding. **The Dewey Decimal System** by Allan Fowler Compare the Dewey decimal numbers of two books on a shelf. Which would come first? Order decimals from least to greatest and vice versa.	• ABCYa Rounding Numbers • Multilingual Glossary

Strand: Number Sense
5.2 The student will a) represent and identify equivalencies among fractions and decimals, with and without models; * and b) compare and order fractions, mixed numbers, and/or decimals, in a given set, from least to greatest and greatest to least.* *On the state assessment, items measuring this objective are assessed without the use of a calculator
Suggested Pacing
1st Nine Weeks

Related Spiraling Standards	
Spiral Down	**Spiral Up**
4.2 The student will a) compare and order fractions and mixed numbers, with and without models; b) represent equivalent fractions; and c) identify the division statement that represents a fraction, with models and in context	6.2 The student will a) represent and determine equivalencies among fractions, mixed numbers, decimals and percents; and b) compare and order positive rational numbers

4.3 The student will c) compare and order decimals; and d) given a model, write the decimal and fraction equivalents	
Essential Questions	**Common Misconceptions**
• When is it appropriate to use fractions? • When is it appropriate to use decimals? • What models and relationships help us name commonly used fractions and mixed numbers in their equivalent decimal forms and vice versa? • How can we use benchmarks, known fraction-decimal equivalents, and the number line to help us order a set of fractions and decimals?	• Students may misapply rules for comparing whole numbers to comparing fractions • Students may overgeneralize decimal notation by equating ⅝ with 0.25 • Students may assume that a mixed number is greater than an improper fraction because it contains a whole number • Students may have a limited concept of fractions and decimals on a number line
Understanding the Standard	**Essential Knowledge and Skills**
• Students should focus on determining equivalent decimals of familiar fractions with denominators that are factors of 100 making connections to tenths and hundredths. (e.g., $\frac{2}{5} = \frac{4}{10}$ or 0.4) and (e.g., $\frac{7}{20} = \frac{35}{100}$ or 0.35). • Students should have experience with fractions such as $\frac{1}{8}$, whose decimal representation is a terminating decimal (e. g., $\frac{1}{8} = 0.125$) and with fractions such as $\frac{2}{3}$, whose decimal representation does not end but continues to repeat (e. g., $\frac{2}{3} = 0.666\ldots$). The repeating decimal can be written with an ellipsis (three dots) as in 0.666… or denoted with a bar above the digits that repeat as in $0.\overline{6}$. • To help students compare the value of two decimals through thousandths, use manipulatives, such as place value	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to • Represent fractions with denominators that are thirds, eighths, and factors of 100 in their equivalent decimal form with concrete or pictorial models. (a) • Represent decimals in their equivalent fraction form (thirds, eighths, and factors of 100) with concrete or pictorial models. (a) • Identify equivalent relationships between decimals and fractions with denominators that are thirds, eighths, and factors of 100 in their equivalent decimal form without models. (a) • Compare and order from least to greatest and greatest to least a given set of no more than four decimals, fractions (proper

mats/charts, 10-by-10 grids, decimal squares, base-ten blocks, meter sticks, number lines, and money. ● Proper fractions, improper fractions, and mixed numbers are terms often used to describe fractions. A proper fraction is a fraction whose numerator is less than the denominator. An improper fraction is a fraction whose numerator is equal to or greater than the denominator. An improper fraction may be expressed as a mixed number. A mixed number is written with two parts: a whole number and a proper fraction (e.g., $3\frac{5}{8}$). ● An amount less than one whole can be represented by a fraction or by an equivalent decimal. ● Base-ten models (e.g., 10-by-10 grids, meter sticks, number lines, decimal squares, money) demonstrate the relationship between fractions and decimals.	or improper), and/or mixed numbers with denominators of 12 or less. (b) ● Use the symbols >, <, =, and ≠ to compare decimals through thousandths, fractions (proper or improper fractions), and/or mixed numbers, having denominators of 12 or less. (b)
Vocabulary	**Instructional Activities Organized by Learning Objective**
Decimal Place Value Mixed Number Equivalent Fractions Less than (<) Greater Than (>) Equal to (=) compare fraction decimal numerator denominator proper fraction	**Textbook** **enVision Math** ● Lesson 9.5 Comparing and Ordering Fractions and Mixed Numbers (b) ● Lesson 9.8 Tenths and Hundredths,(a) ● Lesson 9.10 Fractions and Decimals on the Number Line (b) ● Differentiated Center Activities: 9.5, 9.8, 9.10 ● EnVision Math Tools4Math- fractions, money, place value blocks **Eureka Math**

improper fraction
least
greatest
factor
terminating decimal
repeating decimal

Assessment

Powerschool – Exam identifier

- GRADE 5 MODULE 1 Lesson 6: Compare decimal fractions to the thousandths using like units, and express comparisons with <, >, =
- GRADE 4 MODULE 6: Decimal Fractions

Notes

Resources

- **Print**
  - Teaching Student-Centered Mathematics-Volume Two, Second Edition:
    - Connecting Fractions and Decimals, pp. 260-264 (a)
    - Comparing and Ordering Decimal Fractions, pp. 267-269 (b)
  - FACEing MATH: Fractions, Decimals & Percents:
    - Lesson 10-11 Converting Fractions and Mixed Numbers to Decimals and Vice Versa
  - Grade 5 Sample Anchor Charts for Fraction Decimal Equivalence
  - Grade 5 Sample Anchor Chart for Fifths, Tenths, Twentieths
  - Grade 5 Thousandths Chart
  - Grade 5 Playing Card Fraction and Decimal Game
  - Grade 5 Hundreths Disks
  - Grade 5 Ordering Fractions Decimals Practice
  - Grade 5 Fraction Decimal Sorting Cards
  - Grade 5 Fraction Benchmarking Number Line Activity

	○ Grade 5 Fraction and Decimal Headbands Game ○ Fraction-Decimal Equivalents on Grid ○ Grade 5 Number Line Using Paper Strips ○ Grade 5 Ordering Fractions and Decimals 2 ○ Grade 5 Ms. Lester's Frog Problem ○ Grade 5 Ordering Fractions and Decimals ○ Grade 5 Fraction Problems with Counters ○ Grade 5 Fraction Decimal Picture Cards ○ Grade 5 Fraction Decimal Grids 1 ○ Grade 5 Fraction Decimal Grids 2 ○ Grade 5 Fraction Decimal Number Line Task ○ Grade 5 Decimal-Fraction Match ○ Grade 5 Decimal Square Model ○ Grade 5 Comparing Fractions with Strategies ○ Grade 5 Comparing Fractions with Strategies Anchor Chart ○ Grade 5 Decimal Fraction Review Sheet ○ Grade 5 Decimal Fraction Number Line ○ Grade 5 VDOE Sample Items Fraction Decimal Relationships ● **Technology-based** o Gizmo: Modeling Decimals (Area and Grid Models) (a,b) o Gizmo: Comparing and Ordering Decimals (b) o Gizmo: Fraction Garden (Comparing Fractions) (b) o Gizmo: Modeling Fractions (Area Models) (a,b) o Gizmo: Treasure Hunter (Decimals on the Number Line) (a) o Brain Pop: Converting Fractions and Decimals (a)

	o Sheppard Software: Fruit Splat Convert Fractions to Decimals (a) **Station Activities/Manipulatives:** Decimal Cubes: Using decimal cubes, students will roll 4 decimals and order them from greatest to least or least to greatest. (b) Fraction Cubes: Using fraction cubes, students will roll 4 fractions and order them from greatest to least or least to greatest. (b) Fraction Circles: Given a set of fractions, students use fraction circles to build fractions and then order from least to greatest or greatest to least. (b) Fraction Tiles: Using fraction tiles, students will build fractions in a given set and order from least to greatest or greatest to least. (b) Fraction Number Lines: Using fraction number lines, students will write the fractions given in the correct location on the number line. (b) Decimal Tiles: Using decimal tiles, students will identify the decimal shown and write the fraction equivalent. (a)
Cross-Curricular Connections	**Differentiation**

Fractions, Decimals, Percents by David A. Adler Use the fractions and decimals and convert it into the equivalent. Percentages are also given - focus on fractions and decimals. **Piece = Part = Portion: Fractions = Decimals = Percents** by Scott Gifford Discuss picture models with fraction and decimal names. Percentages are also given - focus on fractions and decimals.	• Gizmo- Fraction, Decimal, Percent (Area and Grid Models) • Sheppard Software-Balloon Pop Order Fractions • EnVision Math: Lesson 9.1 Meanings of Fractions • EnVision Math: Lesson 9.3 Mixed Numbers and Improper Fractions • Multilingual Glossary • Math Live: Math tutorial

Strand: Number Sense	
5.3 The student will a) identify and describe the characteristics of prime and composite numbers; and b) identify and describe the characteristics of even and odd numbers.	
Suggested Pacing	
2nd Nine Weeks	
Related Spiraling Standards	
Spiral Down 4.5 The student will a) determine common multiples and factors, including least common multiple and greatest common factor	**Spiral Up**
Essential Questions	**Common Misconceptions**
• How can we use arrays to demonstrate the difference between prime and composite numbers?	• Students believe 1 is a prime number. • Students believe that since 2 is even it is a composite number.

● How can we demonstrate that all positive whole numbers can be represented as a product of prime numbers? ● How can we use manipulatives to demonstrate the difference between even and odd numbers? ● How can knowing whether a number is prime or composite and whether it is even or odd be useful in mathematics?	● Students confuse which digit to use when identifying if a number is even or odd.
Understanding the Standard	**Essential Knowledge and Skills**
● Natural numbers are the counting numbers starting at one. ● A prime number is a natural number, other than one, that has exactly two different factors, one and the number itself. ● A composite number is a natural number that has factors other than one and itself. ● The number one is neither prime nor composite because it has only one set of factors and both factors are one. ● The prime factorization of a number is a representation of the number as the product of its prime factors. For example, the prime factorization of 18 is 2 x 3 x 3. ● Prime factorization concepts can be developed by using factor trees. ● Prime or composite numbers can be represented by rectangular models or rectangular arrays on grid paper. A prime number can be represented by only one rectangular array (e.g., seven can be represented by a 7 x 1 and a 1 × 7). A composite number can always be represented by two or more rectangular arrays (e.g., nine can be represented by a 9 x 1, a 1 × 9, or a 3 x 3). ● Divisibility rules are useful tools in identifying prime and composite numbers.	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to ● Identify prime numbers less than or equal to 100. (a) ● Identify composite numbers less than or equal to 100. (a) ● Demonstrate with concrete or pictorial representations and explain orally or in writing why a number is prime or composite. (a) ● Identify which numbers are even or odd. (b) ● Demonstrate with concrete or pictorial representations and explain orally or in writing why a number is even or odd. (b) ● Demonstrate with concrete or pictorial representations and explain orally or in writing why the sum or difference of two numbers is even or odd. (b)

● Odd and even numbers can be explored in different ways (e.g., dividing collections of objects into two equal groups or pairing objects). When pairing objects, the number of objects is even when each object has a pair or partner. When an object is left over, or does not have a pair, then the number is odd. ● Students should use manipulatives (e.g., base-ten blocks, cubes, tiles, hundreds board, etc.) to explore and categorize numbers into groups of odd or even. ● Examples of ways to use manipulatives to show even and odd numbers may include (but are not limited to): - for an even number, such as 12, six pairs of counters can be formed with no remainder, or two groups of six counters can be formed with no remainder; and - for an odd number, such as 13: (a) six pairs of counters can be formed with one counter remaining, or (b) two groups of six counters can be formed with one counter remaining. ● Students should use rules to categorize numbers into groups of odd or even. Rules can include: - An odd number does not have two as a factor and is not divisible by two. - The sum of two even numbers is even. - The sum of two odd numbers is even. - The sum of an even number and an odd number is odd. - Even numbers have an even number or zero in the ones place. - Odd numbers have an odd number in the ones place. - An even number has two as a factor and is divisible by two. - The product of two even numbers is even.	

- The product of two odd numbers is odd. - The product of an even number and an odd number is even.	
Vocabulary	**Instructional Activities Organized by Learning Objective**
prime numbers composite numbers even numbers odd numbers factor sum difference prime factorization product quotient	**Textbook** **enVision** ● Lesson 4.7 Understanding Factors (a) ● Lesson 4.8 Prime and Composite Numbers (a) ● Differentiated Center Activities: 4.7, 4.8 **Eureka** ● GRADE 6 MODULE 2 Lesson 16: Even and Odd Numbers ● GRADE 4 MODULE 3 Topic F: Reasoning with Divisibility **Notes** ● Interactive Notebook Math Grade 5 ○ Prime and Composite Numbers pages 42-43 **Resources** ● **Print** o Prime Time (a) o Teaching Student Centered Mathematics Volume Two, Second Edition (2014) ▪ Activity 8.1 page 115 *Finding Factors* (a) ▪ Activity 8.2 page 115 *Factor Patterns* (a) ▪ Activity 15.16 page 303 *Broken Calculator: Can You Fix It?* (b) o Grade 5 Prime Even Venn Diagram o Grade 5 Sample Venn Diagram o Grade 5 Number Characteristics Statement Sort
Assessment	
Powerschool – Exam identifier	

	○ Grade 5 Prime Numbers Slide Show ○ Grade 5 Prime Composite Sort ○ Grade 5 Math VDOE Sample Items SOL 5.3 ○ Grade 5 Prime Composite and Neither Sort ○ Grade 5 Prime or Composite ○ Grade 5 Math Guess Who ○ Grade 5 Prime Composite Even Odd Task Card ○ Grade 5 Number Sort Venn Diagram ○ Grade 5 Prime and Composite Song ○ Grade 5 Guess My Rule Prime Composite Even Odd ○ Grade 5 Even Odd Prime Composite with Digit Cards Hundreds Chart ○ Grade 5 Even Odd Sort ○ Grade 5 Even Odd Dice Roll ○ Grade 5 Evens and Odds ○ Grade 5 Hundreds Chart ○ Grade 5 Even Odd Prime Composite True or False ○ Grade 5 Even Odd Prime Composite True False ○ Grade 5 Even Odd Sort by Characteristics ○ Grade 5 Venn Diagram Prime Even ○ Grade 5 Divisibility Challenge ○ Grade 5 5.3 VDOE Released Test Items ○ Grade 5 Divisibility Rules 2,3,5,7 ○ Grade 5 Composite Odd Venn Diagram ○ Grade 5 Arrays for 12 ○ Grade 5 Venn Diagram Prime Composite Odd Sorting ○ Grade 5 Blank Venn Diagram ○ Even Odd Number Cube Activity ● **Technology-based** o Sheppard Software: Monkey Drive Prime (a) o Sheppard Software: Fruit Splat: Prime-Composite (a)

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o Sheppard Software: Fruit Splat: Odd-Even (b)
o Flocabulary: Factors and Prime Numbers (a)
o Prime and Composite Sort (a)
○ Gizmo: Chocomatic (Multiplication, Arrays, and Area) (a)
○ Gizmo: Factor Trees (Factoring Numbers) (a)

Station Activities/ Manipulatives

Square Tiles: Using square tiles, students will create arrays to show if a given number is prime or composite. (a)
Linking Cubes: Using linking cubes, students will create a given number by pairing cubes to determine if the number is odd or even (b)
Foam 2-Color Counters: Students will arrange Foam 2-Color Counters to express a given addition or subtraction problem and then pair the counters to determine if the sum or difference is odd or even. (b)

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<tr><th>Cross-Curricular Connections</th><th>Differentiation</th></tr>
<tr><td>
Missing Mittens by Stuart Murphy

Bean Thirteen by Matthew McElligott The characters explore even and odd numbers of beans. Lesson Activities with Beans (can be used for even and odd and prime and composite)

