5th Grade Math

Pacing Guide and Unpacked Standards

GROVEPORT MADISON SCHOOLS

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Groveport Madison Math Pacing Guide - Grade 5

5th	Operations & Algebraic Thinking	Number & Operations in Base Ten	Number & Operations in Fractions	Measurement & Data	Geometry	Standards for Mathematical Practice
1st 9wks		5.NBT.1 - Understand place value and recognize that one place is 10 times the number on its right and 1/10 number on its left 5.NBT.2 - Understand place value and explain patterns when multiplying by powers of 10 & placement of the decimal 5.NBT.3(a,b) - Read, write and compare decimals to thousandths 5.NBT.4 - Use place value understanding to round decimals to any place, millions through hundredths 5.NBT.5 - Fluently multiply multi-digit whole numbers using a standard algorithm 5.NBT.6 - Fine whole-number quotients & illustrate and explain the calculation		5.MD.3 - Recognize volume as an attribute of solid figures and understand measurement using unit cubes 5.MD.4 - Understand concepts of volume and relate to multiplication & addition measuring with unit cubes 5.MD.5 - Relate volume to multiplication and addition to solve real-world and mathematical problems finding volume of right rectangular prism, applying formulas and recognizing volume as additive		MP.1 - Make sense of problems and persevere in solving them MP.2 - Reason abstractly and quantitatively MP.3 - Construct viable arguments and critique the reasoning of others MP.4 - Model with mathematics MP.5 - Use appropriate tools strategically MP.6 - Attend to precision MP.7 - Look for and make use of structure MP.8 - Look for and express regularity in repeated reasoning
2nd 9wks		5.NBT.7 - Solve real-world problems by adding, subtracting, multiplying and dividing using decimals	5.NF.1 - Add and subtract unsimplified fractions and mixed numbers with unlike denominators 5.NF.2 - Solve word problems involving adding and subtracting of fractions 5.NF.3 - Solve word problems involving division of whole numbers with fraction and mixed number answers 5.NF.4a - Multiply fractions & interpret product 5.NF.4b - Find area of a rectangle with fractional side lengths			

Groveport Madison Math Pacing Guide - Grade 5

5th	Operations & Algebraic Thinking	Number & Operations in Base Ten	Number & Operations in Fractions	Measurement & Data	Geometry	Standards for Mathematical Practice
3rd 9wks			5.NF.5(a,b) - Interpret multiplication as scaling & compare size of product based on factor size; explain why products are greater or less than 1 5.NF.6 - Solve real-world problems using multiplication of fractions and mixed numbers 5.NF.7(a,b,c) - Apply, interpet and extend division of fractions by whole numbers & solve real-world problems	5.MD.1 - Know relative sizes of US customary units and convert between units in solving multi-step , real-world problems 5.MD.2 - Display and interpret data in graphs to solve problems	5.G.3 - Identify and describe different triangles by angle measure 5.G.4 - Identify and describe quadrilaterals by angle measure, side lengths and lines	MP.1 - Make sense of problems and persevere in solving them MP.2 - Reason abstractly and quantitatively MP.3 - Construct viable arguments and critique the reasoning of others MP.4 - Model with mathematics MP.5 - Use appropriate tools strategically MP.6 - Attend to precision MP.7 - Look for and make use of structure MP.8 - Look for and express regularity in repeated reasoning
4th 9wks	5.OA.1 - Write and interpret numerical expressions using parentheses & evaluate expressions without using algebraic order of operations 5.OA.2 - Write and interpret simple expressions that record calculations with numbers 5.OA.3 - Analyze patterns and relationships generating two numerical patterns with two rules & graph formulated ordered pairs on coordinate plane				5.G.1 - Use and understand perpendicular number lines to define coordinate system 5.G.2 - Represent real-world and mathematical problems by graphing points and interpreting coordinate values in first quadrant	

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.OA.1	Use parentheses in numerical expressions and evaluate expressions with this symbol. Formal use of algebraic order of operations is not necessary.	**Common Misconceptions** Students may believe the order in which a problem with mixed operations is written is the order to solve the problem. Allow students to use calculators to determine the value of the expression, and then discuss the order the calculator used to evaluate the expression. Do this with four-function and scientific calculators.	**Vocabulary** ▪ Numerical expression ▪ Order of Operation ▪ Parentheses ▪ Evaluate
Essential Question(s) What do the parentheses represent when evaluating an expression?			
Essential Skills	Use order of operations including parenthesis. Evaluate expressions using the order of operations including parenthesis.		

Examples	Questions
2 x (3 + 6)	Simplify the following expression 5(5 - 2) + 3(1 + 3)

Performance Level Descriptors

Limited: Evaluate numerical expressions with one set of parentheses.
Basic: Evaluate numerical expressions having two non-nested sets of parentheses.
Proficient: Write and evaluate numerical expressions having any number of non-nested sets of parentheses.
Accelerated: Write and evaluate numerical expressions with non-nested parentheses, use to solve problems.
Advanced: Write, evaluate, and interpret complex numerical expressions having any number of non-nested sets of parentheses, brackets, or braces, also use to solve problems.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

There are conventions (rules) determined by mathematicians that must be learned with no conceptual basis. For example, multiplication and division are always done before addition and subtraction.

Begin with expressions that have two operations without any grouping symbols (multiplication or division combined with addition or subtraction) before introducing expressions with multiple operations. Using the same digits, with the operations in a different order, have students evaluate the expressions and discuss why the value of the expression is different. For example, have students evaluate 5 × 3 + 6 and 5 + 3 × 6. Discuss the rule that must be followed. Have students insert parentheses around the multiplication or division part in an expression. A discussion should focus on the similarities and differences in the problems and the results. This leads to students being able to solve problem situations which require that they know the order in which operations should take place.

After students have evaluated expressions without grouping symbols, present problems with one grouping symbol, beginning with parentheses.

4.OA.1 (Prior Grade Standard)	6.EE.3 (Future Grade Standard)
Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.	Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6(4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.OA.2

Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

For example, express the calculation "add 8 and 7 then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.

Common Misconceptions

Students may forget to insert parentheses in writing their expressions. It's important for them to understand why they are necessary and how the answer can change if the are not added.

Students may believe the order in which a problem with mixed operations is written is the order to solve the problem.

Vocabulary

- Numerical expression
- Order of Operation
- Parentheses
- Brackets
- Braces
- Evaluate
- Record

Essential Question(s)

What do the parentheses symbols represent when evaluating an expression?

Essential Skills

Write numerical expressions for given numbers with operation words.
Write operation words to describe a given numerical expression.
Interpret numerical expressions without evaluating them.
Solve addition and subtraction word problems within 10.

Examples	Questions
"Twice the sum of 8 and 7" can be written as 2 x (8+7). Explain why 3 x (18932 + 921) is 3 times as large as (18932 + 921) without calculating the answers.	Write the expression for add 8 and 7 and then multiply by 2. How many times larger is 3(35 + 57) than (35 + 57)?

Performance Level Descriptors

Limited: N/A
Basic: N/A
Proficient: N/A
Accelerated: N/A
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Have students write numerical expressions in words without calculating the value. This is the foundation for writing algebraic expressions. Then, have students write numerical expressions from phrases without calculating them.