Among the Odds and Evens by Priscilla Turner
Explore patterns that occur when adding and multiplying odd and even numbers. Write rules using variables. EX: E + E = 2E

Even Steven and Odd Todd by Kathryn Cristaldi
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Multilingual Glossary
Math Live: Math tutorial

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<table>
<tr><th colspan="2">Strand: Number Sense</th></tr>
<tr><td colspan="2">5.4 The student will create and solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of whole numbers.</td></tr>
<tr><th colspan="2">Suggested Pacing</th></tr>
<tr><td colspan="2">1st Nine Weeks</td></tr>
<tr><th colspan="2">Related Spiraling Standards</th></tr>
<tr><td><u>Spiral Down</u>
4.4 The student will
a) demonstrate fluency with multiplication facts through 12 x 12, and the corresponding division facts;
b) estimate and determine sums, differences, and products of whole numbers;
c) estimate and determine quotients of whole number with and without remainders; and
d) create and solve single-step and multistep practical problems involving addition, subtraction, and multiplication, and single-step practical problems involving division with whole numbers</td><td><u>Spiral Up</u>
6.6 The student will
a) add, subtract, multiply, and divide integers;
b) solve practical problems involving operations with integers; and
c) simplify numerical expressions involving integers</td></tr>
<tr><th>● Essential Questions</th><th>Common Misconceptions</th></tr>
</table>

• How are the four basic operations related to one another? • What situations call for the computation of sums? ...differences? …products? ... quotients? ...or a combination of operations? • How does the context of a problem situation determine how to represent a remainder in division? • How do we determine whether it is more appropriate to estimate the solutions to problems or to compute the exact answer? • What determines a reasonable estimation for a given situation? • How is estimation used to check the reasonableness of the computation involved in solving a problem? • What are efficient methods for finding sums, differences, products, and quotients? How are the different methods related? How do you determine which strategy you want to use?	• Students may rely on "clue words" to determine if a practical problems involves addition, subtraction, multiplication, or division. • When adding or subtracting, students misapply the procedure for regrouping. • Students may know *how* to add, subtract, multiply, or divide but fail to understand *when* to add, subtract, multiply, or divide. • Students think that division is commutative. • Students think that the operation that needs to be performed (+, -, x, ÷) is defined by the numbers in the problem. • Students may not understand how to apply a remainder in a practical problem.
Understanding the Standard	**Essential Knowledge and Skills**
• The problem-solving process is enhanced when students create and solve their own practical problems and model problems using manipulatives and drawings. • In problem solving, emphasis should be placed on thinking and reasoning rather than on keywords. Focusing on key words such as in all, altogether, difference, etc., encourages students to perform a particular operation rather than make sense of the context of the problem. A key-word focus prepares students to solve a limited set of problems and often leads to incorrect solutions as well as challenges in upcoming grades and courses.	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to • Create single-step and multistep practical problems involving addition, subtraction, multiplication, and division of whole numbers, with and without remainders. • Estimate the sum, difference, product, and quotient of whole numbers. • Apply strategies, including place value and application of the properties of addition and multiplication, to solve single step and multistep practical problems involving addition,

● Estimation can be used to determine a reasonable range for the answer to computation and to verify the reasonableness of sums, differences, products, and quotients of whole numbers. ● The least number of steps necessary to solve a single-step problem is one. ● A multistep problem incorporates two or more operational steps (operations can be the same or different). ● Extensive research has been undertaken over the last several decades regarding different problem types. Many of these studies have been published in professional mathematics education publications using different labels and terminology to describe the varied problem types. ● Students should experience a variety of problem types related to multiplication and division. Some examples are included in the following chart:	subtraction, multiplication, and division of whole numbers, with and without remainders, in which: ○ sums, differences, and products do not exceed five digits; ○ factors do not exceed two digits by three digits; ○ divisors do not exceed two digits; or ○ dividends do not exceed four digits. ● Use the context of a practical problem to interpret the quotient and remainder

GRADE 5: COMMON MULTIPLICATION AND DIVISION PROBLEM TYPES		
Equal Group Problems		
Whole Unknown (Multiplication)	Size of Groups Unknown (Partitive Division)	Number of Groups Unknown (Measurement Division)
There are 25 boxes of crayons. Each box contains 96 crayons. How many crayons are there in all?	If 2,400 crayons are divided equally among 25 tubs, how many crayons will go into each tub?	If 2,400 crayons are placed into tubs with each tub containing 96 crayons, how many tubs can be filled?
Multiplicative Comparison Problems		
Result Unknown	Start Unknown	Comparison Factor Unknown
Tyrone traveled 125 miles last month. Jasmine traveled 15 times as many miles as Tyrone during the same month. How many miles did Jasmine travel?	Jasmine traveled 1,956 miles last summer. She traveled 12 times as many miles as Tyrone during the same summer. How many miles did Tyrone travel?	Jasmine traveled 1,275 miles in December. Tyrone traveled 85 miles in December. Jasmine travelled how many times more miles than Tyrone?
Array or Area Problems		
Whole Unknown	One Dimension Unknown	
There are 28 sections of parking lot at the stadium. There are 115 cars parked in each section of the parking lot at the stadium. How many cars are parked at the stadium all together? Mr. Myers's barn measures 35 feet by 110 feet. How many square feet are in the barn?	There are 3,220 cars parked at the stadium. The cars are divided evenly among each of the 28 sections of parking lot. How many cars are parked in each section? There are 3,220 cars parked at the stadium. There are exactly 115 cars parked in each section. How many sections are filled with cars? Mr. Myers' barn covers 3,850 square feet. The width of the barn is 35 feet. What is the length of the barn?	
COMBINATION PROBLEMS		
Outcomes Unknown	Factor Unknown	
An experiment involves tossing a coin and rolling a die. How many different outcomes are possible? Kelly has 2 pairs of pants and 3 shirts that can all be worn together. How many different outfits consisting of a pair of pants and a shirt does she have?	Mike bought some new shorts and shirts that can all be worn together. He has a total of 12 different outfits. If he bought 3 pairs of shorts, how many shirts did he buy?	

- Students also need exposure to various types of practical problems in which they must interpret the quotient and

remainder based on the context. The chart below includes one example of each type of problem.

MAKING SENSE OF THE REMAINDER IN DIVISION	
TYPE OF PROBLEM	EXAMPLE
Remainder is not needed and can be left over (or discarded).	Bill has 29 pencils to share fairly with 6 friends. How many pencils will each friend receive? 4 pencils with 5 pencils left over
Remainder is partitioned and represented as a fraction or decimal.	Six friends will share 29 ounces of juice. How many ounces will each person get if all of the juice is shared equally? $4\frac{5}{6}$ ounces
Remainder forces the answer to be increased to the next whole number.	There are 29 people going to the party by car. How many cars will be needed if each car holds 6 people? 5 cars
Remainder forces the answer to be rounded (giving an approximate answer).	Six children will share a bag of candy containing 29 pieces. About how many pieces of candy will each child get? about 5 pieces of candy

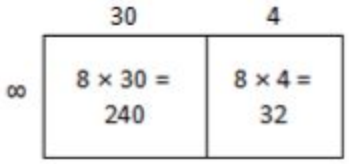
- Investigating arithmetic operations with whole numbers helps students learn about several different properties of arithmetic relationships. These relationships remain true regardless of the numbers.
- Grade five students should explore and apply the properties of addition and multiplication as strategies for solving addition, subtraction, multiplication, and division problems using a variety of representations (e.g., manipulatives, diagrams, and symbols).
- The properties of the operations are "rules" about how numbers work and how they relate to one another. Students at this level do not need to use the formal terms for these properties but should utilize these properties to further develop flexibility and fluency in solving problems. The following properties are most appropriate for exploration at this level:

- The commutative property of addition states that changing the order of the addends does not affect the sum (e.g., 4 + 3 = 3 + 4). Similarly, the commutative property of multiplication states that changing the order of the factors does not affect the product (e.g., 2 □ 3 = 3 □ 2).
- The identity property of addition states that if zero is added to a given number, the sum is the same as the given number. The identity property of multiplication states that if a given number is multiplied by one, the product is the same as the given number.
- The associative property of addition states that the sum stays the same when the grouping of addends is changed (e.g., 15 + (35 + 16) = (15 + 35) + 16).
- The associative property of multiplication states that the product stays the same when the grouping of factors is changed (e.g., 6 ×(3 ×5) = (6 × 3) × 5).
- The distributive property states that multiplying a sum by a number gives the same result as multiplying each addend by the number and then adding the products.
  - 3(9) = 3(5 + 4)
  - 3(54 + 4) = 3 × 54 + 3 × 4
  - 5 × (3 + 7) = (5 × 3) + (5 × 7)
  - (2 × 3) + (2 × 5) = 2 × (3 + 5)
  - 9 × 23

    9 (20 + 3)

    180 + 27

    207
  - 34 × 8



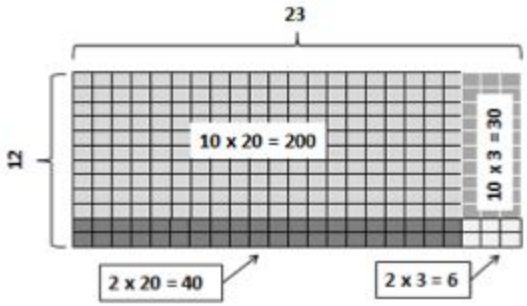
– 23 × 12

(20 + 3) × (10 + 2)

(20 × 10) + (20 × 2) + (3 × 10) + (3 × 2)

200 + 40 + 30 + 6

276



Vocabulary	Instructional Activities Organized by Learning Objective
Addition Subtraction Multiply: Product Divide: Quotient sum difference	**Textbook** **enVision Math** • Lesson 2.5 Adding and Subtracting • Lesson 3.4 Multiplying by 1-digit Numbers • Lesson 3.5 Multiplication, 2-digit by 2-digit Numbers • Lesson 3.6 Multiplying Greater Numbers

factors
divisor
dividend
remainder
estimate
single-step problem
multi-step problem
problem solving strategy
whole number
reasonableness

Assessment

Powerschool – Exam identifier

- Lesson 3.8 Problem Solving : Draw a Picture and Write an Equation
- Lesson 4.3. Problem Solving- Reasonableness
- Lesson 4.4 Connecting Models and Symbols
- Lesson 4.5 Dividing by 1-Digit Divisors
- Lesson 4.6 Zeros in the Quotient
- Lesson 4.9. Problem Solving: Draw a Picture and Write an Equation
- Lesson 5.3 Problem Solving: Multiple-Step Problems
- Lesson 5.5 1 Digit Quotients
- Lesson 5.6 2 Digits Quotients

Eureka Math

- GRADE 5 MODULE 2: Multi-Digit Whole Number and Decimal Fraction Operations
- GRADE 5 MODULE 3 Lesson 7: Solve two-step word problems
- GRADE 5 MODULE 3 Lesson 15: Solve multi-step word problems; assess reasonableness of solutions using benchmark numbers

Notes

- Interactive Notebook Math Grade 5
  - Dividing Multi-Digit Numbers pages 18-19
  - Is It Reasonable? pages 50-51
- Interactive Notebook Math Grade 4
  - Multiplying Two-Digit Numbers pages 28-29

Resources

- **Print**

	o Teaching Student Centered Mathematics Volume Two, Second Edition (2014) ▪ Invented Strategies in Addition and Subtraction-pp 177-180 ▪ Invented Strategies for Multiplication- pp 180-185 ▪ The Standard Algorithm for Multiplication pp 185-188 ▪ Invented Strategies for Division- pp 189-190 ▪ The Standard Algorithm for Division- pp 190-195 o Grade 5 Partial Quotient Division o Grade 5 Culminating Division Word Problems to Interpret Remainders o Grade 5 Algorithms for Multiplication o Grade 5 Arrays for Multiplication o Grade 5 Base 10 Multiplication Frame o Grade 5 Division Tic Tac Toe 2 digit Divisor o Grade 5 Base 10 Grid Paper Multiplication o Grade 5 Decimal Word Problems Add Subtract o Grade 5 Distributive Property Poster o Grade 5 Multi Step Problems o Grade 5 Division Tic Tac Toe o Grade 5 Estimating Quotients o Grade 5 Multiplication Powerpoint o Grade 5 Field Trip Task o Grade 5 Division Word Problems Interpret Remainder o Grade 5 Division Word Problems Models o Grade 5 Math Slicing Rectangles o Grade 5 Math Rearranging Rectangles o Grade 5 Modeling Division with Base 10 Blocks

	○ Grade 5 VDOE Sample Items Estimating Adding Subtracting Whole Numbers and Decimals ○ Grade 5 Story Problem Structures ○ Grade 5 Power of Estimation ○ Grade 5 Strategies with Bigger Numbers ○ Grade 5 VDOE Sample Items Estimate Divide Whole Numbers and Decimals ○ Grade 5 Math Arrays for Multiplication 5.4 ○ Grade 5 Open Number Lines ○ Grade 5 Partial Quotient Division ○ Grade 5 Pages Read ○ Grade 5 VDOE Sample Items Estimate Multiply Whole Numbers and Decimals ○ Grade 5 Math Modeling Division with Base 10 Blocks 5.4 ○ 5.4 VDOE Released Test Items ○ Multiplication Property Task Cards ○ Grade 5 Math Open Number Lines 5.4 ○ Grade 5 Math Strategies with Bigger Numbers 5.4 ○ Multiplication Grade 4 and 5 Newsletter ○ Grade 5 Math Multiplication Powerpoint 5.4 ○ Grade 5 MAth Partial Quotient Division 5.4 ○ Multiplication and Division Fact Strategies ○ Grade 5 Math Division Word Problems Models 5.4 • **Technology-based** o Gizmo: No Alien Left Behind (Division with Remainders) o BrainPOP: Word Problems

	Station Activities/Manipulatives Foam Cubes: Using foam cubes, students will roll 5 digits and build a three digit by two digit multiplication problem and create a matching story problem. 0-9 Cubes: Using 0-9 cubes, students will create a story problem by rolling 1 digit to be the divisor and rolling 3 digits to be the dividend.
Cross-Curricular Connections	**Differentiation**
Is A Blue Whale The Biggest Thing There Is? By Robert E. Wells Have students find how many of their heights (in inches) it would take to equal the blue whale's length.	• Math Cards (multiplication) • Tic, Tac, Toe (multiplication) • Broken Eggs (problem solving) • Big, Bad Wolf (multiplication and division) • Race to One Hundred (basic computation) • Mr. Nussbaum: Best Math Friends (word problems) • Multilingual Glossary • MathLive: online tutorial

Strand: Computation and Estimation
5.5 The student will a) estimate and determine the product and quotient of two numbers involving decimals* and b) create and solve single-step and multistep practical problems involving addition, subtraction, and multiplication of decimals, and create and solve single-step practical problems involving division of decimals. *On the state assessment, items measuring this objective are assessed without the use of a calculator**.**
Suggested Pacing