4.OA.1 (Prior Grade Standard)	6.EE.4 (Future Grade Standard)
Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.	Identify when two expressions are equivalent, i.e., when the two expressions name the same number regardless of which value is substituted into them. For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.OA.3	Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*	**Common Misconceptions** Students reverse the points when plotting them on a coordinate plane. They count up first on the *y*-axis and then count over on the *x*-axis. The location of every point in the plane has a specific place. Have students plot points where the numbers are reversed such as (4, 5) and (5, 4). Begin with students providing a verbal description of how to plot each point. Then, have them follow the verbal description and plot each point.	**Vocabulary** ▪ Numerical patterns ▪ Rules ▪ Ordered pairs ▪ Coordinate plane ▪ Sequence ▪ Term ▪ Generate ▪ Identify
Essential Question(s) How can I compare two numerical patterns?			
Essential Skills	Generate two numerical patterns using two given rules. Form ordered pairs consisting of corresponding terms for the two patterns. Graph generated ordered pairs on a coordinate plane. Analyze and explain the relationships between corresponding terms in the two numerical patterns. Given two rules with an apparent relationship, students should be able to identify the relationship between the resulting sequences of the terms in one sequence to the corresponding terms in the other sequence.		

Examples

Generate numbers from the following rules: Rule 1: "Start with 0 and add 3"
Rule 2: "Start with 0 and add 6"

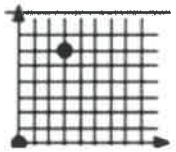
What is the rule that given a number in the "first" column will create the matching number in the "second" column.

First	Second
0	0
2	6
4	12
6	18
8	24

Questions

Create a table of numbers where the first column starts with 0 and adds 2 and the second column starts with 0 and adds 5.

Graph the pairs of numbers from the table above on a coordinate graph. (0,0); (3,6); (6,12); (9,18); …



Performance Level Descriptors

Limited: N/A
Basic: N/A
Proficient: N/A
Accelerated: N/A
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Given two rules with an apparent relationship, students should be able to identify the relationship between the resulting sequences of the terms in one sequence to the corresponding terms in the other sequence. For example, starting with 0, multiply by 4 and starting with 0, multiply by 8 and generate each sequence of numbers (0, 4, 8, 12, 16, …) and (0, 8, 16, 24, 32…). Students should see that the terms in the second sequence are double the terms in the first sequence, or that the terms in the first sequence are half the terms in the second sequence.

Have students form ordered pairs and graph them on a coordinate plane. Patterns can be also discerned in graphs.
Graphing ordered pairs on a coordinate plane is introduced to students in the Geometry domain where students solve real-world and mathematical problems. For the purpose of this cluster, only use the first quadrant of the coordinate plane, which contains positive numbers only. Provide coordinate grids for the students, but also have them make coordinate grids. In Grade 6, students will position pairs of integers on a coordinate plane.

The graph of both sequences of numbers is a visual representation that will show the relationship between the two sequences of numbers. Encourage students to represent the sequences in T-charts so that they can see a connection between the graph and the sequences.

0	0
1	4
2	8
3	12
4	16

0	0
1	8
2	16
3	24
4	32

4.OA.5 (Prior Grade Standard)

Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

6.EE.7 (Future Grade Standard)

Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p,q and x are all nonnegative rational numbers.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.NBT.1

Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

Essential Question(s)

How does a digit's position affect its value?

Common Misconceptions

Students have the idea that the longer the number the greater the number. With whole numbers, a 5-digit number is always greater that a 1-, 2-, 3-, or 4-digit number. However, with decimals a number with one decimal place may be greater than a number with two or three decimal places. For example, 0.5 is greater than 0.12, 0.009 or 0.499. One method for comparing decimals it to make all numbers have the same number of digits to the right of the decimal point by adding zeros to the number, such as 0.500, 0.120, 0.009 and 0.499. A second method is to use a place-value chart to place the numerals for comparison.

Vocabulary

- Place Value
- Period
- Decimal
- Decimal point
- Tenths
- Thousands
- Place Value Chart
- Recognize
- Represents

Essential Skills

Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

Example	Question
In a number such as 555, the "5" in the hundreds column has a value 10 times	In the number **5**52, how many times larger is the value of the underlined 5 than the other 5?

Performance Level Descriptors

Limited: N/A
Basic: N/A
Proficient: N/A
Accelerated: N/A
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Money is a good medium to compare decimals. Present contextual situations that require the comparison of the cost of two items to determine the lower or higher priced item. Students should also be able to identify how many pennies, dimes, dollars and ten dollars, etc., are in a given value. Help students make connections between the number of each type of coin and the value of each coin, and the expanded form of the number. Build on the understanding that it always takes ten of the number to the right to make the number to the left.

4.NBT.1 (Prior Grade Standard)	6.EE.1 (Future Grade Standard)
Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right by applying concepts of place value, multiplication, or division.	Write and evaluate numerical expressions involving whole-number exponents.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.NBT.2	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.	**Common Misconceptions** Students should reason that the exponent above the 10 indicates how many places the decimal point is moving (not just that the decimal point is moving but that you are multiplying or making the number 10 times greater three times) when you multiply by a power of 10.	**Vocabulary** ▪ Exponent ▪ Base ▪ Power ▪ Squared ▪ Cubed ▪ Explain ▪ Denote
Essential Question(s) What did you notice every time you multiplied by ten?			
Essential Skills	Represent powers of 10 using whole number exponents. Translate between powers of 10 written as 10 raised to a whole number exponent, the expanded form, and standard notation. Explain the patterns in the number of zeros of the product when multiplying a number by powers of 10. Explain the relationship of the placement of the decimal point when a decimal is multiplied or divided by a power of 10.		

Examples	Questions
1000 x 23.4 is 23,400 OR 103 x 23.4 is 23,400 234 ÷ 100 is 2.34 OR 234 ÷ 102 is 2.34	Compute the value of 103 x 23.4 Explain how you might find the answer to 234 ÷ 100 without actually computing the division problem. (i.e. explain a shortcut to finding the answer)

Performance Level Descriptors

Limited: N/A
Basic: Represent multi-digit numbers in expanded form, including decimals to the thousandths place.
Proficient: Determine the value of a digit when multiplied or divided by 10 and powers of 10.
Accelerated: N/A
Advanced: Explain the relationship of exponents to the number of zeroes when multiplying by powers of 10.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Number cards, number cubes, spinners and other manipulatives can be used to generate decimal numbers. For example, have students roll three number cubes, then create the largest and small number to the thousandths place. Ask students to represent the number with numerals and words.

4.NBT.1 (Prior Grade Standard)	6.EE.1 (Future Grade Standard)
Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right by applying concepts of place value, multiplication, or division.	Write and evaluate numerical expressions involving whole-number exponents.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.NBT.3

Read, write, and compare decimals to thousandths.

a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000).

b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

Common Misconceptions

Students may not see relations or work with decimals and fractions interchangeably

Vocabulary

- Greater Than
- Less Than
- Equal To
- Comparison
- <, >, =
- Expanded Form
- Read
- Write
- Compare

Essential Question(s)

How does a digit's position affect its value?

Essential Skills

Read and write decimal to thousandths using base-ten numerals, number names, and expanded form.

Use >, =, and < symbols to record the results of comparisons between decimals.

Compare two decimals to the thousandths, based on the place value of each digit.

Examples	Questions
12.345 is read "twelve and three hundred forty five thousandths". 12.345 = 10 + 2 + .3 + .04 + .005 12.345 = 1 × 10 + 2 × 1 + 3 × (1/10) + 4 × (1/100) + 5 × (1/1000).	Write the number 12.345 with correct number names and with base ten numerals. Write the number 5.34 in expanded form. Using the different place value information, explain why 2.09 is smaller than 2.1.