Richmond Public Schools

Curriculum Framework
Grade 5

<table>
<tr><td colspan="2">1st Nine Weeks</td></tr>
<tr><td colspan="2">Related Spiraling Standards</td></tr>
<tr><td><u>Spiral Down</u>
4.6 The student will
a) add and subtract decimals;* and
b) solve single-step and multistep practical problems involving addition and subtraction with decimals.</td><td><u>Spiral Up</u>
6.6 The student will
a) add, subtract, multiply, and divide integers;*
b) solve practical problems involving operations with integers; and
c) simplify numerical expressions involving integers.*</td></tr>
<tr><td>Essential Questions</td><td>Common Misconceptions</td></tr>
<tr><td>● What situations require computation with decimal numbers?
● How are operations with decimals similar to or different from operations used with whole numbers?
● What are the effects of multiplying or dividing a given number (whole number and or decimal number) by a multiple of ten?
● How can we use models and pictures to demonstrate why multiplication of two numbers does not always result in a larger product?
● What strategies can be developed to estimate and compute sums, differences, products, and quotients of numbers expressed as decimals?
● How are estimation skills and computational strategies related?</td><td>● Students misapply the rule of placing the decimal when multiplying. Students may move the decimal a certain number of places from the right instead of from the left.
● Students may confuse where to place the decimal in the quotient.
● When dividing in a practical problem, students may confuse which number to use as the divisor and the dividend.
● Students will be confused which operation to use when solving a practical problem.
● Students will line up digits and not the decimals when adding and subtracting decimals.</td></tr>
<tr><td>Understanding the Standard</td><td>Essential Knowledge and Skills</td></tr>
<tr><td>● Addition and subtraction of decimals may be investigated using a variety of models (e.g., 10-by-10 grids, number lines, money).</td><td>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to
● Estimate and determine the product of two numbers in which:</td></tr>
</table>

● The base-ten relationships and procedures developed for whole number computation apply to decimal computation, giving careful attention to the placement of the decimal point in the solution. ● In cases where an exact product is not required, the product of decimals can be estimated using strategies for multiplying whole numbers, such as front-end and compatible numbers, or rounding. In each case, the student needs to determine where to place the decimal point to ensure that the product is reasonable. ● Estimation keeps the focus on the meaning of the numbers and operations, encourages reflective thinking, and helps build informal number sense with decimals. Students can reason with benchmarks to get an estimate without using an algorithm. ● Estimation can be used to determine a reasonable range for the answer to computation and to verify the reasonableness of sums, differences, products, and quotients of decimals. ● Division is the operation of making equal groups or shares. When the original amount and the number of shares are known, divide to determine the size of each share. When the original amount and the size of each share are known, divide to determine the number of shares. Both situations may be modeled with base-ten manipulatives. ● The fair-share concept of decimal division can be modeled, using manipulatives (e.g., base-ten blocks). Multiplication and division of decimals can be represented with arrays,	- the factors do not exceed two digits by two digits (e.g., 2.3 × 4.5, 0.08 × 0.9, 0.85 × 2.3, 1.8 × 5); and - the products do not exceed the thousandths place. (Leading zeroes will not be considered when counting digits.) (a) ● Estimate and determine the quotient of two numbers in which - quotients do not exceed four digits with or without a decimal point; - quotients may include whole numbers, tenths, hundredths, or thousandths; - divisors are limited to a single digit whole number or a decimal expressed as tenths; and - no more than one additional zero will need to be annexed. (a) ● Use multiple representations to model multiplication and division of decimals and whole numbers. (a) ● Create and solve single-step and multistep practical problems involving addition, subtraction, and multiplication of decimals. (b) ● Create and solve single-step practical problems involving division of decimals. (b)

paper folding, repeated addition, repeated subtraction, base-ten models, and area models.

- Students in grade four studied decimals through thousandths and solved practical problems that involved addition and subtraction of decimals. Consideration should be given to creating division problems with decimals that do not exceed quotients in the thousandths. Teachers may desire to work backwards in creating appropriate decimal division problems meeting the parameters for grade five students.
- Examples of appropriate decimal division problems for grade five students include, but are not limited to:
  - 2.38 ÷ 4; 6 ÷ 0.2; 1.78 ÷ 0.5; etc.
  - A scientist collected three water samples from local streams. Each sample was the same size, and she collected 1.35 liters of water in all. What was the volume of each water sample?
  - There are exactly 12 liters of sports drink available to the tennis team. If each tennis player will be served 0.5 liters, how many players can be served?
  - The relay team race is exactly 4.8 miles long. Each person on the team is expected to run 0.8 miles. How many team members will be needed to cover the total distance?
- Division with decimals is performed the same way as division of whole numbers. The only difference is the placement of the decimal point in the quotient.
- When solving division problems, numbers may need to be expressed as equivalent decimals by annexing zeros. This

occurs when a zero must be added in the dividend as a place holder.

- The quotient can be estimated, given a dividend expressed as a decimal through thousandths (and no adding of zeros to the dividend during the division process) and a single-digit divisor.
- Estimation can be used to check the reasonableness of a quotient.
- Division is the inverse of multiplication; therefore, multiplication and division are inverse operations.
- Terms used in division are *dividend, divisor*, and *quotient.*

$dividend \div divisor = quotient$ $\qquad$ $divisor\overline{)\,dividend}\,quotient$ $\qquad$ $\frac{dividend}{divisor} = quotient$

- There are a variety of algorithms for division such as repeated multiplication and subtraction. Experience with these algorithms may enhance understanding of the traditional long division algorithm.

Vocabulary	Instructional Activities Organized by Learning Objective
product quotient tenths hundredths thousandths divisor dividend division multiplication	**Textbook** **enVision:** 5.5b ● Lesson 2.6 Adding Decimals, ● Lesson 2.7 Subtracting Decimals **Eureka Math** 5.5a ● GRADE 5 MODULE 2: Multi-Digit Whole Number and Decimal Fraction Operations

decimal whole number reasonableness **Assessment** **Powerschool** – Exam identifier	5.5b ● GRADE 5 MODULE 2: Multi-Digit Whole Number and Decimal Fraction Operations ● GRADE 5 MODULE 1: Place Value and Decimal Fractions ● GRADE 5 MODULE 4 Lessons 17-18: Relate decimal and fraction multiplication ● GRADE 5 MODULE 4 Lesson 29: Connect division by a unit fraction to division by 1 tenth and 1 hundredth ● GRADE 5 MODULE 4 Lessons 30-31: Divide decimal dividends by non-unit decimal divisors. **Notes** ● Interactive Notebook Math Grade 5: ○ Multiplying Decimals pages 26-27 ○ Dividing Decimals pages 28-29 **Resources** ● **Print** o Teaching Student Centered Mathematics Volume 2 Second Edition (2014) ▪ Activity 14.12 page 272 *Where Does the Decimal Go: Multiplication?* (a) ▪ Activity 14.13 page 274 *Where does the Decimal Go: Division?* (a) ▪ Activity 15.2 page 286 *Don't Push the Point* (multiplication) (a) ○ Grade 5 Math Property Match ○ Grade 5 Hundred Grids ○ Grade 5 Modeling Decimal Division Base Ten Blocks ○ Grade 5 Partner Coach Dividing Decimals ○ Grade 5 Math Property Practice

	○ Grade 5 Where Does the Decimal Point Go ○ Grade 5 Multiplication Division Decimal Word Problems Models ○ Grade 5 Estimating Decimal Division Sort ○ Grade 5 Decimal Word Problems ○ Grade 5 Decimal Computation Practice ○ Grade 5 Decimal Division Annex Zero Set 1 ○ Grade 5 Decimal Division Annex Zero Set 2 ○ Grade 5 Decimal Word Problems Add Subtract ○ 5.5 VDOE Released Test Items ○ Grade 5 Decimal Division Estimation Matching Activity ○ Grade 5 Decimal Computation Expressions ○ Grade 5 Decimal Multiplication Example ● **Technology-based** o Math Nook: Math Speed Racing Decimal Multiplication (a) o Gizmos: Multiplying Decimals (Area Model) (a) **Station Activities** ● Decimal Cubes: Students will roll 2 decimal cubes and create a practical problem using the numbers generated. (b) ● Foam Base 10s: Using foam base 10 blocks, students will arrange the blocks to create an area model for a multiplication problem involving decimals. (a)
Cross-Curricular Connections	**Differentiation**

Scholastic Atlas of Space (Les Editions Quebec Amerique Inc.)
Use division to find the distance you would need to travel each day in order to get from earth to other planets in one week.
	• FACEing Fractions, Decimals, and Percents
	  ○ Lesson 12: Adding and Subtracting Decimals (low)
	  ○ Lesson 13: Multiplying Decimals
	  ○ Lesson 14: Dividing Decimals
	  ○ Lesson 14: Adding, Subtracting, Multiplying, and Dividing Decimals
	• FACEing Elementary Math
	  ○ Lesson 4 Adding, Subtracting, Multiplying and Dividing Money in Decimal Notation
	  ○ Lesson 20: Money and Decimal Operations
	• enVision Math
	  ○ Lesson 7.2 Multiplying a Decimal by a Whole Number
	  ○ Lesson 7.4 Multiplying Two Decimals
	  ○ Lesson 7.6 Dividing a Decimal by a Whole Number
	  ○ Lesson 7.7 Estimation: Decimals Divided by Whole Numbers
	• Multilingual Glossary
	• MathLive: online tutorial

Strand: Number Sense
5.6 The student will a) solve single-step and multistep practical problems involving addition and subtraction with fractions and mixed numbers; and b) solve single-step practical problems involving multiplication of a whole number, limited to 12 or less, and a proper fraction, with models.* *On the state assessment, items measuring this objective are assessed without the use of a calculator
Suggested Pacing

Richmond Public Schools

Curriculum Framework
Grade 5

1st & 2nd Nine Weeks

Related Spiraling Standards

Spiral Down	**Spiral Up**
4.5 The student will a) determine common multiples and factors, including least common multiple and greatest common factor b) add and subtract fractions and mixed numbers having like and unlike denominators; and c) estimate and determine quotients of whole numbers, with and without remainders; and d) solve single-step and multistep practical problems involving addition, subtraction, and multiplication, and single step practice problems involving division with whole numbers	6.5 The student will a) multiply and divide fractions and mixed numbers; b) solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of fractions and mixed numbers; and c) solve multistep practical problem involving addition, subtraction, multiplication, and division of decimals

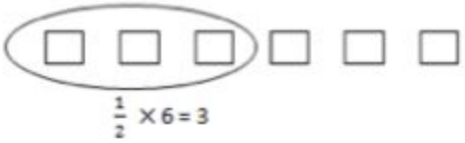
Essential Questions	**Common Misconceptions**
● What does it mean to "simplify" a fraction, and why is it important? ● How can we use models to devise strategies for renaming improper fractions as mixed numbers and vice versa? ● How is the understanding of multiples and factors useful in simplifying fractions and mixed numbers? ● How can we use mental models, benchmarks, and approximate decimal equivalents to estimate sums and differences of fractions? ● What strategies can be developed to compute sums and differences with fractions and mixed numbers? ● How are common denominators useful when adding and subtracting fractions?	● When adding fractions, students may try to add both the numerator and denominator. ● When subtracting fractions, students may not understand which fraction to subtract from because they do not know which fraction is larger. ● When solving subtraction practical problems involving a whole number and a fraction, students may not understand and apply the concept of a whole number as a fraction. For example, $10 - 6\ \frac{5}{7} = 9\ \frac{7}{7} - 6\ \frac{5}{7}$ ● Students think that multiplying always gives them a larger number. ● When simplifying an answer, students do not use the greatest common factor and fail to simplify the fraction completely.

Understanding the Standard	**Essential Knowledge and Skills**

• A fraction can be expressed in simplest form (simplest equivalent fraction) by dividing the numerator and denominator by their greatest common factor. • When the numerator and denominator have no common factors other than one, then the fraction is in simplest form. • Fractions having like denominators have the same meaning as fractions having common denominators. • Addition and subtraction with fractions and mixed numbers can be modeled using a variety of concrete and pictorial representations. • Estimation keeps the focus on the meaning of the numbers and operations, encourages reflective thinking, and helps build informal number sense with fractions. Students can reason with benchmarks to get an estimate without using an algorithm. Estimation can be used to check the reasonableness of an answer. • A mixed number has two parts: a whole number and a fraction. The value of a mixed number is the sum of its two parts. • A unit fraction is a fraction in which the numerator is one. • Models for representing multiplication of fractions may include arrays, paper folding, repeated addition, fraction strips or rods, pattern blocks, or area models. • Students should begin exploring multiplication with fractions by solving problems that involve a whole number and a unit fraction. • When multiplying a whole number by a fraction such as $6 \times \frac{1}{2}$, the meaning is the same as with multiplication of whole numbers: six groups the size of $\frac{1}{2}$ of the whole.	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to • Solve single-step and multistep practical problems involving addition and subtraction with fractions (proper or improper) having like and unlike denominators and/or mixed numbers. Denominators in the problems should be limited to 12 or less (e.g., $\frac{5}{8} + \frac{1}{4}$, $\frac{5}{6} - \frac{2}{3}$, $3\frac{3}{4} + 2\frac{5}{12}$) and answers should be expressed in simplest form. (a) • Solve single-step practical problems involving multiplication of a whole number, limited to 12 or less, and a proper fraction (e.g., $6 \times \frac{1}{3}$, $\frac{1}{4} \times 8$, $9 \times \frac{2}{3}$), with models. The denominator will be a factor of the whole number and answers should be expressed in simplest form. (b) • Apply the inverse property of multiplication in models. (For example, use a visual fraction model to represent $\frac{4}{4}$ or 1 as the product of $4 \times \frac{1}{4}$). (b)

$6 \times \frac{1}{2} = \frac{6}{2} = 3$

- When multiplying a fraction by a whole number such as $\frac{1}{2} \times 6$, we are trying to determine a part of the whole (e.g., one-half of six).



- The inverse property of multiplication states that every number has a multiplicative inverse and the product of multiplicative inverses is 1 (e.g., 5 and $\frac{1}{5}$ are multiplicative inverses because $5 \times \frac{1}{5} = 1$). The multiplicative inverse of a given number can be called the reciprocal of the number. Students at this level do not need to use the term for the properties of the operations.
- Multiplying a whole number by a unit fraction can be related to dividing the whole number by the denominator of the fraction. For example, $\frac{1}{3}$ of 6 is equivalent to 2. This understanding forms a foundation for learning how to multiply a whole number by a proper fraction.

- At this level, students will use models to solve problems that involve multiplication of a whole number, limited to 12 or less, and a proper fraction where the denominator is a factor

of the whole number. For example, a model for $\frac{3}{4} \times 8$ or $8 \times \frac{3}{4}$ shows that the answer is three groups of $\frac{1}{4} \times 8$.

- Examples of problems grade five students should be able to solve include, but are not limited to the following:
  - If nine children each bring $\frac{1}{3}$ cup of candy for the party, how many thirds will there be? What will be the total number of cups of candy?
  - If it takes $\frac{3}{4}$ cup of ice cream to fill an ice cream cone, how much ice cream will be needed to fill eight cones?
- Resulting fractions should be expressed in simplest form.
- Problems where the denominator is not a factor of the whole number (e.g., $\frac{1}{8}$ x 6 or 6 x $\frac{1}{8}$) will be a focus in grade six.