Performance Level Descriptors

Limited: Given a place value chart, read decimals to the thousandths place using number names.
Basic: Read and write decimals to the thousandths place using word names.
Proficient: Read, write, and compare two decimals, to the thousandths, based on the meaning of the digits in each place, record using the symbols >, =, < and supported with place value charts and/or decimal models.
Accelerated: Recognize the place value relationships between digits in multi-digit numbers and use them to read, write and compare decimals to the thousandths place and record with =.
Advanced: N/A

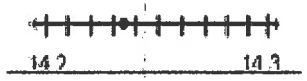
Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Number cards, number cubes, spinners and other manipulatives can be used to generate decimal numbers. For example, have students roll three number cubes, then create the largest and small number to the thousandths place. Ask students to represent the number with numerals and words.

4.NF.7 (Prior Grade Standard)	6.NS.3 (Future Grade Standard)
Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions.	Fluently add, subtract, multiply, and divide multi-digit decimals using a standard algorithm for each operation.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.NBT.4	Use place value understanding to round decimals to any place, millions through hundredths.	**Common Misconceptions** A misconception that is directly related to comparing whole numbers is the idea that the longer the number the greater the number. With whole numbers, a 5-digit number is always greater that a 1-, 2-, 3-, or 4-digit number. However, with decimals a number with one decimal place may be greater than a number with two or three decimal places. For example, 0.5 is greater than 0.12, 0.009 or 0.499. One method for comparing decimals it to make all numbers have the same number of digits to the right of the decimal point by adding zeros to the number, such as 0.500, 0.120, 0.009 and 0.499. A second method is to use a place-value chart to place the numerals for comparison.	**Vocabulary** ▪ Decimal ▪ Round ▪ Place value
Essential Question(s) How does a digit's position affect its value?			
Essential Skills	Use knowledge of base ten and place value to round decimals to any place.		

Examples	Questions
Rounding 14.235 to the nearest tenth means knowing it is located between 14.2 and 14.3 on the number line and it's closer to 14.2  	What two numbers is 3.2 between? A. 3.20 & 3.21 B. 3.1 & 3.2 C. 3.1 & 3.3

Performance Level Descriptors

Limited: Round decimals to the whole number.
Basic: Round decimals to the hundredths place.
Proficient: N/A
Accelerated: N/A
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Number cards, number cubes, spinners and other manipulatives can be used to generate decimal numbers. For example, have students roll three number cubes, then create the largest and small number to the thousandths place. Ask students to represent the number with numerals and words.

4.NBT.3 (Prior Grade Standard)	6.NS.7 (Future Grade Standard)
Use place value understanding to round multi-digit whole numbers to any place through 1,000,000.	Understand ordering and absolute value of rational numbers.

Ohio's Learning Standards-Clear Learning Targets

Math, Grade 5

5.NBT.5

Fluently multiply multi-digit whole numbers using a standard algorithm.

Common Misconceptions

When students only see each factor as a single digit numeral, they will not understand the magnitude of the numbers they are multiplying.
Using the partial product method for multiplication often helps students see the actual numbers they are multiplying. Use grid paper to show the partial products and then how you add to get the final product.

Vocabulary

- Distributive Property
- Product
- Rectangular arrays
- Compatible number
- Fluently

Essential Question(s)

Why is the standard algorithm an efficient method for multiplication?

Essential Skills

Fluently multiply multi-digit whole numbers using the standard algorithm.

Examples	Questions
23 x 45 115 920 1035	Compute 23 X 45.

Performance Level Descriptors

Limited: Represent multi-digit whole numbers in expanded form.
Basic: Using strategies find the product of multi-digit factors.
Proficient: Use strategies to multiply multi-digit numbers to solve mathematical and routine real-world problems.
Accelerated: Use efficient strategies to multiply multi-digit numbers to solve mathematical and routine real-world problems.
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Connections between the algorithm for multiplying multi-digit whole numbers and strategies such as partial products or lattice multiplication are necessary for students' understanding.
You can multiply by listing all the partial products. For example:

234
× 8
32 Multiply the ones (8 × 4 ones = 32 ones)
240 Multiply the tens (8 × 3 tens = 24 tens or 240
1600 Multiply the hundreds (8 × 2 hundreds = 16 hundreds or 1600) 1872
Add the partial products

The multiplication can also be done without listing the partial products by multiplying the value of each digit from one factor by the value of each digit from the other factor. Understanding of place value is vital in using the standard algorithm.
In using the standard algorithm for multiplication, when multiplying the ones, 32 ones is 3 tens and 2 ones. The 2 is written in the ones place. When multiplying the tens, the 24 tens is 2 hundreds and 4 tens. But, the 3 tens from the 32 ones need to be added to these 4 tens, for 7 tens. Multiplying the hundreds, the 16 hundreds is 1 thousand and 6 hundreds. But, the 2 hundreds from the 24 tens need to be added to these 6 hundreds, for 8 hundreds.

234
× 8
1872

4.NBT.5 (Prior Grade Standard)	6.NS.2 (Future Grade Standard)
Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	Fluently divide multi-digit numbers using a standard algorithm.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.NBT.6

Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Common Misconceptions

When students use the traditional algorithm, they often treat each digit in the dividend separately and do not look at the value of the entire number. Encourage the students to estimate prior to dividing, this helps them see what a reasonable quotient will be.

Vocabulary

- Quotients
- Dividends
- Divisor
- Illustrate
- Explain
- Calculation

Essential Question(s)

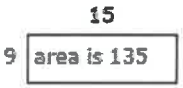
What is an efficient strategy for dividing numbers?

Essential Skills

Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors.

Use strategies based on place value, the properties of operations, and/or the relationship between multiplication and division to solve division problems.

Illustrate and explain division calculations by using equations, rectangular arrays, and/or area models.

Examples	Questions
Explain how to divide 315 by 15 by a method than the standard algorithm.	John says that to divide 315 by 15 he first divides 15 into the last other two digits of 315 (15) which is one and then since 15 doesn't divide into 3 you put a zero so the answer is 10 r 3. Explain why you agree or disagree. 135 ÷ 15 = 9 as illustrated by this area model  Draw an area model that would illustrate 315 ÷ 15 = 21

Performance Level Descriptors

Limited: Multiply one- and two-digit whole numbers and find whole-number quotients of whole numbers with up to three-digit dividends and one-digit divisors.
Basic: Use base-ten models to divide up to four digit dividends by one or two digit divisors.
Proficient: Use a variety of strategies based on place value, properties of operations, and the relationship of multiplication to division to divide up to four-digit dividends by one- or two-digit divisors.
Accelerated: Use a variety of strategies based on place value, properties of operations, and the relationship of multiplication to division to divide up to four-digit dividends by two-digit divisors; Explain calculations of whole number quotients of whole numbers with up to four-digit dividends and two-digit divisors.
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

This standard references various strategies for division. Division problems can include remainders. Even though this standard leads more towards computation, the connection to story contexts is critical. Make sure students are exposed to problems where the divisor is the number of groups and where the divisor is the size of the groups. In fourth grade, students' experiences with division were limited to dividing by one-digit divisors. This standard extends students' prior experiences with strategies, illustrations, and explanations. When the two-digit divisor is a "familiar" number, a student might decompose the dividend using place value.