Vocabulary	Instructional Activities Organized by Learning Objective
Fraction Mixed Number Addition Subtraction Multiply: Product proper fraction improper fraction like denominators unlike denominators numerator	**Textbook** **enVision Math** ● Tools4Math- Fractions **Eureka Math** 5.6a ● GRADE 5 MODULE 3: Addition and Subtraction of Fractions 5.6b ● GRADE 5 MODULE 4 Topic C: Multiplication of a Whole Number by a Fraction

denominator
simplify
simplest form
simplest equivalent fraction
greatest common factor
common denominator
unit fraction
mixed number
multiplicative inverse
reciprocal
inverse property of multiplication
whole number
factors
inverse
reasonableness

Assessment

Powerschool – Exam identifier

Notes

Resources

- **Print**
  - Teaching Student-Centered Mathematics-Volume Two, Second Edition (2014)
    - Addition and Subtraction, Chapter 13 pp. 236-242 (a)
    - Multiplication, Fractions of Whole Numbers, Chapter 13, pp. 242-243 (b)
  - Grade 5 VDOE Sample Items Add Subtract
  - Multiplying by a Fraction Sort
  - Grade 5 Math LCM and GCF task Cards
  - Grade 5 Pattern Block Fraction Game
  - Grade 5 Adding and Subtracting Fractions with Grid Paper
  - Grade 5 Adding and Subtracting Fractions Task Cards
  - Grade 5 Fraction Application Word Problem Bank
  - Grade 5 Fraction Comp 14 Day Plan
  - Grade 5 LCM GCF Power Towers
  - Grade 5 Adding and Subtracting Fraction Bars
  - Grade 5 Math Add Subtract Templates
  - Grade 5 Correct or Incorrect- Multiply a Whole by a Fractions
  - Grade 5 Fraction Strips

- **Technology-based**
  - Gizmo: Adding Fractions (Fraction Tiles) (a)

	o Gizmo: Multiplying Fractions (b) o Sheppard Software: Mathman (a) o Study Jams: Add and Subtract Unlike Denominators (a) o AAA Math: Multiplying Fractions by Whole Numbers (b) o BrainPOP: Adding and Subtracting Fractions (a) **Station Activities/Manipulatives** Fraction Cubes: Using fraction cubes, students will roll 2 fractions and write a practical problem for a partner to solve. (a, b) Fraction Circles: Using fraction circles, students will model a given subtraction problem. (a) Fraction Tiles: Using fraction tiles, students will represent a fraction addition problem. (a) Fraction Number Lines: Given an addition or subtraction problem, students will use the fraction number lines to demonstrate the problem. (a)
Cross-Curricular Connections	**Differentiation**

[The Hershey's Milk Chocolate Bar Fractions Book] by Jerry Pallotta
After the initial read, the story can be used again for practicing adding and subtracting fractions. On each page, teacher will have students roll a dice twice to create a fraction (lower number serves as the numerator and higher number serves as the denominator) to be added or subtracted from the fraction on the page. The teacher can also ask real world questions about adding or subtracting pieces to make the practice more meaningful.
	• enVision Math:
	  ○ Lesson 10.1 Adding and Subtracting Fractions with Like Denominators
	  ○ Lesson 10.2 Common Multiples and Least Common Multiple
	  ○ Lesson 10.3 Adding Fractions with Unlike Denominators
	  ○ Lesson 10.4 Subtracting Fractions with Unlike Denominators
	  ○ Lesson 10.5 Adding Mixed Numbers
	  ○ Lesson 10.6 Subtracting Mixed Numbers
	  ○ Lesson 11.1 Multiplying Fractions and Whole Numbers
	• Multilingual Glossary

Strand: Computation and Estimation	
5.7 The student will simplify whole number numerical expressions using the order of operations.* *On the state assessment, items measuring this objective are assessed without the use of a calculator**.**	
Suggested Pacing	
2nd Nine Weeks	
Related Spiraling Standards	
Spiral Down	**Spiral Up**
4.16 The student will recognize and demonstrate the meaning of equality in an equation.	6.6 The student will a) add, subtract, multiply, and divide integers;* b) solve practical problems involving operations with integers; and

	c) simplify numerical expressions involving integers.*
Essential Questions	**Common Misconceptions**
● What is a mathematical expression? …equation? ● What is order of operations? What do we mean when we say order of operations? ● Why are parentheses used in mathematical expressions? ● Why does "order of operations" matter when simplifying expressions containing more than one operation?	● Students may multiply before dividing in a problem instead of solving them in the order they appear in the problem from left to right. ● Students may add before subtracting in a problem instead of solving them in the order they appear in the problem from left to right. ● Students may be confused when a multiplication sign is omitted.
Understanding the Standard	**Essential Knowledge and Skills**
● An expression is a representation of a quantity. It is made up of numbers, variables, computational symbols, and grouping symbols. It does not have an equal symbol (e.g., 15 × 12). ● Expressions containing more than one operation are simplified by using the order of operations. ● The order of operations is a convention that defines the computation order to follow in simplifying an expression. It ensures that there is only one correct value. ● The order of operations is as follows: - First, complete all operations within grouping symbols. If there are grouping symbols within other grouping symbols, do the innermost operation first. (Students in grade five are not expected to simplify expressions having parentheses within other grouping symbols.)	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to ● Use the order of operations to simplify whole number numerical expressions, limited to addition, subtraction, multiplication, and division. Expressions may contain parentheses. ● Given a whole number numerical expression involving more than one operation, describe which operation is completed first, which is second, etc.

- If there are multiple operations within the parentheses, apply the order of operations.
- Second, evaluate all exponential expressions. (Students in grade five are not expected to simplify expressions with exponents.)
- Third, multiply and/or divide in order from left to right.
- Fourth, add and/or subtract in order from left to right.

Vocabulary

parentheses
expressions
equations
simplify
numerical expression
grouping symbols
variable
operation
order of operations

Assessment

Powerschool – Exam identifier

Instructional Activities Organized by Learning Objective

Textbook
enVision
- Lesson 6.5 Order of Operations
- Differentiated Center Activities: 6.5

Eureka Math
- GRADE 5 MODULE 2 Lesson 3: Write and interpret numerical expressions and compare expressions using a visual model
- GRADE 5 MODULE 2 Lesson 4: Convert numerical expressions into unit form as a mental strategy for multi-digit multiplication.
- GRADE 5 MODULE 4 Lesson 10: Compare and evaluate expressions with parentheses.

Notes

Resources
- **Print**

	○ Grade 5 What's the Order ○ Grade 5 Order Of Operations task Cards Set 1 ○ Grade 5 Order of Operations Task Cards Set 2 ○ Grade 5 Rally Coach Order of Operations ○ Grade 5 VDOE Sample Items Order of Operations ○ Grade 5 Order of Ops Boxing Steps ○ Grade 5 Anno's Magic Seeds ○ Grade 5 Order of Operations Sort ○ Grade 5 Order of Operations Hopscotch Board ○ Grade 5 Order of Operations Steps ○ Grade 5 Order of Operations Anchor Chart ○ Grade 5 Intro Hooks to Order of Operations ○ Grade 5 Order of Operations Hopscotch ● **Technology-based** o The Order of Operations Royal Rescue Order of Operations o High-Stakes Heist Order of Operations **Station Activities/ Manipulatives** Number cubes: Using 5 number cubes each, students will roll and then arrange the number cubes into an equation using +, - , x , ÷ , ( ), trying to create the largest answer.
Cross-Curricular Connections	**Differentiation**

Two Of Everything by Lily Toy Hong The Haktaks have one stack of eight coins, three stacks of five coins, and one stack of seven coins. Tell me how many coins the Haktaks have. (8 + 3 x 5 + 7) Solve and discuss why order matters. **Anno's Magic (Magical) Seeds** by Mitsumasa Anno Have students calculate the seed totals for each year. Challenge students to use variables and equations to solve for the number of seeds planted each year.	• Multilingual Glossary

Strand: Measurement and Geometry
5.8 The student will a) solve practical problems that involve perimeter, area, and volume in standard units of measure; and b) differentiate among perimeter, area, and volume and identify whether the application of the concept of perimeter, area, or volume is appropriate for a given situation.
Suggested Pacing
3rd Nine Weeks
Related Spiraling Standards

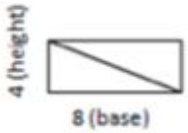
Spiral Down	**Spiral Up**
4.7 The student will solve practical problems that involve determining perimeter and area in U.S. Customary and metric unit	6.7 The student will b) solve problems, including practical problems, involving circumference and area of a circle; and c) solve problems, including practical problems, involving area and perimeter of triangles and rectangles.

Richmond Public Schools

Curriculum Framework
Grade 5

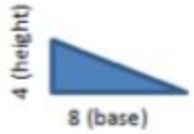
Essential Questions	Common Misconceptions
● How does area relate to perimeter? ● Why is area measured in square units? ● Why is volume measured in cubic units? ● When would you use perimeter? ….area? ...volume? ● How do you determine if a situation calls for perimeter? ...area? ...volume? ● How does the area of a right triangle relate to the area of a rectangle? How can we use the area of a rectangle to find the area of a right triangle? ● How does area relate to volume?	● Students confuse and interchange formulas of area, perimeter, and volume. ● Students try to use the formula for the perimeter of rectangular shapes for shapes that are non rectangular ● Students confuse and interchange the appropriate measure to use when given practical problems ● Students use the wrong units (squared units for area and cubic units for volume)
Understanding the Standard	**Essential Knowledge and Skills**
● A plane figure is any closed, two-dimensional shape. ● Perimeter is the path or distance around any plane figure. It is a measure of length. ● Area is the surface included within a plane figure. Area is measured by the number of square units needed to cover a surface or plane figure. ● Volume of a three-dimensional figure is a measure of capacity and is measured in cubic units. ● A polygon is a closed plane figure composed of at least three line segments that do not cross. ● To determine the perimeter of any polygon, add the lengths of the sides. ● Students should label the perimeter, area, and volume with the appropriate unit of linear, square, or cubic measure. ● A right triangle has one right angle.	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to ● Solve practical problems that involve perimeter, area, and volume in standard units of measure. (a) ● Determine the perimeter of a polygon, with or without diagrams, when – the lengths of all sides of a polygon that is not a rectangle or a square are given; – the length and width of a rectangle are given; or – the length of a side of a square is given. (a) ● Estimate and determine the area of a square and rectangle using whole number measurements given in metric or U.S. Customary units, and record the solution with the appropriate unit of measure (e.g., 24 square inches). (a)

- Students should use manipulatives to discover the formulas for the area of a right triangle and volume of a rectangular solid.
  - Area of a right triangle = $\frac{1}{2}$ base x height
  - Volume of a rectangular solid = length × width × height
- Students would benefit from opportunities that include the use of benchmark fractions (e.g., $\frac{1}{2}$, $\frac{1}{4}$) in determining perimeter.
- The area of a rectangle can be determined by multiplying the length of the base by the length of the height.
- The diagonal of the rectangle shown divides the rectangle in half creating two right triangles. The legs of the right triangles are congruent to the side lengths of the rectangle. The representation illustrates that the area of each right triangle is half the area of the rectangle. Exploring the decomposition of shapes helps students develop algorithms for determining area of various shapes (e.g., area of a triangle is ½ × base × height).



- The distance from the top of the right triangle to its base is called the height of the triangle.

- Develop a procedure for determining the area of a right triangle using only whole number measurements given in metric or U.S. Customary units, and record the solution with the appropriate unit of measure (e.g., 12 square inches). (a)
- Estimate and determine the area of a right triangle, with diagrams, when the base and the height are given. (a)
- Develop a procedure for determining volume using manipulatives (e.g., cubes). (a)
- Estimate and determine the volume of a rectangular prism with diagrams, when the length, width, and height are given, using whole number measurements. Record the solution with the appropriate unit of measure (e.g., 12 cubic inches). (a)
- Describe practical situations where perimeter, area, and volume are appropriate measures to use, and justify orally or in writing. (b)
- Identify whether the application of the concept of perimeter, area, or volume is appropriate for a given situation. (b)



- Two congruent right triangles can always be arranged to form a square or a rectangle.
- To develop the formula for determining the volume of a rectangular prism, volume = length × width × height, students will benefit from experiences filling rectangular prisms (e.g., shoe boxes, cereal boxes) with cubes by first covering the bottom of the box and then building up the layers to fill the entire box.

Vocabulary	Instructional Activities Organized by Learning Objective
Area: Square Units Perimeter: Units Volume: Height, Width, Length right triangle right angle rectangle square polygon rectangular prisms cube cubic units Metric units U.S. Customary Units congruent estimate	**Textbook** **enVision Math** 5.8 a,b • Lesson 12.3 Perimeter • Lesson 12.4 Area or Squares and Rectangles • Lesson 13.5 Volume • Differentiated Center Activities: 12.3, 12.4, 13.5 • Tools4Math- Geometry Shapes, Geometry Drawing, Measurement **Eureka Math** 5.8 a,b • GRADE 5 MODULE 5: Addition and Multiplication with Volume and Area **Notes**

appropriate
plane figure
two-dimensional shape
closed
length
height
point
surface
square units
three-dimensional figures
capacity
polygon
side
line segment
linear unit
diagonal
rectangular solid
leg
base

Assessment

Powerschool – Exam identifier

- Interactive Notebook Math Grade 5:
  - Volume pages 60-61
  - Finding Volume with a Formula pages 62-63
- Interactive Notebook Math Grade 4
  - Area and Perimeter pages 54-55

Resources

- **Print**
  - Teaching Student-Centered Mathematics-Volume Two, Second Edition:
    - Measuring Area-Chapter 16, pp. 324-327
    - Developing Formulas for Area and Volume, Chapter 16, pp. 329-331
    - Measuring Volume and Capacity, Chapter 16, pp. 331-334
    - Expanded Lesson- Fixed Areas, Chapter 16, pp. 341-343
  - **o** Painting Youcubed (volume, area): **Volume, Area**
  - Grade 5 VDOE Sample Items Perimeter Area and Volume
  - Grade 5 Volume of Rectangular Prism
  - Grade 5 Perimeter Practice
  - Grade 5 Mystery Present
  - Grade 5 Exploring Area Perimeter with Grid Paper
  - Grade 5 Rolling Rectangles
  - Grade 5 Perimeter Area Task
  - Grade 5 Triangle Challenge
  - Grade 5 Perimeter Area Volume Sort
  - Grade 5 Perimeter Task
  - Grade 5 Exploring Boxes

	○ Grade 5 Exploring Volume ○ Area of Right Triangles ○ Grade 5 Math VDOE Sample Items 5.8 ○ Grade 5 Perimeter Area Volume ○ Grade 5 Comparing Area and Perimeter of Rectangles ○ Grade 5 Area Practice ○ Grade 5 Determine Perimeter Area Volume Situations ○ Grade 5 Area and Perimeter Practice ○ Grade 5 Area Perimeter Volume task Cards ○ Grade 5 Area and Perimeter of Right Triangle with Grid Paper ○ Grade 5 Centimeter Grid Paper ○ Grade 5 Area and Perimeter • **Technology-based** o Gizmo: Fido's Flower Bed (Perimeter and Area) o Study Jams: Surface Area o Study Jams: Perimeter o Study Jams: Volume **Station Activities/Manipulatives** Rulers: Using rulers, students will measure the perimeter of given shapes. Linking Cubes: Using linking cubes, students will build three dimensional figures and find the volume. Square Tiles: Using square tiles, students will build two dimensional figures and find the area and perimeter of that figure.
Cross-Curricular Connections	**Differentiation**

The Promise Quilt by Candice Ransom Explore area and perimeter with quilt squares. **Perimeter, Area, and Volume: a Monster Book of Dimensions** by David A. Adler Explore these three concepts in one story with a movie theater theme. **Spaghetti and Meatballs For All** by Marilyn Burns Students find perimeter and area of different sized tables using color tiles. **Zachary Zormer: Shape Transformer** by Joanne Anderson Reisburg Zachary takes on a different math concept (length, width, area, perimeter) with projects that include a mobius strip, a paper frame, and a light show. Instructions for doing Zach's projects are included at the end.	• Multilingual Glossary • MathLive: online tutorial

Strand: Measurement and Geometry
5.9 The student will a) given the equivalent measure of one unit, identify equivalent measurements within the metric system; and b) solve practical problems involving length, mass, and liquid volume using metric units.
Suggested Pacing
3rd Nine Weeks
Related Spiraling Standards