4.NBT.6 (Prior Grade Standard)	6.NS.2 (Future Grade Standard)
Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	Fluently divide multi-digit numbers using a standard algorithm.

Ohio's New Learning Standards-Clear Learning Targets

Math, Grade 5

5.NBT.7

Solve real-world problems by adding, subtracting, multiplying, and dividing decimals using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction, or multiplication and division; relate the strategy to a written method and explain the reasoning used.

a. Add and subtract decimals, including decimals with whole numbers (whole numbers through the hundreds place and decimals through the hundredths place).

b. Multiply whole numbers by decimals (whole numbers through the hundreds place and decimals through the hundredths place)

c. Divide whole numbers by decimals and decimals by whole numbers (whole numbers through the tens place and decimals less than one through the hundredths place using numbers whose division can be readily modeled).

For example, 0.75 divided by 5, 18 divided by 0.6, or 0.9 divided by 3.

Essential Question(s)

What is an efficient strategy for adding, subtracting, multiplying and dividing decimals?

Common Misconceptions

Students might compute the sum or difference of decimals by lining up the right-hand digits as they would whole number. For example, in computing the sum of 15.34 + 12.9, students will write the problem in this manner:

15.34
+ 12.9
16.63

To help students add and subtract decimals correctly, have them first estimate the sum or difference. Providing students with a decimal-place value chart will enable them to place the digits in the proper place.

Vocabulary

- Associative Property of Multiplication
- Commutative Property of Multiplication
- Identity Property of Multiplication
- Relate
- Explain
- Reason
- Whole Numbers
- Decimals

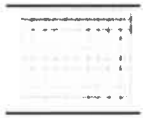
Essential Skills

Add, subtract, multiply, and divide decimals to hundredths using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

Relate the strategy to a written method and explain the reasoning used to solve decimal operation calculations.

Examples

Explain how many decimal places are in the answers to 2.4 + 5.3 and 2.4 x 5.3 and why it may be different. Use the grid at the right to model 0.7 x 0.4.



Questions

Show at least two ways to multiply 23 x 4.76. Explain how you would add 3 + 2.74 + 8.6.

Performance Level Descriptors

Limited: Add, subtract, and multiply decimals to tenths using concrete models or drawings.
Basic: Use strategies and models to add, subtract and multiply decimals to the hundredths place.
Proficient: Perform the four operations on decimals to the hundredths place and demonstrate a partial explanation of reasoning.
Accelerated: Use efficient and accurate strategies to perform the four operations on decimals to the hundredths place and explain the reasoning.
Advanced: N/A

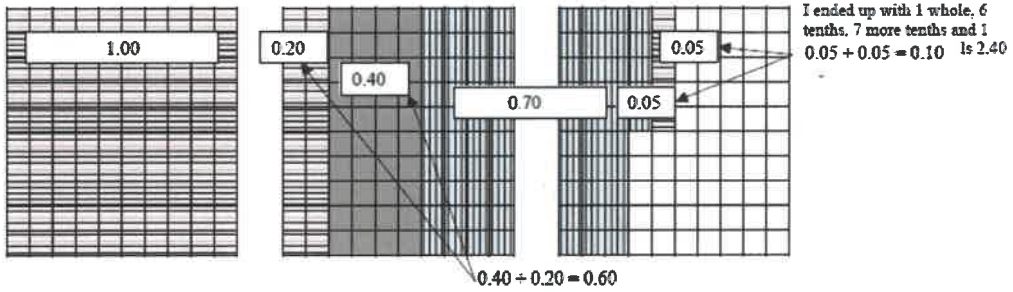
Ohio Department of Education Model Curriculum Instructional Strategies and Resources

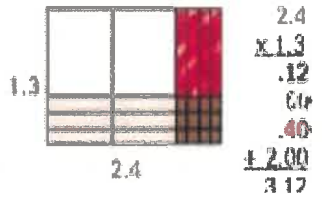
As students developed efficient strategies to do whole number operations, they should also develop efficient strategies with decimal operations.

Students should learn to estimate decimal computations before they compute with pencil and paper. The focus on estimation should be on the meaning of the numbers and the operations, not on how many decimal places are involved. For example, to estimate the product of 32.84 × 4.6, the estimate would be more than 120, closer to 150. Students should consider that 32.84 is closer to 30 and 4.6 is closer to 5. The product of 30 and 5 is 150. Therefore, the product of 32.84 × 4.6 should be close to 150.

Have students use estimation to find the product by using exactly the same digits in one of the factors with the decimal point in a different position each time. For example, have students estimate the product of 275 × 3.8; 27.5 × 3.8 and 2.75 × 3.8, and discuss why the estimates should or should not be the same.

1.25 + 0.40 + 0.75





4.OA.3 (Prior Grade Standard)

Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

6.NS.3 (Future Grade Standard)

Fluently add, subtract, multiply, and divide multi-digit decimals using a standard algorithm for each operation.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.NF.1

Add and subtract fractions with unlike denominators (including mixed numbers and fractions greater than 1) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.

For example, use visual models and properties of operations to show 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (a/b x d/d) + (c/d x b/b) = (ad + bc)/bd.)

Essential Question(s)

How do I add or subtract fractions with unlike denominators?

Common Misconceptions

Students often mix models when adding, subtracting or comparing fractions. Students will use a circle for thirds and a rectangle for fourths when comparing fractions with thirds and fourths. Remind students that the representations need to be from the same whole models with the same shape and size.

Vocabulary

- Equivalent
- Sum
- Difference
- Unlike denominator
- Numerator
- Mixed numbers
- Least Common Denominator
- Produce

Essential Skills

Generate equivalent fractions to find the like denominator.

Solve addition and subtraction problems involving fractions (including mixed numbers) with like and unlike denominators using an equivalent fraction strategy.

Examples	Questions
2/3 + 5/4 = 8/12 + 15/12 = 23/12	Add 2/3 and 5/4
4/5 - 1/2 = 8/10 - 5/10 = 3/10	Subtract 1/2 from 4/5

Performance Level Descriptors

Limited: Solve straightforward word problems involving addition and subtraction of fractions with common unlike denominators multiples, 2, 4; 3, 6, under 12.
Basic: Find the sum or difference of common fractions with unlike denominators using visual models to solve straightforward problems.
Proficient: Solve routine word problems by finding the sum or difference of fractions and mixed numbers with unlike denominators.
Accelerated: N/A
Advanced: Represent the sum or difference of fractions and mixed numbers in a form that is appropriate for the real-world situation.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

To add or subtract fractions with unlike denominators, students use their understanding of equivalent fractions to create fractions with the same denominators. Start with problems that require the changing of one of the fractions and progress to changing both fractions. Allow students to add and subtract fractions using different strategies such as number lines, area models, fraction bars or strips. Have students share their strategies and discuss commonalities in them.

Students need to develop the understanding that when adding or subtracting fractions, the fractions must refer to the same whole. Any models used must refer to the same whole. Students may find that a circular model might not be the best model when adding or subtracting fractions.

These models of fractions use the same size rectangle to represent the whole unit and are therefore much easier to compare fractions.

4.NF.1 (Prior Grade Standard)	6.NS.1 (Future Grade Standard)
Explain why a fraction a /b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.NF.2

Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.

For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 <1/2.