Spiral Down	**Spiral Up**
4.8 The student will a) estimate and measure length and describe the result in U.S. Customary and metric units; b) estimate and measure weight/mass and describe the result in U.S. Customary and metric units; c) given the equivalent measure of one unit, identify equivalent measures of length, weight/mass, and liquid volume between units within the U.S. Customary system; and d) solve practical problems that involve length, weight/mass, and liquid volume in U.S. Customary units.	
Essential Questions	**Common Misconceptions**
● Why are all measurements approximations? How does the selection of an appropriate unit of measurement and measurement tool affect the precision of the solution to problems involving measurement? ● What tools are used in linear measurement? …measurement of weight/mass? …measurement of liquid volume? …measurement of temperature? How does one determine which is appropriate to use? ● How do the units within a system relate to each other? ● How can we use benchmarks to help us estimate measurements of length, weight/mass, and liquid volume in metric units?	● Students have a limited number of units of measure that they know and understand and use those units inappropriately.
Understanding the Standard	**Essential Knowledge and Skills**
● Length is the distance between two points along a line. ● Metric units for measurement of length include millimeters, centimeters, meters, and kilometers. Appropriate measuring devices include centimeter ruler, meter stick, and tape measure.	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to ● Given the equivalent measure of one unit, identify equivalent measurements within the metric system for the following:

- Weight and mass are different. Mass is the amount of matter in an object. Weight is determined by the pull of gravity on the mass of an object. The mass of an object remains the same regardless of its location. The weight of an object changes depending on the gravitational pull at its location. In everyday life, most people are actually interested in determining an object's mass, although they use the term *weight* (e.g., "How much does it weigh?" versus "What is its mass?").
- Balances are appropriate measuring devices to measure mass in U.S. Customary units (ounces, pounds) and metric units (grams, kilograms).
- Metric units to measure liquid volume (capacity) include milliliters and liters.
- Practical experience measuring familiar objects helps students establish benchmarks and facilitates students' ability to use the appropriate units of measure to make estimates.
- Students at this level will be given the equivalent measure of one unit when asked to determine equivalencies between units in the metric system. An example can be found below.
  - Students will be told 1 kilometer is equivalent to 1,000 meters and then will be asked to apply that relationship to determine:
    - the number of meters in 3.5 kilometers;
    - the number of kilometers equal to 2,100 meters; or
    - Seth ran 2.78 kilometers on Saturday. How many meters are equivalent to 2.78 kilometers?
  - length (millimeters, centimeters, meters, and kilometers);
  - mass (grams and kilograms); and
  - liquid volume (milliliters and liters). (a)
- Estimate and measure to solve practical problems that involve metric units:
  - length (millimeters, centimeters, meters, and kilometers);
  - mass (grams and kilograms); and
  - liquid volume (milliliters, and liters). (b)

Vocabulary	Instructional Activities Organized by Learning Objective
volume height width length equivalent measurements kilometer meter centimeter kilogram gram liter milliliters millimeters mass estimate metric centimeter balance gravity metric units liquid volume	**Textbook** **enVision Math** 5.9a ● Lesson 14.5 Converting Metric Units ● Differentiated Center Activities: 14.5 5.9b ● Lesson 12.2 Using Metric Units of Length ● Lesson 14.2 Metric Units of Capacity ● Differentiated Center Activities: 12,2, 14.2 ● EnVision Math: Tools4Math- Measurement **Eureka Math** 5.9a ● GRADE 5 MODULE 1 Lesson 4: Use exponents to denote powers of 10 with application to metric conversions ● GRADE 5 MODULE 2 Topic D: Measurement Word Problems with Whole Number and Decimal Multiplication ● GRADE 5 MODULE 4 Lesson 19: Convert measures involving whole numbers, and solve multi-step word problems. Note: Strategy shown can be used for differentiation and applied to metric conversions ● GRADE 5 MODULE 4 Lesson 20: Convert mixed unit measurements and solve multi-step word problems. 5.9b ● GRADE 5 MODULE 5 Lesson 5: Addition and Multiplication with Volume and Area
Assessment	
Powerschool – Exam identifier	**Notes**

	Resources ● **Print** o Teaching Student-Centered Mathematics-Volume Two, Second Edition (2014): ▪ Measuring Length-Chapter 16, pp.322-324 ▪ Measuring Weight and Mass- Chapter 16, pg. 335 o FACEing Elementary Math: Lesson 16: Metric Measurement o Grade 5 Mass Chart o Grade 5 Liquid Volume Chart o Grade 5 Length Chart o Grade 5 Mass Conversion o Grade 5 Length Conversion o Grade 5 Metric Measurement Conversion Word Problems o Grade 5 Volume Conversion ● **Technology-based** o BrainPop - Metric Units - instructional tool o Gizmo: Cannonball Clowns (Number Line Estimation) (a) **Station Activities/ Manipulatives** ● Meter Sticks: Students will use a meter stick to measure the length of a classroom or objects larger than 1 meter using both centimeters and meters. ● Rulers: Students will use a ruler to measure lengths of various smaller objects in both centimeters and millimeters.

	• Metric Weight Set: Given metric weights for gram and kilogram, students will find objects in the room that they estimate to be equivalent to a gram and a kilogram. • School Pan Balance: Students will use a school pan balance to weigh objects. • School Rocker Scale: Students will use a school rocker scale to find equivalent mass by placing grams on one side and kilograms on the other side of the scale.
Cross-Curricular Connections	**Differentiation**
Polly's Pen Pal by Stuart Murphy Polly has a pen pal that lives in Canada where they use the metric system. Metric conversions and comparisons are discussed. **Activity** **Millions to Measure** by David Schwartz Match the tool and unit of measure appropriate for measuring a given attribute of different objects. **Zachary Zormer: Shape Transformer** by Joanne Anderson Reisburg Zachary takes on a different math concept (length, width, area, perimeter) with projects that include a mobius strip, a paper frame, and a light show. Instructions for doing Zach's projects are included at the end. 32 pages	• FACEing Primary Problem Solving ○ Lesson 10: Measuring to the Nearest Centimeter • Multilingual Glossary

Strand: Measurement and Geometry
5.10 The student will identify and describe the diameter, radius, chord, and circumference of a circle.

Richmond Public Schools

Curriculum Framework
Grade 5

Suggested Pacing	
3rd Nine Weeks	
Related Spiraling Standards	
Spiral Down 4.10 The student will a) identify and describe points, lines, line segments, rays, and angles, including endpoints and vertices	**Spiral Up** 6.7 The student will a) derive pi; b) solve problems, including practical problems, involving circumference and area of a circle; and c) solve problems, including practical problems, involving area and perimeter of triangles and rectangles.
Essential Questions	**Common Misconceptions**
● How is a chord related to a diameter? ● How does diameter relate to radius? ● How does radius relate to circumference? How does diameter relate to circumference? ● How is circumference related to perimeter?	● Students have difficulty remembering the definitions of chord, diameter, radius, and circumference. ● Students do not understand that the diameter is a type of chord and believe that a chord cannot pass through the center.
Understanding the Standard	**Essential Knowledge and Skills**
● A circle is a set of points in a plane that are the same distance from a point called the *center*. ● A chord is a line segment connecting any two points on a circle. A chord may or may not go through the center of a circle. The diameter is the longest chord of a circle. ● A diameter is a chord that goes through the center of a circle. The length of the diameter of a circle is twice the length of the radius.	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to ● Identify and describe the diameter, radius, chord, and circumference of a circle. ● Investigate and describe the relationship between ○ diameter and radius; ○ diameter and chord; ○ radius and circumference; and

- A radius is a line segment joining the center of a circle to any point on the circle. Two radii end-to-end form a diameter of a circle.
- Circumference is the distance around or "perimeter" of a circle. An approximation for circumference is about three times the diameter of a circle. An approximation for circumference is about six times the radius of a circle.
    - diameter and circumference.

Vocabulary

Chord
Diameter
Radius
Circumference
Line Segment
Point
Circle
Center
Perimeter

Assessment

Powerschool – Exam identifier

Instructional Activities Organized by Learning Objective

Textbook
Eureka Math

- GRADE 6 MODULE 3 Lesson 16: The Most Famous Ratio of All
- GRADE 6 MODULE 3 Lesson 18: More Problems on Area and Circumference
- A STORY OF FUNCTIONS (GRADES 9-12) GEOMETRY MODULE 5: Circles With and Without Coordinates

Notes

Resources

- **Print**
    - VDOE Lesson Plan: Human Circle
      Note: SOL 5.9 is now 5.10
    - Grade 5 Relating Diameter to Radius
    - Grade 5 Relating Circumference to Diameter
    - Grade 5 Relating Diameter to Circumference
    - Grade 5 Pipe Cleaner Circle Activity

	○ Grade 5 Labeling the Parts of a Circle ○ Grade 5 Circle Task Cards ○ Grade 5 Connecting the Circumference to the Diameter ○ Grade 5 Circles Hyperdoc ○ Grade 5 Math VDOE Sample Items ○ Grade 5 Naming the Parts of a Circle ○ Grade 5 Circles Foldable ○ Grade 5 Circle Practice ○ Grade 5 Making Circumference Make Sense ○ Grade 5 Circle Notes • **Technology-based** o BrainPOP: Circles **Station Activities/Manipulatives**
Cross-Curricular Connections	**Differentiation**
Sir Cumference and the First Round Table by Cindy Neuschwander Relate circle vocabulary to characters in the story.	• Multilingual Glossary

Strand: Measurement and Geometry
5.11 The student will solve practical problems related to elapsed time in hours and minutes within a 24-hour period.
Suggested Pacing

Richmond Public Schools

Curriculum Framework
Grade 5

<table>
<tr><td colspan="2">4th Nine Weeks</td></tr>
<tr><td colspan="2">Related Spiraling Standards</td></tr>
<tr><td><u>Spiral Down</u>
4.9 The student will solve practical problems related to elapsed time in hours and minutes within a 12-hour period.</td><td><u>Spiral Up</u></td></tr>
<tr><td>Essential Questions</td><td>Common Misconceptions</td></tr>
<tr><td>● What is meant by elapsed time?
● When might we need to find elapsed time?
● What strategies can we use to find elapsed time?</td><td>● Students overgeneralize base-10 and apply it to time inappropriately.</td></tr>
<tr><td>Understanding the Standard</td><td>Essential Knowledge and Skills</td></tr>
<tr><td>● Elapsed time is the amount of time that has passed between two given times.
● Elapsed time can be found by counting on from the beginning time or counting back from the ending time.</td><td>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to
● Solve practical problems related to elapsed time in hours and minutes within a 24-hour period:
– when given the beginning time and the ending time, determine the time that has elapsed;
– when given the beginning time and amount of elapsed time in hours and minutes, determine the ending time; or
– when given the ending time and the elapsed time in hours and minutes, determine the beginning time.</td></tr>
<tr><td>Vocabulary</td><td>Instructional Activities Organized by Learning Objective</td></tr>
<tr><td>elapsed time
hours
minutes</td><td>Textbook
enVision Math
● Lesson 14.6 Elapsed Time</td></tr>
</table>

beginning time ending time	● Lesson 14.7 Elapsed Time in Other Units ● Differentiated Center Activities: 14.6, 14.7 ● Tools4Math- Time
Assessment	**Eureka Math** ● GRADE 3 MODULE 2 Topic A: Time Measurement and Problem Solving
Powerschool – Exam identifier	**Notes** ● Interactive Notebook Math Grade 4 o Elapsed Time pages 52-53 **Resources** ● **Print** o Teaching Student-Centered Mathematics-Volume Two, Second Edition (2014) ▪ Elapsed Time-Chapter 16, pp 339-340 o FACEing: Primary Problem Solving: Lesson 16: Determining Elapsed Time o Grade 5 Elapsed Time Task Cards o Grade 5 Elapsed Time Problems o Grade 5 Elapsed Time Mountain o Grade 5 Elapsed Time Stories o Counting on Strategy Elapsed Time o Grade 5 Bus Schedule for Elapsed Time ● **Technology-based** o Brain Pop: Elapsed Time o Mr. Nussbaun: Clock Works o Study Jams: Elapsed Time o Gizmo: Elapsed Time

	Station Activities/ Manipulatives ● Write On, Wipe Off Clocks: ○ Given a beginning time and an end time, students will show the beginning time on the clock and move the hands of the clock to determine the elapsed time. ○ Given the beginning time and the amount of elapsed time in hours and minutes, students will use the clock to manipulate the hands in order to determine the end time. ○ Given the ending time and the elapsed time, the students will use the clock to manipulate the hands in order to determine the beginning time.
Cross-Curricular Connections	**Differentiation**
Three Days on a River in a Red Canoe by Vera Williams Use the activities from the first morning to create elapsed time problems. EX: On the first morning, they ate lunch at 12:35 pm. It took 2 hours and 28 minutes to get to the swimming hole. What time did they arrive at the swimming hole? **The Grouchy Ladybug** by Eric Carle Post sticky notes on pages with different start times to allow for practice of change in time within a 24 hour time frame. EX. Instead of only changing an hour later for each page, give a more challenging increase in time.	● Multilingual Glossary ● MathLive: online tutorial ● Sheppard Software: Elapsed Time

Strand: Measurement and Geometry
5.12 The student will classify and measure right, acute, obtuse, and straight angles.

Richmond Public Schools

Curriculum Framework
Grade 5

Suggested Pacing	
3rd Nine Weeks	
Related Spiraling Standards	
Spiral Down 4.10 The Student will a) identify and describe points, lines, line segments, rays, and angles, including endpoints and vertices; and b) identify and describe intersecting, parallel, and perpendicular lines.	**Spiral Up** 6.9 The student will determine congruence of segments, angles, and polygons
Essential Questions	**Common Misconceptions**
● How does angle measurement differ from linear measurement? ● How can we use benchmark angle measurements (e.g., 90°, 180°) to determine the measurement of other angles? ● How is a protractor or an angle ruler used to measure? ● How can visualizing a circle folded into halves and quarters help us classify angles?	● Students do not line up the vertex of the angle with the center mark of the protractor. ● Students do not line up the zero edge of the protractor with the ray of the angle. ● Students read the wrong number on the protractor when finding the measure of an angle. ● Students confuse the terms acute angle, obtuse angle, right angle, and straight angle.
Understanding the Standard	**Essential Knowledge and Skills**
● Angles can be classified as right, acute, obtuse, or straight according to their measures. ● Angles are measured in degrees. A degree is $\frac{1}{360}$ of a complete rotation of a full circle. There are 360 degrees in a circle.	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to ● Classify angles as right, acute, obtuse, or straight. ● Identify the appropriate tools (e.g., protractor and straightedge or angle ruler as well as available software) used to measure and draw angles.

• To measure the number of degrees in an angle, use a protractor or an angle ruler. • A right angle measures exactly 90 degrees. • An acute angle measures greater than zero degrees but less than 90 degrees. • An obtuse angle measures greater than 90 degrees but less than 180 degrees. • A straight angle measures exactly 180 degrees. • Before measuring an angle, students should first compare it to a right angle to determine whether the measure of the angle is less than or greater than 90 degrees. • Students should recognize angle measure as additive. When an angle is decomposed into nonoverlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. • Students should understand how to work with a protractor or angle ruler as well as available computer software to measure and draw angles and triangles.	• Measure right, acute, obtuse, and straight angles, using appropriate tools, and identify their measures in degrees. • Solve addition and subtraction problems to determine unknown angle measures on a diagram in practical problems.
Vocabulary	**Instructional Activities Organized by Learning Objective**
angle ray vertex acute angle obtuse angle right angle straight angles	**Textbook** **enVision Math** • Lesson 8.2 Measuring and Classifying Angles • Differentiated Center Activities: 8.2 • Tools4Math- Geometry Drawing **Eureka Math** • GRADE 4 MODULE 4 Topic B: Angle Measurement

degree
rotation
protractor
straightedge
angle ruler

Assessment

Powerschool – Exam identifier

Notes

- Interactive Notebook Math Grade 4
  - Introduction to Angles pages 64-65
  - Finding Unknown Angle Measures pages 68-69

Resources

- **Print**
  - Teaching Student-Centered Mathematics-Volume Two, Second Edition
    - Measuring Angles-Chapter 16 pp. 335-337
  - Grade 5 Measuring Angles
  - Grade 5 Angles Memory
  - Grade 5 Decomposing Angle Train
  - Grade 5 Angle Decomposing Window
  - Grade 5 Decomposing Angles Cake
  - Grade 5 Angles Sort
  - Grade 5 Math Clock Angels
  - Grade 5 Angle Decomposing Farm
  - Grade 5 Math Angle Benchmarks
  - Grade 5 Decomposing Angles in a Circle
  - Grade 5 Angles Man
- **Technology-based**
  - Gizmo: Isosceles and Equilateral Triangles
  - BrainPOP: Angles
  - Study Jams: Classify Angles
  - Study Jams: Measure Angles

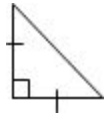
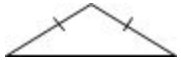
Station Activities

Geosticks: Using Geosticks, students will build and measure acute, obtuse, right, and straight angles.

	Protractors: Using protractors, students will measure given angles and determine if the angle is an acute, obtuse, right, or straight angle.
Cross-Curricular Connections	**Differentiation**
Hamster Champs by Stuart Murphy Build cardboard ramps and measure the angles. **Sir Cumference and the Great Knight of Angleland** by Cindy Neuschwander This book is an introduction to the topic of angles, including the difference between right, acute and obtuse, as well as measuring angles. **G is for Googol** by David Schwartz Read the "O" page. Make hand shadows to illustrate different angles. **Lines, Segments, Rays, and Angles** by Claire Piddock	• Multilingual Glossary

Strand: Measurement and Geometry
5.13 The student will a) classify triangles as right, acute, or obtuse and equilateral, scalene, or isosceles; and b) investigate the sum of the interior angles in a triangle and determine an unknown angle measure.
Suggested Pacing
3rd Nine Weeks

Related Spiraling Standards	
Spiral Down 4.11 The student will identify, describe, compare, and contrast plane and solid figures according to their characteristics (number of angles, vertices, edges, and the number and shape of faces) using concrete models and pictorial representations. 4.12 The student will classify quadrilaterals as parallelograms, rectangles, squares, rhombi, and/or trapezoids.	**Spiral Up**
Essential Questions	**Common Misconceptions**
● How are angle properties used to classify triangles? ● How are side lengths used to classify triangles? ● How does the sum of the interior angles of a triangle help you determine an unknown angle measure? ● How can you use models to prove that the sum of the interior angles of a triangle is 180°? ● How are geometric markings used to identify congruent sides and right angles of triangles?	● Students confuse the definitions of the different types of triangles. ● Students do not understand that a triangle can be classified in more than one way. ● Students may not know the measurement of the interior angles of a triangle.
Understanding the Standard	**Essential Knowledge and Skills**
● Angles can be classified as right, acute, obtuse, or straight according to their measures. ● A triangle can be classified as right, acute, or obtuse according to the measure of its largest angle. ● Triangles may also be classified according to the measure of their sides, e.g., scalene (no sides congruent), isosceles (at least two sides congruent) and equilateral (all sides congruent).	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to ● Classify triangles as right, acute, or obtuse. (a) ● Classify triangles as equilateral, scalene, or isosceles. (a) ● Compare and contrast the properties of triangles. (a) ● Identify congruent sides and right angles using geometric markings to denote properties of triangles. (a)

• An equilateral triangle (with three congruent sides) is a special case of an isosceles triangle (which has at least two congruent sides). • Triangles can be classified by the measure of their largest angle and by the measure of their sides (i.e., an isosceles right triangle).  Isosceles Right Triangle • Congruent sides are denoted with the same number of hatch (or hash) marks on each congruent side. • A right angle measures exactly 90 degrees. • An acute angle measures greater than zero degrees but less than 90 degrees. • An obtuse angle measures greater than 90 degrees but less than 180 degrees. • A straight angle measures exactly 180 degrees. • A right triangle has one right angle. • An obtuse triangle has one obtuse angle. • An acute triangle has three acute angles. • A scalene triangle has no congruent sides. • An isosceles triangle has at least two congruent sides. 	• Use models to prove that the sum of the interior angles of a triangle is 180 degrees, and use that relationship to determine an unknown angle measure in a triangle. (b)

- An equilateral triangle has three congruent sides. All angles of an equilateral triangle are congruent and measure 60 degrees.

Vocabulary

acute triangle
right triangle
obtuse triangle
equilateral triangle
scalene triangle
isosceles triangle
protractor
triangle
interior angles
hatch (hash) marks

Assessment

Powerschool – Exam identifier

Instructional Activities Organized by Learning Objective

Textbook
enVision Math
5.13 a, b

- Lesson 8.4 Triangles
- Differentiated Center Activities: 8.4
- Tools4Math- Geometry Drawing

Eureka Math
5.13 a,b

- GRADE 4 MODULE 4: Angle Measure and Plane Figures

Notes

Resources

- **Print**
  - Teaching Student Centered Mathematics Volume 2 Second Edition (2014)
    - Activity 17.6 page 355 *Triangle Sort*
  - FACEing Elementary Math Lesson 18: Triangles
  - Triangles Notes
  - Grade 5 Triangle Task Cards
  - Grade 5 TEI Triangle Sort by Sides
  - Grade 5 Math Classifying Triangles
  - Grade 5 TEI Triangle Sort by Angles

<table>
<tr><td></td><td>

Grade 5 Triangle Sort Free Sort of by Sides or Angles
Grade 5 Angle and Triangle Notes
Grade 5 Triangle Sort by Angles and Sides
Grade 5 TEI TRiangle Sort by Angles and Sides

Technology-based

Math Games: Types of Triangles (a)
Sheppard Software: Triangle Shoot (a)
Classifying Triangles Drag and Drop (a)
Gizmo: Classifying Triangles (a)
Gizmo: Triangle Angle Sum (b)
Gizmo: Isosceles and Equilateral Triangles (a)

Station Activities/ Manipulatives

Connecting GeoStix: Students will use the Geostix to create a given type of triangle. (a)
Protractors: Using a protractor, students will measure the angles of a given triangle. (a)

</td></tr>
<tr><td>Cross-Curricular Connections</td><td>Differentiation</td></tr>
<tr><td>Triangles by David A. Adler
David A. Adler and Edward Miller tackle questions about different kinds of triangles with a crystal-clear text and cheerful illustrations starring two friendly kids and one savvy robot.</td><td>

Multilingual Glossary

</td></tr>
</table>

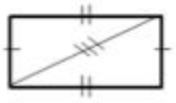
Richmond Public Schools

Curriculum Framework
Grade 5

Strand: Measurement and Geometry	
5.14 The student will a) recognize and apply transformations, such as translation, reflection, and rotation; and b) investigate and describe the results of combining and subdividing polygons.	
Suggested Pacing	
3rd Nine Weeks	
Related Spiraling Standards	
Spiral Down 4.11 The student will identify, describe, compare, and contrast plane and solid figures according to their characteristics (number of angles, vertices, edges, and the number and shape of faces) using concrete models and pictorial representations.	**Spiral Up** 6.9 The student will determine congruence of segments, angles, and polygons
Essential Questions	**Common Misconceptions**
● How can transformations help us understand congruency? ● How can we recognize and apply transformations (translation, reflection, and rotation)? ● How can we predict and explain the results of combining and subdividing polygons into other polygons?	● Students do not understand that once a transformation has been applied to a polygon, the resulting polygon is congruent. ● Students confuse the terms translation, reflection, and rotation. ● Students have difficulty subdividing polygons and identifying which polygons make up a larger polygon.
Understanding the Standard	**Essential Knowledge and Skills**
● A transformation of a figure (preimage) changes the size, shape, or position of the figure to a new figure (image).	The student will use problem solving, mathematical communication, mathematical reasoning, connections and representation to

• Transformations can be explored using mirrors, paper folding, and tracing. • Congruent figures have the same size and shape. • A translation is a transformation in which an image is formed by moving every point on the preimage the same distance in the same direction. • A reflection is a transformation in which an image is formed by reflecting the preimage over a line called the *line of reflection*. All corresponding points in the image and preimage are equidistant from the line of reflection. • A rotation is a transformation in which an image is formed by rotating the preimage about a point called the center of rotation. The center of rotation may or may not be on the preimage. • The resulting figure of a translation, reflection, or rotation is congruent to the original figure. • The orientation of figures does not affect congruency or noncongruency. • A polygon is a closed plane figure composed of at least three line segments that do not cross. • Two or more polygons can be combined to form a new polygon. Students should be able to identify the figures that have been combined. • A polygon that can be divided into more than one basic figure is said to be a composite figure (or shape). Students should understand how to divide a polygon into familiar figures	• Apply transformations to polygons in order to determine congruence. (a) • Recognize that translations, reflections, and rotations preserve congruency. (a) • Identify the image of a polygon resulting from a single transformation (translation, reflection, or rotation). (a) • Investigate and describe the results of combining and subdividing polygons. (b) • Compare and contrast the characteristics of a given polygon that has been subdivided with the characteristics of the resulting parts. (b)

using concrete materials (e.g., pattern blocks, tangrams, geoboards, grid paper, paper (folding), etc.).



This diagonal of the rectangle above subdivides the rectangle in half and creates two right triangles. The figure can also be formed by combining two right triangles that are congruent. The resulting figure shows that the legs of the right triangles are congruent to the sides of the rectangle. The representation illustrates that the area of each right triangle is half the area of the rectangle. Exploring decomposition of shapes helps students develop algorithms for determining area of various shapes (e.g., area of a triangle is ½ × base × height).

- Congruent sides are denoted with the same number of hatch (or hash) marks on each congruent side. For example, a side on a polygon with two hatch marks is congruent to the side with two hatch marks on a congruent polygon or within the same polygon.

Vocabulary	Instructional Activities Organized by Learning Objective
rotation: congruent figures reflection: congruent figures translation: congruent figures polygon line of reflection subdivide combine	**Textbook** **enVision Math** 5.14 a • Lesson 19.1 Translations • Lesson 19.2 Reflections • Lesson 19.3 Rotations • Lesson 19.4 Congruence

congruency
transformation
preimage
image
equidistant
rotation
center of rotation
composite figure

Assessment

Powerschool – Exam identifier

- Differentiated Center Activities: 19.1, 19.2,19,3,19.4

Eureka Math

5.14 a

- GRADE 8 MODULE 2: The Concept of Congruence

5.14 b

- GRADE 5 MODULE 5 Topic D: Drawing, Analysis, and Classification of Two-Dimensional Shapes

Notes

- Interactive Notebook Math Grade 5**:** Congruent Shapes and Transformations pages 74-75

Resources

- **Print**
  - Teaching Student-Centered Mathematics-Volume Two, Second Edition
    - Learning about Transformations, Chapter 17, pp 366-367
  - **o** YouCubed: Similar Shapes (transformations, congruent shapes)
  - Grade 5 Tangram Shapes
  - Grade 5 VDOE Sample Items Congruence Transformation
  - Grade 5 Transformation Vocab Sort
  - Grade 5 Test the Tangram Shapes
  - Grade 4 Math Transformation Activity Geometry 4.11
  - Grade 5 Flipping Over Tessellations
  - Grade 5 Funky Shape Transformations Geometry

	○ Grade 5 Shape Search Cards ○ Grade 5 Mystery Transformations ○ Congruent versus Similar Sort ○ Combine and Subdivide Task Cards (Pattern Blocks) ○ Grade 5 Congruent Shapes ○ Grade 5 Combine-Subdivide Polygons ○ Grade 5 Math Transformation Activity ○ Grade 5 Color Me Congruent ● **Technology-based** ○ Gizmo: Rock Art (Transformations) (a) ○ Math is Fun: Congruent (a) ○ Study Jams: Congruent Figures (a) ○ Study Jams: Transformations (a) **Station Activities** Attribute Blocks: Using attribute blocks, students will combine shapes to create new shapes. (b) Pattern Blocks: Using pattern blocks, students will demonstrate a rotation, reflection, and translation. (a)
Cross-Curricular Connections	**Differentiation**

The Warlord's Puzzle by Virginia Pilegard Use tangram puzzle pieces to explore composing and decomposing shapes. **Grandfather Tang's Story** by Ann Tompert Explore the properties of the shapes that result from cutting a square to make the tangram pieces.	• Multilingual Glossary • MathLive: online tutorial

Strand: Probability and Statistics	
5.15 The student will determine the probability of an outcome by constructing a sample space or using the Fundamental (Basic) Counting Principle.	
Suggested Pacing	
2nd Nine Weeks	
Related Spiraling Standards	
Spiral Down 4.13 The student will a) determine the likelihood of an outcome of a simple event; b) represent probability as a number between 0 and 1, inclusive; and c) create a model or practical problem to represent a given probability.	**Spiral Up**
Essential Questions	**Common Misconceptions**
• How can we construct a sample space to show all of the possible combinations (outcomes)?	• Students only see the most obvious possibilities.

● How does a tree diagram, list, or chart help us see all possible combinations? ● What are the similarities and differences between a tree diagram, list and chart? ● How can probability information be useful in real-world situations? ● How is sample space related to the Fundamental Counting Principle?	● Students will only use the multiplication strategy and not fully understand the concept.
Understanding the Standard	**Essential Knowledge and Skills**
● A spirit of investigation and experimentation should permeate probability instruction, where students are actively engaged in explorations and have opportunities to use manipulatives, tables, tree diagrams, and lists. ● Probability is the measure of likelihood that an event will occur. An event is a collection of outcomes from an investigation or experiment. ● The probability of an event can be expressed as a fraction, where the numerator represents the number of favorable outcomes and the denominator represents the total number of possible outcomes. If all the outcomes of an event are equally likely to occur, the probability of the event is equal to: $\frac{\text{number of favorable outcomes}}{\text{total number of possible outcomes}}$ ● Probability is quantified as a number between zero and one. An event is "impossible" if it has a probability of zero (e.g., the probability that the month of April will have 31 days). An event is "certain" if it has a probability of one (e.g., the	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to ● Construct a sample space, using a tree diagram to identify all possible outcomes. ● Construct a sample space, using a list or chart to represent all possible outcomes. ● Determine the probability of an outcome by constructing a sample space. The sample space will have a total of 24 or fewer equally likely possible outcomes. ● Determine the number of possible outcomes by using the Fundamental (Basic) Counting Principle.