Common Misconceptions

Students often mix models when adding, subtracting or comparing fractions. Students will use a circle for thirds and a rectangle for fourths when comparing fractions with thirds and fourths. Remind students that the representations need to be from the same whole models with the same shape and size.

Vocabulary

- Equivalent
- Sum
- Difference
- Unlike denominator
- Numerator
- Mixed Numbers
- Least Common Denominator
- Benchmark Fractions
- Estimate
- Solve
- Reasonableness

Essential Question(s)

What is an efficient strategy for adding and subtracting fractions?

Essential Skills

Generate equivalent fractions to find like denominators.

Evaluate the reasonableness of an answer, using fractional number sense, by comparing it to a benchmark fraction.

Solve word problems involving addition and subtraction of fractions with unlike denominators referring to the same whole.

Examples	Questions
Draw a picture to solve the problem of how much pizza there would be if we combine 1/2 pizza with 1/3. Explain how to use the model shown to add 5/12 and 1/4.  John's paper strip is 7/8" long and Sue's is 3/4" long. Whose is longer and by how much?	What subtraction problem is shown on the fraction model shown?  Explain why adding 2/5 and 1/2 to get 3/7 does not make sense. Is the sum of 3/5 and 7/16 going to be greater than or less than one?

Performance Level Descriptors

Limited: N/A
Basic: N/A
Proficient: N/A
Accelerated: N/A
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

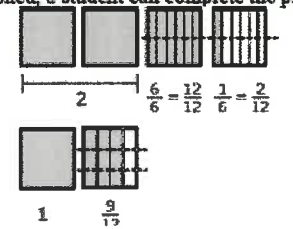
As with solving word problems with whole number operations, regularly present word problems involving addition or subtraction of fractions. The concept of adding or subtracting fractions with unlike denominators will develop through solving problems. Mental computations and estimation strategies should be used to determine the reasonableness of answers. Students need to prove or disprove whether an answer provided for a problem is reasonable.

Estimation is about getting useful answers, it is not about getting the right answer. It is important for students to learn which strategy to use for estimation. Students need to think about what might be a close answer.

Students need to develop the understanding that when adding or subtracting fractions, the fractions must refer to the same whole. Any models used must refer to the same whole. Students may find that a circular model might not be the best model when adding or subtracting fractions.

These models of fractions use the same size rectangle to represent the whole unit and are therefore much easier to compare fractions.

This diagram models a way to show how 3 1/6 and 1 ¾ can be expressed with a denominator of 12. Once this is accomplished, a student can complete the problem, 2 14/12 – 1 9/12 = 1 5/12.



4.NF.3a,d (Prior Grade Standard)

Understand a fraction a/b with a > 1 as a sum of fractions 1/b. a.) Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. d.) Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators.

6.NS.1 (Future Grade Standard)

Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.NF.3

Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?

Common Misconceptions

Students may believe that division always results in a smaller number. Using models when dividing with fractions will enable students to see that the results will be larger.

Vocabulary

- Fraction
- Numerator
- Denominator
- Interpret
- Solve
- Represent

Essential Question(s)

What is an efficient strategy for dividing whole numbers and fractions to obtain an answer in the form of a mixed number?

Essential Skills

Interpret a fraction as division of the numerator by the denominator.

Interpret the remainder as a fractional part of the problem.

Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers.

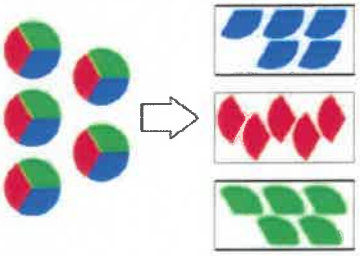
Examples	Questions
Interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size ¾. Change 3/4 into its decimal equivalent.	If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get?

Performance Level Descriptors

Limited: N/A
Basic: N/A
Proficient: N/A
Accelerated: N/A
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

How to share 5 objects equally among 3 shares:
$5 \div 3 = 5 \times \frac{1}{3} = \frac{5}{3}$



If you divide 5 objects equally among 3 shares, each of the 5 objects should contribute $\frac{1}{3}$ of itself to each share. Thus each share consists of 5 pieces, each of which is $\frac{1}{3}$ of an object, and so each share is $5 \times \frac{1}{3} = \frac{5}{3}$ of an object.

4.NF.3 (Prior Grade Standard)	6.NS.1 (Future Grade Standard)
Understand a fraction a/b with a > 1 as a sum of fractions 1/b . a.) Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b.) Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. c.) Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. d.) Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

Ohio's Learning Standards-Clear Learning Targets

Math, Grade 5

5.NF.4

Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

a. Interpret the product (a/b) × q as a part of a partition of q into b equal parts; equivalently, as the result of a sequence of operations a × q ÷ b. *For example, use a visual fraction model to show (2/3) x 4 = 8/3, and create a story context for this equation. Do the same with (2/3) x (4/5) = 8/15. (In general, (a/b) x (c/d) = ac/bd.)*

b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

Common Misconceptions

Students may believe that multiplication always results in a larger number. Using models when multiplying with fractions will enable students to see that the results will be smaller.

Students have difficulty connecting visual models to the symbolic representation using equations. Use concrete visuals to represent problems.

Vocabulary

- Fraction
- Numerator
- Denominator
- Product
- Partition
- Equal Parts
- Equivalent
- Factor
- Unit Fraction
- Area
- Side Lengths
- Apply
- Extend
- Interpret

Essential Question(s)

What is an efficient strategy to find the area of a rectangle with fractional side lengths?

Essential Skills

Interpret the product of a fraction times a whole number as total number parts of the whole.

Determine the sequence of operations that result in the total number of parts of the whole.

Interpret the product of a fraction times a fraction as the total number of parts of the whole.

Represent fraction products as rectangular areas.

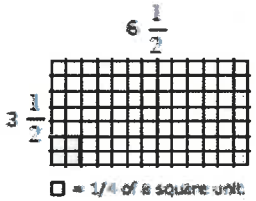
Justify multiplying fractional side lengths to find the area is the same as tiling a rectangle with unit squares of the appropriate unit fraction side lengths.

Examples

(2/3) × 12 means to take 12 and divide it into thirds (1/3 of 12 is 4) and take two of the parts (2 x 4 is 8). So (2/3) x 12 = 8.

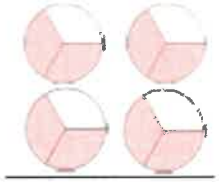
(2/3) × (4/5) means to take (4/5) and divide it into thirds (1/3 of 4/5 is 4/15) and take two of the parts (2 x 4/15 is 8/15). So (2/3) x (4/5) = (8/15). Similarly (2/3) x (4/5) = (2x4)/(3x5) = (8/15).

What is the area of the of the rectangle?
The area is (91/4) or 22 3/.



Questions

Explain how the model shown can be used to solve 4 x 2/3 and what the answer is.



Compute 2/3 x 4/5.

Performance Level Descriptors

Limited: N/A
Basic: N/A
Proficient: N/A
Accelerated: N/A
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Ask questions such as, "What does 2 × 3 mean?" and "What does 12 ÷ 3 mean?" Then, follow with questions for multiplication with fractions, such as, "What does 3/4 x 1/3 mean?" "What does 3/4 × 7 mean?" (7 sets of 3/4) and What does 7 × 3/4 mean?" (3/4 of a set of 7)
The meaning of 4 ÷ 1/2 (how many 1/2 are in 4) and 1/2 ÷ 4 (how many groups of 4 are in 1/2) also should be illustrated with models or drawings like:

3/4 

7 groups of 3/4  or 21/4

Encourage students to use models or drawings to multiply or divide with fractions. Begin with students modeling multiplication and division with whole numbers. Have them explain how they used the model or drawing to arrive at the solution.
Models to consider when multiplying or dividing fractions include, but are not limited to: area models using rectangles or squares, fraction strips/bars and sets of counters.

4.NF.4 (Prior Grade Standard)

Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

6.NS.1 (Future Grade Standard)

Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.NF.5

Interpret multiplication as scaling (resizing).

a. Compare the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

b. Explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b = (n×a)/(n×b) to the effect of multiplying a/b by 1.

Essential Question(s)

Why does the product of whole number multiplication differ from the multiplication of a whole number and fraction?

Common Misconceptions

Seeing a one as a numerator, students may believe that unit fractions cannot be further subdivided. Throughout this unit, visual representations show how unit fractions are further subdivided.

Vocabulary

- Fraction
- Numerator
- Denominator
- Product
- Partition
- Equal Parts
- Equivalent
- Factor
- Unit Fraction
- Scaling
- Comparing
- Interpret
- Explain

Essential Skills

Know the scaling (resizing) involves multiplication.

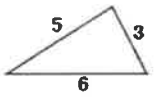
Know that multiplying whole numbers and fractions result in products greater than or less than one depending upon the factors.

Draw a conclusion that multiplying a fraction greater than one will result in a product greater than the given number.

Draw a conclusion that when you multiply a fraction by one the resulting fraction is equivalent.

Draw a conclusion that when you multiply a fraction by a fraction, the product will be smaller than the given number.

Compare the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.

Examples	Questions
The effect of multiplying 7 by 3 will make a product larger than 7 or more accurately it will be triple the size of 7. Multiplying 3 x 2 1/2 will make a product larger than 3. Multiplying 3 x 3/4 will make a product smaller than 3. Multiplying by one does not change a number so multiplying 3/4 by 2/2 or 3/3 or n/n creates equivalent forms of 3/4.	John wants to enlarge the triangle by a factor of 3. What will the sides measure on the new triangle?  Which of the following when multiplied by 2 1/2 will give a product (answer) less than 2 1/2? A. 2/3 B. 1 C. 2 1/2 D. 2 Explain why multiplying 2/3 by 5/5 does not change the value of the fraction.

Performance Level Descriptors

Limited: N/A
Basic: N/A
Proficient: Know the effect that a fraction has on another fraction when multiplied (both fractions less than 1 and both fractions greater than 1).
Accelerated: Understand and use the fact that a fraction multiplied by 1 in the form of a/a is equivalent to the original fraction.
Advanced: Create visual models when multiplying two fractions that are larger than 1.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Use calculators or models to explain what happens to the result of multiplying a whole number by a fraction (3 x 1/2, 4 x 1/2…) and when multiplying a fraction by a number greater than 1.

4.NF.4 (Prior Grade Standard)	6.EE.9 (Future Grade Standard)
Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

Ohio's New Learning Standards-Clear Learning Targets
Math, Grade 5

5.NF.6

Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

Essential Question(s)

What models or equations can be used to efficiently solve problems using fractions and mixed numbers?

Common Misconceptions

Students may believe that division always results in a smaller number. Using models when dividing with fractions will enable students to see that the results will be larger.

Students may believe that multiplication always results in a larger number. Using models when multiplying with fractions will enable students to see that the results will be smaller.

Consider area models of multiplication and both sharing and measuring models for division

Vocabulary

- Fraction
- Numerator
- Denominator
- Product
- Quotient
- Partition
- Equal Parts
- Equivalent
- Factor
- Unit Fraction
- Solve
- Represent

Essential Skills

Represent word problems involving multiplication of fractions and mixed numbers.

Solve real world problems involving multiplication of fractions and mixed numbers.

Example	Question
Decide how many pizzas need to be purchased if each person will eat 1/5 of a pizza and there are 12 people.	How many pizzas need to be purchased if each person will eat 1/5 of a pizza and there are 12 people.

Performance Level Descriptors

Limited: Multiply a whole number by a fraction to solve straightforward problems using visual models.
Basic: Multiply a whole number by a mixed number using visual models to solve straightforward problems.
Proficient: Multiply a proper fraction by a mixed number to solve routine real-world problems; Solve a routine real-world problem involving multiplying two fractions by using visual models.
Accelerated: Create contexts for multiplying two fractions, solve with visual models; Multiply a mixed number by a mixed number and use to solve real-world problems; Use visual models when multiplying two fractions that are larger than 1.
Advanced: Create contexts for multiplying two fractions, solve without visual models; Create visual models when multiplying two fractions that are larger than 1.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Present problem situations and have students use models and equations to solve the problem. It is important for students to develop understanding of multiplication and division of fractions through contextual situations.

4.NF.4 (Prior Grade Standard)	6.NS.1 (Future Grade Standard)
Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

Ohio's Learning Standards-Clear Learning Targets

Math, Grade 5

5.NF.7

Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division, but division of a fraction by a fraction is not a requirement at this grade.

a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients.
For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.

b. Interpret division of a whole number by a unit fraction, and compute such quotients.
For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.

c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem.
For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?

Common Misconceptions

Students may believe that division always results in a smaller number. Using models when dividing with fractions will enable students to see that the results will be larger.

Students may believe that multiplication always results in a larger number. Using models when multiplying with fractions will enable students to see that the results will be smaller.

Vocabulary

- Fraction
- Numerator
- Denominator
- Quotient
- Partition
- Equal Parts
- Equivalent
- Factor
- Unit Fraction
- Apply
- Extend

Essential Question(s)

What models or equations can be used to efficiently solve problems using fractions and mixed numbers?

Essential Skills

Solve real world problems involving division of unit fractions by whole numbers other than 0 and division of whole numbers by unit fractions using strategies such as visual fraction models and equations.

Interpret division of a whole number by a unit fraction and justify your answer using the relationship between multiplication and division, and by representing the quotient with a visual fraction model.

Interpret division of a unit fraction by a whole number and justify your answer using the relationship between multiplication and division, by creating story problems, using visual models, and relationship to multiplication, etc.

Examples	Questions
Create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3 Write a real-world problem where the solution involves taking and dividing it by 4 and then state the solution. a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4. Write a real-world problem where the solution involves taking 4 and dividing it by 1/5 and then state the solution.	How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How much pizza will each student get if 5 of them share half a pizza? Draw a model to help explain the solution. How many 1/3-cup servings are in 2 cups of raisins? 1/3 The recipe calls for 1/3 cup of flour. If Bob has 2 cups of flour all Create together, how many times can he repeat the recipe?

Performance Level Descriptors

Limited: Divide a whole number by 1 2 or 1 3 using visual models.
Basic: Divide a unit fraction by a whole number using visual models.
Proficient: N/A
Accelerated: Interpret and perform division of a unit fraction by a whole number in solving real-world problems.
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Use calculators or models to explain what happens to the result when dividing a unit fraction by a non-zero whole number and what happens to the result when dividing a whole number by a unit fraction.