probability that if today is Thursday then tomorrow will be Friday). ● When a probability experiment has very few trials, the results can be misleading. The more times an experiment is done, the closer the experimental probability comes to the theoretical probability (e.g., a coin lands heads up half of the time). ● Students should have opportunities to describe in informal terms (i.e., *impossible*, *unlikely*, *equally likely*, *likely*, and *certain*) the degree of likelihood of an event occurring. Activities should include practical examples. ● A sample space represents all possible outcomes of an experiment. The sample space may be organized in a list, chart, or tree diagram. ● Tree diagrams can be used to illustrate all possible outcomes in a sample space. For example, how many different outfit combinations can you make from two shirts (red and blue) and three pants (black, white, khaki)? The sample space displayed in a tree diagram would show the outfit combinations: red-black; red-white; red-khaki; blue-black; blue-white; blue-khaki. Exploring the use of tree diagrams for modeling combinations helps students develop the Fundamental Counting Principle. For this problem, applying the Fundamental Counting Principle shows there are 2x 3 = 6 outcomes. ● The Fundamental (Basic) Counting Principle is a computational procedure to determine the total number of possible outcomes when there are multiple choices or several events. It is the product of the number of outcomes for each choice or event that can be chosen individually. For example, the possible final outcomes or outfits of four shirts (green,	

yellow, blue, red), two shorts (tan or black), and three shoes (sneakers, sandals, flip flops) is 4 x 2 x 3 = 24 outfits.	
Vocabulary	**Instructional Activities Organized by Learning Objective**
sample space tree diagram Fundamental Counting Principle probability outcomes favorable outcome possible outcome event equally likely certain impossible unlikely likely	**Textbook** **enVision Math** ● Lesson 20.1 Outcomes ● Lesson 20.2 Writing Probability as a Fraction ● Differentiated Center Activities: 20.1, 20.2 ● Tools4Math- Probability **Eureka Math** ● GRADE 7 MODULE 5: Statistics and Probability **Notes** **Resources** ● **Print** o YouCubed Ice Cream Scoop o Grade 5 Probability Task Cards o Grade 5 VDOE Sample Items o Grade 5 Sample Space Task 1 o Grade 5 Sample Space Task 1 Key o Grade 5 Sample Space Task 2 o Grade 5 Tiles in 3 Bags o Grade 5 Probability Sample Space Spinner Activity o Grade 5 Probability Notes- Tree Diagram Coin Flip o Grade 5 Mr. Potato Head Notes o Grade 5 Probability Notes Tree Diagrams
Assessment	
Powerschool – Exam identifier	

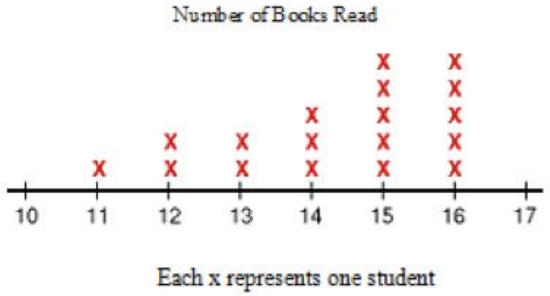
	○ Grade 5 Combinations Activity ○ Grade 5 Math Tree Diagrams Task Cards ○ Grade 5 Math Coin Toss ○ Grade 5 Math Probability Spinner Sample Space With Chart ○ Grade 5 Probability Number Line ○ Grade 5 Math Die Toss ● **Technology-based** ○ Tree Diagram (Demonstration) ○ Math is Fun: Tree Diagram ○ BrainPOP: Probability ○ Gizmo: Spin the Big Wheel! (Probability) **Station Activities/ Manipulatives** ● Probability Resource Kit: ○ Using a spinner, students will construct a list or chart of all possible outcomes. ○ Using a random number generator and a coin, construct a tree diagram to identify all possible outcomes.
Cross-Curricular Connections	**Differentiation**
Where The Wild Things Are by Maurice Sendak How many wild things can you make given 2 different heads, 3 bodies, and 3 kinds of legs? What is the probability that a creature would have horns on its head?	● Multilingual Glossary

Richmond Public Schools

Curriculum Framework
Grade 5

<table>
<tr><th colspan="2">Strand: Probability and Statistics</th></tr>
<tr><td colspan="2">5.16 The student, given a practical problem, will
a) represent data in line plots and stem-and-leaf plots;
b) interpret data represented in line plots and stem-and-leaf plots; and
c) compare data represented in a line plot with the same data represented in a stem-and-leaf plot.</td></tr>
<tr><th colspan="2">Suggested Pacing</th></tr>
<tr><td colspan="2">2nd Nine Weeks</td></tr>
<tr><th colspan="2">Related Spiraling Standards</th></tr>
<tr><td><u>Spiral Down</u>
4.14 The student will
a) collect, organize, and represent data in bar graph and line graphs;
b) interpret data represented in bar graphs and line graphs; and
c) compare two different representations of the same data (e.g., a set of data displayed on a chart and a bar graph, a chart and a line graph, or a pictograph and a bar graph).</td><td><u>Spiral Up</u>
6.10 The student, given a practical situation, will
a) represent data in a circle graph;
b) make observations and inferences about data in a circle graph; and
c) compare circle graphs with the same data represented in bar graphs, pictographs, and line plots</td></tr>
<tr><th>Essential Questions</th><th>Common Misconceptions</th></tr>
<tr><td>● How do the selections of the question, sample, method of data collection, and way in which data are displayed influence conclusions about the data?
● How is a stem-and-leaf plot created?
● How is a line plot constructed?</td><td>● When reading a line plot, students do not understand that the dots illustrate the frequency of data.
● Students read segments of the stem and leaf plot when answering practical problems and fail to look at the entire data set.</td></tr>
</table>

● How is a line plot helpful in determining median, mode, minimum, maximum, range and outliers? How is a stem-and leaf plot helpful in determining median, mode, minimum, maximum, range and outliers? ● What situations would a line plot be the best graph to use to represent data? ● What situations would a stem-and-leaf plot be the best graph to represent data? ● How does line plot representation and the stem-and-leaf plot representation compare using the same data? ● How can the title of the graph help you interpret the data?	● Students can easily miss or forget a data point when building a stem and leaf plot or a line plot.
Understanding the Standard	**Essential Knowledge and Skills**
● The emphasis in all work with statistics should be on the analysis of the data and the communication of the analysis, rather than on a single correct answer. Data analysis should include opportunities to describe the data, recognize patterns or trends, and make predictions. ● Statistical investigations should be active, with students formulating questions about something in their environment and determining quantitative ways to answer the questions. ● Investigations that support collecting data can be brief class surveys or more extended projects taking many days. ● Through experiences displaying data in a variety of graphical representations, students learn to select an appropriate representation (i.e., a representation that is more helpful in analyzing and interpreting the data to answer questions and make predictions). ● There are two types of data: categorical and numerical. Categorical data can be sorted into groups or categories while	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to ● Collect data, using observations (e.g., weather), measurement (e.g., shoe sizes), surveys (e.g., hours watching television), or experiments (e.g., plant growth). (a) ● Organize the data into a chart or table. (a) ● Represent data in a line plot. Line plots will have no more than 30 data points. (a) ● Represent data in a stem-and-leaf plot where the stem is listed in ascending order and the leaves are in ascending order, with or without commas between leaves. Stem-and-leaf plots will be limited to no more than 30 data points. (a) ● Title the given graph or identify an appropriate title. (a) ● Interpret data by making observations from line plots and stem-and-leaf plots, describing the characteristics of the data and describing the data as a whole. One set of data will be represented on a graph. (b)

numerical data are values or observations that can be measured. For example, types of fish caught would be categorical data while weights of fish caught would be numerical data. While students need to be aware of the differences, they do not have to know the terms for each type of data. ● A line plot shows the frequency of data on a number line. Line plots are used to show the spread of the data and quickly identify the range and mode.  ● A stem and leaf plot uses columns to display a summary of discrete numerical data while maintaining the individual data points. A stem-and-leaf plot displays data to show its shape and distribution.	● Interpret data by making inferences from line plots and stem-and-leaf plots. (b) ● Compare data represented in a line plot with the same data represented in a stem-and-leaf plot. (c)

Stem	Leaf
0	3,6,9
1	2,5,7,8
2	4,6
3	1,3,7,7,7
4	0,0,4,8
5	
6	1,2,2,3,8

3|5 = 35

- The data are organized from least to greatest.
- Each value is separated into a stem and a leaf (e.g., two-digit numbers are separated into stems (tens) and leaves (ones)).
- The stems are listed vertically from least to greatest with a line to their right. The leaves are listed horizontally, also from least to greatest, and can be separated by spaces or commas. Every value is recorded, regardless of the number of repeats. No stem can be skipped. For example, in the stem and leaf plot above, there are no data for the stem 5; 5 should be listed showing no leaves.
- A key is included to explain how to read the plot.

• Different situations call for different types of graphs. The way data are displayed is often dependent upon what someone is trying to communicate. • Comparing different types of representations (e.g., charts graphs, line plots, etc.) provides students an opportunity to learn how different graphs can show different aspects of the same data. Following construction of representations, students benefit from discussions around what information each representation provides. • Tables or charts organize the exact data and display numerical information. They do not show visual comparisons, which generally means it takes longer to understand or to examine trends. • Bar graphs can be used to compare data easily and see relationships. They provide a visual display comparing the numerical values of different categories. The scale of a bar graph may affect how one perceives the data. • Comparisons, predictions and inferences are made by examining characteristics of a data set displayed in a variety of graphical representations to draw conclusions. • Sample questions that could be explored in comparing different representations such as a chart to a line plot and a stem-and-leaf plot could include: In which representation can you quickly identify the mode? The range? What predictions can you make?	
Vocabulary	**Instructional Activities Organized by Learning Objective**
sample space line plot stem-and-leaf plot	**Textbook** **enVision Math** 5.16 a, b, c

data
ascending
descending
title
inference
frequency
number line
prediction
least
greatest
shape
distribution
key
chart
table
comparison
bar graph
category
scale

Assessment

Powerschool – Exam identifier

- Lesson 18.1 Data from Surveys
- Lesson 18.4 Stem-and-Leaf Plots
- Differentiated Center Activities: 18.1, 18.4

Eureka Math
5.16 a, b, c

- GRADE 3 MODULE 6: Collecting and Displaying Data
- GRADE 3 MODULE 7 Lesson 22: Use a line plot to record the number of rectangles constructed in Lessons 20 and 21.

Note: Supplemental material is necessary to address stem and leaf plots

Notes

- Interactive Notebook Math Grade 5
  - Line Plots pages 54-55
  - Stem-and-Leaf Plots pages 56-57

Resources

- **Print**
  - Teaching Student-Centered Mathematics-Volume Two, Second Edition (2014)
    - Line Plots, Chapter 18, pp. 389-390
  - Domino Line Plot Activity
  - Grade 5 Line Plot Graphing Sort
  - Grade 5 Stem and Leaf Plot Graphing Sort
  - Stem and Leaf Plot Notes
  - Grade 5 Math VDOE Sample Items
  - Grade 5 Line Plot Stations
  - Grade 5 Math Junk Mail Graph Project
  - Grade 5 Line Plot Summary

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Grade 5 Line Plot Cards
Grade 5 VDOE Sample Items Graphing
Grade 5 What's My Name Worth Stem Leaf Model Lesson

Technology-based

Gizmo: Reaction Time 2 (a)
Gizmo: Stem and Leaf Plots (c)
Study Jams: Stem-and-Leaf Plots (a, b)

Station Activities
Foam Cubes (1-6): Using foam cubes, students will build a data set of 15 numbers by rolling 2 dice at a time and will create a stem and leaf plot using this data. (a)

Graphing Mats: Using dry erase graphing mats, students will create a line plot illustrating the data given. (a)
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<tr>
<td>Cross-Curricular Connections</td>
<td>Differentiation</td>
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<tr>
<td>
Wilma Unlimited: How Wilma Rudolph Became the World's Fastest Woman by Kathleen Krull
Activity: Go to a large area such as a gym, where a 20 meter distance has been marked. Hop on one foot, hobble (walk with one leg straight and one leg bent to mimic wearing a brace), walk, and run the marked distance. Work with a partner to time how long it takes to perform the movements for 20 meters. Create a class stem and leaf plots of one of the distances (hopping, hobbling, walking, or running).

On The Same Day In March by Marilyn Singer
The book shows the wildly different weather conditions around the
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Multilingual Glossary

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globe. Your students could research the high temperature of several cities mentioned on a given week and organize the data in a stem-and-leaf plot. **Hottest, Coldest, Highest, Deepest** by Steve Jenkins Read the pages focusing on the hottest and coldest places. Collect data on high temperatures or low temperatures in various places of the world. Organize into a stem-and-leaf plot. Or make a line plot showing the high temperatures at our school for the last month.	

Strand:Probability and Statistics	
5.17 The student, given a practical context, will a) describe mean, median, and mode as measures of center; b) describe mean as fair share; c) describe the range of a set of data as a measure of spread; and d) determine the mean, median, mode, and range of a set of data.	
Suggested Pacing	
2nd Nine Weeks	
Related Spiraling Standards	
Spiral Down	**Spiral Up** 6.11 The student will a) represent the mean of a data set graphically as the balance point; and;

	b) determine the effect on measures of center when a single value of a data set is added, removed, or changed.
Essential Questions	**Common Misconceptions**
● How are the mean, median, mode, and range of a set of data computed? How can they be determined from various data displays: tables? graphs? stem-and-leaf plots? ● How can we describe the similarities and differences of mean, median, mode, and range of the same set of data? ● How are the statistics—mean, median, mode, and/or range—affected by outliers in a data set? ● How can we use objects to demonstrate the idea of the mean as a fair share? ● Why are the mean, median, and mode all considered measures of center? What are the advantages/disadvantages of each for describing a data set?	● Students may confuse the difference between mean, median, and mode. ● When there is an even amount of items in a data set, students may be confused on how to find the median.
Understanding the Standard	**Essential Knowledge and Skills**
● Statistics is the science of conducting studies to collect, organize, summarize, analyze, and draw conclusions from data. ● Students need to learn more than how to identify the mean, median, mode, and range of a set of data. They need to build an understanding of what the measure tells them about the data, and see those values in the context of other characteristics of the data in order to best describe the results. ● A measure of center is a value at the center or middle of a data set. Mean, median, and mode are measures of center. ● The mean, median, and mode are three of the various ways that data can be analyzed.	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to ● Describe and determine the mean of a group of numbers representing data from a given context as a measure of center. (a, d) ● Describe and determine the median of a group of numbers representing data from a given context as a measure of center. (a, d) ● Describe and determine the mode of a group of numbers representing data from a given context as a measure of center. (a, d) ● Describe mean as fair share. (b)

• The mean, median, and mode are referred to as types of averages. The term arithmetic average can be used when referring to the mean. • Mean represents a fair share concept of the data. Dividing the data constitutes a fair share. This idea of dividing as sharing equally should be demonstrated visually and with manipulatives to develop the foundation for the arithmetic process. The arithmetic way is to add all of the data points and then divide by the number of data points to determine the arithmetic average or mean. • The median is the middle value of a data set in ranked order. Given an odd number of pieces of data, the median is the middle value in ranked order. If there is an even number of pieces of data, the median is the arithmetic average of the two middle values. • The mode is the piece of data that occurs most frequently in the data set. There may be one, more than one, or no mode in a data set. Students should order the data from least to greatest so they can better determine the mode. • The range is the spread of a set of data. The range of a set of data is the difference between the greatest and least values in the data set. It is determined by subtracting the least number in the data set from the greatest number in the data set. An example is ordering test scores from least to greatest: 73, 77, 84, 87, 89, 91, 94. The greatest score in the data set is 94 and the least score is 73, so the least score is subtracted from the greatest score or 94 - 73 = 21. The range of these test scores is 21.	• Describe and determine the range of a group of numbers representing data from a given context as a measure of spread. (c, d)
Vocabulary	**Instructional Activities Organized by Learning Objective**

measures of center mean as fair share mean median mode range **Assessment** **Powerschool** – Exam identifier	**Textbook** **enVision Math** 5.17a ● Lesson 18.7 Mean ● Lesson 18.8 Median, Mode, Range ● Differentiated Center Activities: 18.7, 18.8 5.17b ● Lesson 18.7 Mean ● Differentiated Center Activity 18.7 5.17c ● Lesson 18.8 Median, Mode, Range ● Differentiated Center Activity 18.8 5.17d ● Lesson 18.7 Mean ● Lesson 18.8 Median, Mode, Range ● Differentiated Center Activities: 18.7, 18.8 **Eureka Math** 5.17a ● GRADE 6 MODULE 6: Statistics 5.17b ● GRADE 6 MODULE 6 Lesson 6: Describing the Center of a Distribution Using the Mean ● GRADE 6 MODULE 6 Lesson 7: The Mean as a Balance Point 5.17d ● GRADE 6 MODULE 6: Statistics Note: Supplemental material is necessary to address mode and range. **Notes**