4.NF.4 (Prior Grade Standard)	6.NS.1 (Future Grade Standard)
Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.MD.1	Know relative sizes of these U.S. customary measurement units: pounds, ounces, miles, yards, feet, inches, gallons, quarts, pints, cups, fluid ounces, hours, minutes, and seconds. Convert between pounds and ounces; miles and feet; yards, feet, and inches; gallons, quarts, pints, cups, and fluid ounces; hours, minutes, and seconds in solving multi-step, real world problems.	**Common Misconceptions** When solving problems that require renaming units, students use their knowledge of renaming the numbers as with whole numbers. Students need to pay attention to the unit of measurement which dictates the renaming and the number to use. The same procedures used in renaming whole numbers should not be taught when solving problems involving measurement conversions. For example, when subtracting 5 inches from 2 feet, students may take one foot from the 2 feet and use it as 10 inches. Since there were no inches with the 2 feet, they put 1 with 0 inches and make it 10 inches.	**Vocabulary** ▪ Conversion ▪ Convert ▪ Metric ▪ Customary Measurement
Essential Question(s) What is the relationship of units in comparing _____ (pounds-ounces, miles-yards-feet-inches, gallons-quarts-pints-cups-fluid ounces, hours-minutes-seconds)?			
Essential Skills	Recognize units of measurement within the same system. Divide and multiply to change units. Convert units of measurement within the same system. Solve multi-step, real world problems that involve converting units.		

Examples	Questions
Convert 1.6 pounds to ounces. Convert 40 pints to gallons.	John has a board measuring 5 1/2 feet long. How many smaller boards each with a length of 10 inches can he make from this board?

Performance Level Descriptors

Limited: Complete a chart converting different-sized, standard whole-number measurement units within one measurement system: inches to feet, cups to quarts, etc.
Basic: Convert different-sized measurement units within one measurement system.
Proficient: Convert and apply measurement units within a given measurement system to solve routine problems.
Accelerated: Use measurement conversions within a measurement system in solving real-world problems.
Advanced: Use measurement conversions within a measurement system in solving multi-step, real-world problems.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Students should gain ease in converting units of measures in equivalent forms within the same system. To convert from one unit to another unit, the relationship between the units must be known. In order for students to have a better understanding of the relationships between units, they need to use measuring tools in class. The number of units must relate to the size of the unit. For example, students have discovered that there are 12 inches in 1 foot and 3 feet in 1 yard. This understanding is needed to convert inches to yards. Using 12-inch rulers and yardsticks, students can see that three of the 12-inch rulers are equivalent to one yardstick (3 x 12 inches = 36 inches; 36 inches = 1 yard). Using this knowledge, students can decide whether to multiply or divide when making conversions.

Once student have an understanding of the relationships between units and how to do conversions, they are ready to solve multi-step problems that require conversions within the same system. Allow students to discuss methods used in solving the problems. Begin with problems that allow for renaming the units to represent the solution before using problems that require renaming to find the solution.

Students will use yardsticks and rulers to make conversions among inches, feet, and yards for measurement. Provide students with real-world examples of how this skill is applied (e.g. football field as an example of how yards are used; doorway height for feet; inseam of pants for inches) and discuss related careers (e.g. agriculture, design, construction).

4.MD.1 (Prior Grade Standard)	6.RP.3d (Future Grade Standard)
Know relative sizes of the metric measurement units within one system of units. Metric units include kilometer, meter, centimeter, and millimeter; kilogram and gram; and liter and milliliter. Express a larger measurement unit in terms of a smaller unit. Record measurement conversions in a two-column table. For example, express the length of a 4-meter rope in centimeters. Because 1 meter is 100 times as long as a 1 centimeter, a two-column table of meters and centimeters includes the number pairs 1 and 100, 2 and 200, 3 and 300,...	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. d.) Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.MD.2	Display and interpret data in graphs (picture graphs, bar graphs, and line plots) to solve problems using numbers and operations for this grade, e.g. including U.S. customary units in fractions 1/2, 1/4, 1/8, or decimals.	**Common Misconceptions** Some students may mix up how to label graphs that include fractions and/or decimals. Care needs to be taken in teaching students the order to label them in.	**Vocabulary** ▪ Picture Graph ▪ Bar Graph ▪ Line Plots ▪ Length ▪ Mass ▪ Liquid Volume ▪ Fair Share ▪ Solve
Essential Question(s) Why is it important to draw or select an accurate graph or line plot to interpret data?			
Essential Skills	Identify benchmark fractions and decimals. Make a graph or line plot to display a data set of measurements in fractions and decimals of a unit. Solve problems involving information presented in graphs and line plots which use fractions of a unit by adding, subtracting, multiplying, and dividing fractions and decimals.		

Examples	Questions
Measure the head circumference of all the students to the nearest 1/4 inch and display the results on a line plot. Create a line plot and bar graph from the following data: 1/2; 1 1/2; 3/4; 1; 1/2; 1 1/4; 3/4; 1; 3/4; 3/4; 1; 3/4; 1 1/4.	Given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally. Three beakers hold 3 1/4 ml, 2 1/4 ml, and 1 1/2 ml. How much would each beaker contain if we distributed the liquid equally in each beaker?

Performance Level Descriptors

Limited: Make a line plot and display data sets involving halves, quarters, and eighths.
Basic: Find a sum or difference involving information presented in a line plot.
Proficient: Solve problems involving information presented in line plots.
Accelerated: Draw conclusions from line plots.
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Using a line plot to solve problems involving operations with unit fractions now includes multiplication and division. Revisit using a number line to solve multiplication and division problems with whole numbers. In addition to knowing how to use a number line to solve problems, students also need to know which operation to use to solve problems.

Use the tables for common addition and subtraction, and multiplication and division situations (Table 1 and Table 2 in the Common Core State Standards for Mathematics) as a guide to the types of problems students need to solve without specifying the type of problem. Allow students to share methods used to solve the problems. Also have students create problems to show their understanding of the meaning of each operation.

4.MD.4 (Prior Grade Standard)	6.SP.4 (Future Grade Standard)
Display and interpret data in graphs (picture graphs, bar graphs, and line plots) to solve problems using numbers and operations for this grade.	Display numerical data in plots on a number line, including dot plots (line plots), histograms, and box plots. (GAISE Model, step 3)

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.MD.3

Recognize volume as an attribute of solid measurement figures and understand concepts of volume

a. A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.

b. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.

Essential Question(s)

How do I calculate volume?

Common Misconceptions

Students may incorrectly fill figures to find volume with cubes. Students need to ensure there is no empty space included and that unit cubes are equal-sized and packed tightly in without overlaps.

Vocabulary

- Measurement
- Attribute
- Volume
- Solid Figure
- Unit Cube
- Gap
- Overlap
- Cubic Units
- Recognize

Essential Skills

Recognize that volume is the measurement of the space inside a solid three-dimensional figure.

Recognize a unit cube has 1 cubic unit of volume and is used to measure volume of three-dimensional shapes.

Recognize any solid figure packed without gaps or overlaps and filled with *n* unit cubes indicates the total cubic units or volume.

Examples	Questions
The "squares" used to measure area are different than the "cubes" needed to measure volume. Solid figures need a solid unit, a cube, to measure volume. Have students explain the concept of cubes filling a space and possibly comparing that to area where squares fill a plane.	What is the term used to find the space contained inside a container? Which of the following might be the volume of a box? A. 8 in. B. 8 square in. C. 8 cubic in. D. 8 triangle in. How many cubes measuring 1 cm on each side will fit into a box measuring 3 cm by 8 cm by 12 cm?