	• Interactive Notebook Math Grade 5**:** Mean, Median, Mode and Range pages 66-67 **Resources** • **Print** o FACEing Primary Problem Solving ▪ Lesson 17: Finding the Range and the Mode o Grade 5 Stem Leaf MMMR Practice o Grade 5 Playing Cards MMMR o Grade 5 Stem and Leaf Plot Jumping Jack o Grade 5 Rally Coach MMMR Comparing Data o Grade 5 Math VDOE Sample Items Statistics o Grade 5 Dice Center o Grade 5 Line Plots with Measures of Center and Range o Grade 5 Mean Median Mode Range Notes o Grade 5 Leveling the Bars Task Cards o Grade 5 Hey Diddle Diddle the Median's in the Middle o Grade 5 Leveling the Bars o Grade 5 VDOE Released Test Items o Grade 5 MMMR Song • **Technology-based** o BrainPOP: Mean, Median, Mode, and Range o Mean, Median, Mode Game o Dunk Tank: PBS Cyberchase: Interactive Lesson • **Gizmo** o Mean, Median, and Model (a and d) o Movie Reviewer (Mean and Median) (a and d) o Reaction Time 1 (Graphs and Statistics) (a, c, and d) o Reaction Time 2 (Graphs and Statistics) (a, c, and d)

	Station Activities/ Manipulatives • Foam 2-Color Counters: Students will build each number in a given set using counters, join them all in one pile, and then divide them into 2 groups to show fair shares. (b) • Probability Resource Kit: Using a random number generator, students will generate a list of numbers and determine the mean, median, mode and range of the numbers. (d)
Cross-Curricular Connections	**Differentiation**
Jumanji by Chris Van Allsburg **Activity** Find the mean, median, mode, and range of the sums rolled. **Wilma Unlimited** by Kathleen Krull A biography of the African-American woman who overcame crippling polio as a child to become the first woman to win three gold medals in track in a single Olympics. Collect data on the shoe size of the students and find the mean, median, mode, and range.	• Multilingual Glossary

Strand: Patterns, Functions, and Algebra
5.18 The student will identify, describe, create, express, and extend number patterns found in objects, pictures, numbers, and tables.
Suggested Pacing
4th Nine Weeks
Related Spiraling Standards

Richmond Public Schools

Curriculum Framework
Grade 5

Spiral Down	**Spiral Up**
4.15 The student will identify, describe, create, and extend patterns found in objects, pictures, numbers, and tables.	6.12 The student will a) represent a proportional relationship between two quantities, including those arising from practical situations; b) determine the unit rate of a proportional relationship and use it to find a missing value in a ratio table
Essential Questions	**Common Misconceptions**
● How can a pattern be identified, created, described, extended, and represented? ● How can we express the relationship found in patterns using words, tables, and symbols? ● How are tables, graphs, and mathematical expressions used to represent relationships in patterns? ● How can we identify, describe and extend single-operation input and output rules? ● How can we find the rule in a list or table? ● How can pattern identification be used to solve problems?	● Students may not make connections that patterns can be represented in many ways and described using words, tables, graphs, and symbols. ● Students may not make connections between concrete materials and numerical representations (number sequence, and tables.) ● Students may confuse growing patterns with repeating patterns and if not given many opportunities to explore patterns using concrete materials and calculators, they may not gain understanding of these patterns. ● Students may struggle with finding an unknown term in a pattern when it is not the very next item. Students often give the next item in a pattern when asked to find the 12th or 15th item. ● When working with input/output tables, students may have difficulty figuring out the unknown value. ● Students may not recognize that the rule in an input/output table is read across the input/output and not from output to

	output or input to input. ● When students are looking at growing patterns with objects, they may not recognize how the pattern is growing and may need manipulatives to make the pattern. ● Students often assume that if a rule works for the first two numbers in a pattern that it can be applied to the entire pattern. Be sure to check if the pattern keeps working for multiple steps, because 4, 8… could be the beginning of plus 4, or times 2.
Understanding the Standard	**Essential Knowledge and Skills**
● Mathematical relationships exist in patterns. There are an infinite number of patterns. ● Patterns and functions can be represented in many ways and described using words, tables, and symbols. ● Students need experiences exploring growing patterns using concrete materials and calculators. Calculators are valuable tools for generating and analyzing patterns. The emphasis is not on computation but on identifying and describing patterns. ● Patterns at this level may include: addition, subtraction, or multiplication of whole numbers; addition or subtraction of fractions (with denominators 12 or less); and decimals expressed in tenths or hundredths). Several sample numerical patterns are included below: • 1, 2, 4, 7, 11, 16, …;	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to ● Identify, create, describe, and extend patterns using concrete materials, number lines, tables, or pictures. ● Describe and express the relationship found in patterns, using words, tables, and symbols. ● Solve practical problems that involve identifying, describing, and extending single-operation input and output rules (limited to addition, subtraction and multiplication of whole numbers; addition and subtraction of fractions, with denominators of 12 or less; and addition and subtraction of decimals expressed in tenths or hundredths). ● Identify the rule in a single-operation numerical pattern found in a list or table (limited to addition, subtraction and multiplication of whole numbers; addition and subtraction of fractions, with denominators of 12 or less; and addition and subtraction of decimals expressed in tenths or hundredths).

- 2, 4, 8, 16, 32, ...;
- 32, 30, 28, 26, 24…;
- 0.15, 0.35, 0.55, 0.75...; and
- $\frac{1}{4}$, $\frac{3}{4}$, $1\frac{1}{4}$, $1\frac{3}{4}$ …

- Students in grades three and four had experiences working with input/output tables to determine the rule or a missing value. Generalizing patterns to identify rules and applying rules builds the foundation for functional thinking. Sample input/output tables that require determination of the rule or missing terms can be found below:

Rule: ?	
Input	Output
4	8
5	?
6	12
?	20

Rule: ?	
Input	Output
8.9	9.4
6.6	7.1
?	3.5
0.5	1.0

- A numerical expression is a representation of a quantity. It is made up of numbers, variables, and/or computational symbols. It does not have an equal symbol (e.g., 15 × 12).
- A verbal expression involving one operation can be represented by a variable expression that describes the relationship. Numbers are used when they are known; variables are used when the numbers are unknown. The example in the table below defines the relationship between the input number and output number as x + 3. Students at this level are not expected to write a variable expression to

describe patterns. They might describe the pattern below as + 3 or given any number, add three.

x	y
6	9
7	10
11	14
15	18

- An algebraic expression is a variable or a combination of variables, numbers, and/or operation symbols and represents a mathematical relationship.

Vocabulary

pattern
growing pattern
input/output
extend
expression
numerical expression
verbal expression
function

Assessment

Powerschool – Exam identifier

Instructional Activities Organized by Learning Objective

Textbook
enVision Math
- 15.4 Patterns and Equations
- Differentiated Center Activities: 15.4

Eureka Math
- GRADE 4 MODULE 6 Topic B: Patterns in the Coordinate Plane and Graphing Number Patterns from Rules
- GRADE 5 MODULE 6 Lesson 18: Draw Symmetric Figures on the Coordinate Plane.

Notes
- Interactive Notebook Math Grade 5**:** Numeric Patterns pages 48-49

	Resources ● **Print** o Teaching Student-Centered Mathematics-Volume Two, Second Edition ▪ Patterns and Functional Thinking, Chapter 15, pp. 303- 304 ▪ Growing Patterns, Chapter 15, pp. 304-306 ▪ Functional Thinking, Chapter 15, pp. 306-309 o YouCubed: Number Transformer Challenge o YouCubed: Squares Upon Squares o YouCubed: Robot Stepper (number patterns) o Grade 5 Practical Pattern Problems o Grade 5 Practical Pattern Problems 2 o Grade 5 VDOE Sample Items Patterns o Grade 5 Number Patterns o Grade 5 Number Line Patterns o Grade 5 Fraction and Decimal Patterns o Grade 5 Function Machine o Grade 5 Function Tables with Decimals o Grade 5 Pattern Practice o Grade 5 Math Fraction Function Machine Practice o Grade 5 Function Table and Rule Matching o Grade 5 In Out Tables o Grade 5 Hundreds Chart ● **Technology-based** o Gizmo: Function Machines 1 (Functions and Tables) o Gizmo: Function Machines 2 (Functions, Tables, and Graphs) **Station Activities** Pattern Blocks:

	• When given pattern blocks, the student will create, extend, and describe patterns. • When given pattern blocks, the student will create, extend, and describe growing patterns using the following activity Patterns Linking Cubes: When given linking cubes, the student will create, extend, and describe patterns created by other students. Number Lines & Fraction Number Lines: When given a number line or a fraction line with numbers missing, the student is able to identify the pattern and complete the number line. Square Tiles: When given square tiles, the student will create, extend, and describe patterns created by other students.
Cross-Curricular Connections	**Differentiation**
Two Of Everything by Lily Toy Hong Read the part of the book where the wife fell in. Ask students to set up an input output table that would show how many wives would come out if 5 wives were put in the pot. **Activity** **One Grain of Rice** by Demi After reading, Click on the link to download a spreadsheet to show the doubling/growing pattern.	• Multilingual Glossary • Circle Fever (enrichment) • Squares to Stairs (enrichment) • MathLive: online tutorial

Richmond Public Schools

Curriculum Framework
Grade 5

Strand: Patterns, Functions, and Algebra	
5.19 The student will a) investigate and describe the concept of variable; b) write an equation to represent a given mathematical relationship, using a variable; c) use an expression with a variable to represent a given verbal expression involving one operation; and d) create a problem situation based on a given equation, using a single variable and one operation.	
Suggested Pacing	
4th Nine Weeks	
Related Spiraling Standards	
Spiral Down 4.16 The student will recognize and demonstrate the meaning of equality in an equation.	**Spiral Up** 6.13 The student will solve one-step linear equations in one variable, including practical problems that require the solution of a one-step linear equation in one variable. 6.14 The student will a) represent a practical situation with a linear inequality in one variable; and b) solve one-step linear inequalities in one variable, involving addition or subtraction, and graph the solution on a number line.
Essential Questions	**Common Misconceptions**
● What is a variable? Why are equations with variables useful? ● How is the "equal sign" in an equation like the fulcrum of a balance scale?	● Students may be confused why there are not only numbers in a problem.

● How can you write an equation that represents a given mathematical relationship? ● How can you use an expression with a variable to represent a given verbal expression? ● How can you create a problem situation to represent a given equation or vice versa?	● Students think that a variable can only stand for one particular number. ● Students think that different variables must stand for different numbers. ● Students think that a variable represents an object rather than a number.
Understanding the Standard	**Essential Knowledge and Skills**
● A variable is a symbol that can stand for an unknown number (e.g., $a + 4 = 6$) or for a quantity that changes (e.g., the rule or generalization for the pattern for an input/output table such as $x + 2 = y$). ● An algebraic expression, an expression with a variable, is like a phrase; a phrase does not have a verb, so an expression does not have an equal symbol (=). ● A verbal expression describing a relationship involving one operation can be represented by an expression with a variable that mathematically describes the relationship. Numbers are used when quantities are known; variables are used when the quantities are unknown. For example, when b stands for the number of cookies in one full box, "the number of cookies in a full box and four extra" can be represented by $b + 4$; "three full boxes of cookies" by $3b$; "the number of cookies each person would receive if a full box of cookies were shared among four people" by $\frac{b}{4}$.	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to ● Describe the concept of a variable (presented as boxes, letters, or other symbols) as a representation of an unknown quantity. (a) ● Write an equation with addition, subtraction, multiplication, or division, using a variable to represent an unknown quantity. (b) ● Use an expression with a variable to represent a given verbal expression involving one operation (e.g., "5 more than a number" can be represented by $y + 5$). (c) ● Create and write a word problem to match a given equation with a single variable and one operation. (d)

• An equation is a statement that represents the relationship between two expressions of equal value (e.g., $12 \times 3 = 72 \div 2$). • A problem situation about two quantities that are equal can be expressed as an equation. • An equation may contain a variable and an equal symbol (=). For example, the sentence, "A full box of cookies and four extra equal 24 cookies." can be written as $b + 4 = 24$, where b stands for the number of cookies in one full box. "Three full boxes of cookies contain a total of 60 cookies" can be written as $3b = 60$. • Another example of an equation is $b + 3 = 23$ and represents the answer to the word problem, "How many cookies are in a box if the box plus three more equals 23 cookies?" where b stands for the number of cookies in the box? • Teachers should consider varying the letters used (in addition to x) to represent variables. The symbol ´ is often used to represent multiplication and can be confused with the variable x. In addition to varying the use of letters as variables, this confusion can be minimized by using parentheses [e.g., $4(x) = 20$ or $4x = 20$] or a small dot raised off the line to represent multiplication [$4 \cdot x = 20$]. • By using story problems and numerical sentences, students begin to explore forming equations and representing quantities using variables.	

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- An equation containing a variable is neither true nor false until the variable is replaced with a number and the value of the expressions on both sides are compared.

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<tr><td>Vocabulary</td><td rowspan="3">Instructional Activities Organized by Learning Objective</td></tr>
<tr><td>equation
equality
expression
variable
represent
operation
unknown quantity
algebraic
verbal expression
numerical expression
algebraic expression</td></tr>
<tr><td>Assessment</td></tr>
<tr><td>Powerschool – Exam identifier</td><td>
Textbook
enVision Math
5.19 a,b,c,d
• Lesson 6.1 Variables and Expressions
• Lesson 6.2 Patterns and Expressions
• Differentiated Center Activities: 6.1, 6.2
Eureka Math
5.19 a,b,c,d
• GRADE 6 MODULE 4: Expressions and Equations

Notes

Resources
• Print
o Teaching Student Centered Mathematics Volume 2 Second Edition (2014)
▪ Activity 15.11 page 297 Story Translations (d)
○ FACEing Elementary Math
■ Lesson 10: Creating True Equations and Inequalities
○ Grade 5 Math Modeling Equations Powerpoint
○ Grade 5 Variables and Expressions
○ Grade 5 Undercover Algebra
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	○ Grade 5 VDOE Sample Items SOL Algebra ○ Grade 5 Expressions Sort ○ Grade 5 Equation Match ○ Grade 5 Matching Game Algebraic Expressions ○ Grade 5 Addition and Subtraction Algebra Statements ○ Grade 5 Modeling Equation Practice ○ Grade 5 Multiplication Division Algebra Sort ○ Grade 5 Expressions Four in a Row Bingo Algebra ○ Grade 5 Modeling Equations Matching Activity ○ Grade 5 Matching Algebraic Expressions ○ Grade 5 Modeling and Drawing Equations Task Cards ● **Technology-based** o Study Jams: Equations (a, b, d) o BrainPOP: Equations with Variables (a, b, d) o Math Playground: Weigh the Wangdoodles (a) o Gizmos ● Using Algebraic Equations (a, b, and d) ● Using Algebraic Expressions (a, b, and c) ● Function Machines 2 (Functions, Tables, and Graphs) (c and d) ● Function Machines 3 (Functions and Problem Solving) (d) **Station Activities/ Manipulatives:** ● Square Tiles: The student will create an equation from a given verbal expression involving one operation, using a square tile as the given variable.
Cross-Curricular Connections	**Differentiation**

Two Of Everything by Lily Toy The magic pot is a model for a function machine that doubles whatever goes into it. Write an expression to match what happens when you put something in the pot. **Mystery Math: A First Book of Algebra** by David Adler	• Multilingual Glossary