Performance Level Descriptors

Limited: N/A
Basic: N/A
Proficient: N/A
Accelerated: N/A
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Volume refers to the amount of space that an object takes up and is measured in cubic units such as cubic inches or cubic centimeters.

Students need to experience finding the volume of rectangular prisms by counting unit cubes, in metric and standard units of measure, before the formula is presented.

Provide multiple opportunities for students to develop the formula for the volume of a rectangular prism with activities similar to the one described below.

Give students one block (a l- or 2- cubic centimeter or cubic-inch cube), a ruler with the appropriate measure based on the type of cube, and a small rectangular box. Ask students to determine the number of cubes needed to fill the box.

4.NBT.5 (Prior Grade Standard)	6.G.4 (Future Grade Standard)
Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real- world and mathematical problems.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.MD.4	Measure volumes by counting unit cubes, using cubic cm, cubic in., cubic ft., and improvised units.	**Common Misconceptions** Students may believe that to make boxes "half the size" or "three times the size" they need to adjust each dimension (length, width, height) by half or three times. They need to investigate how the total volume is affected by changing the dimensions and determine "half" and "three time" by calculating total volume.	**Vocabulary** ▪ Volume ▪ Solid Figure ▪ Cubic Units ▪ Multiplication ▪ Addition ▪ Edge Lengths ▪ Height ▪ Area of Base ▪ Measure ▪ Count
Essential Question(s) How can I accurately find the volume of a shape?			
Essential Skills	Measure volume by counting unit cubes, cubic cm, cubic in, cubic ft., and improvised units.		

Examples	Questions
Fill a rectangular prism with various sized cubes and have students count them to estimate the volume.	Sue found she could put exactly 40 one inch cubes in a box. What is its volume?

Performance Level Descriptors

Limited: Use unit cubes to find the volume of right rectangular prisms with whole number edge lengths; Count the cubes to determine the volume;
Basic: N/A
Proficient: N/A
Accelerated: N/A
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Have students share their strategies with the class using words, drawings or numbers. Allow them to confirm the volume of the box by filling the box with cubes of the same size.

By stacking geometric solids with cubic units in layers, students can begin understanding the concept of how addition plays a part in finding volume. This will lead to an understanding of the formula for the volume of a right rectangular prism, b x h, where b is the area of the base. A right rectangular prism has three pairs of parallel faces that are all rectangles.

4.NBT.5 (Prior Grade Standard)	6.G.2 (Future Grade Standard)
Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = lwh and V = B h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

Ohio's Learning Standards-Clear Learning Targets

Math, Grade 5

5.MD.5

Relate volume to the operations of multiplication and addition and solve real-world problems involving volume.

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole- number products as volumes, e.g., to represent the Associative Property of Multiplication.

b. Apply the formulas V = l × w × h and V = B × h for rectangular prisms to find volumes f right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems.

c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

Essential Question(s)

How do I solve real world problems using volume efficiently?

Common Misconceptions

Students do not need to use the term "associative property" themselves, but they do need to understand that when you multiply three numbers, you can group them any way you want and still get the same result.

5.MD.C.5 states that students need to apply the formula $V=l\times w\times h$ to find the volume of a right rectangular prism. In fact, an expression like $2\times3\times5$ only makes sense because multiplication is associative. In other words, students must be comfortable with the idea that you can group the three factors in any way you wish and still get the same product in order to make sense of and apply this formula.

Vocabulary

- Volume
- Solid Figure
- Cubic Units
- Multiplication
- Addition
- Edge Lengths
- Height
- Area of Base
- Right Rectangular Prism
- Relate
- Apply
- Recognize

Essential Skills

Develop volume formula for a rectangle prism by comparing volume when filled with cubes to volume by multiplying the height by the area of the base, or when multiplying the edge lengths (L x W x H).

Apply the following formulas to right rectangular prisms having whole number edge lengths in the context of real world mathematical problems: Volume = length x width x height Volume = area of base x height.

Solve real world problems by decomposing a solid figure into two non-overlapping right rectangular prisms and adding their volumes.

Find the volume of a right rectangular prism with whole number side lengths by packing it with unit cubes.

Examples

Students should experience filling a rectangular prism with cubes, counting these cubes, and relating this number to the volume of the prism.

Students should discover the efficient way of counting the cubes in a rectangular prism by generalizing the short cut of multiplying the three dimensions.

Students can explain and apply the conventional formulas to find volumes of rectangular prisms in a real-world problem setting.

Have students create a new shape by putting 2 or more "boxes" together and then find the total volume.

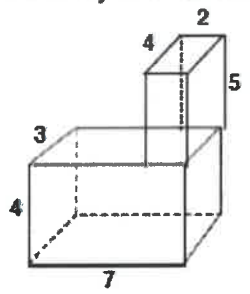
Questions

Sue found she could put exactly 40 one inch cubes in a box. What is it volume?

What is the volume of the rectangular prism that measures 23 cm by 1 cm by 18 cm?

Bill found that he could put exactly 14 one centimeter cubes to cover the bottom of a box. If the box is 7 cm high, how many one centimeter cubes will the box hold in all?

Find the total volume of the two boxes.



Performance Level Descriptors

Limited: N/A
Basic: Understand the concept that the volume of a right rectangular prism packed with unit cubes is related to the edge lengths; determine the volume.
Proficient: Use the formulas $v = l \times w \times h$ and $v = b \times h$ to find the volume of right rectangular prisms.
Accelerated: Find the volume of figures composed of two or more non-overlapping right rectangular prisms in routine real-world problems.
Advanced: Find the volume of figures composed of two or more non-overlapping right rectangular prisms in routine and non-routine real-world problems.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Have students build a prism in layers. Then, have students determine the number of cubes in the bottom layer and share their strategies. Students should use multiplication based on their knowledge of arrays and its use in multiplying two whole numbers.

Ask what strategies can be used to determine the volume of the prism based on the number of cubes in the bottom layer. Expect responses such as "adding the same number of cubes in each layer as were on the bottom layer" or multiply the number of cubes in one layer times the number of layers.

4.NBT.5 (Prior Grade Standard)

Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

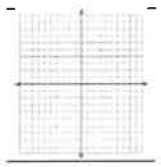
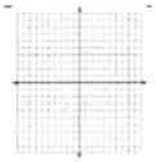
6.G.2 (Future Grade Standard)

Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = B\,h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.G.1	Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond, e.g., x-axis and x-coordinate, y-axis and y- coordinate.	**Common Misconceptions** **When playing games with coordinates or looking at maps, students may think the order in plotting a coordinate point is not important. Have students plot points so that the position of the coordinates is switched. For example, have students plot (3, 4) and (4, 3) and discuss the order used to plot the points. Have students create directions for others to follow so that they become aware of the importance of direction and distance.**	**Vocabulary** ▪ Coordinate System ▪ Coordinate Plane ▪ First Quadrant ▪ Point ▪ Lines ▪ Axis ▪ X-axis ▪ Y-axis ▪ Origin ▪ Ordered Pairs ▪ X-Coordinates ▪ Y-Coordinates ▪ Vertical ▪ Horizontal
Essentials Understanding What are the parts of the coordinate system?			

Essential Skills	Define the coordinate system. Identify the x- and y-axes. Locate the origin on the coordinate system. Identify coordinates of a point on a coordinate system. Recognize and describe the connection between the ordered pair and the x- and y-axes from the origin.

Examples	Questions
Have the student label and explain the parts of the coordinate plane. Explain how the first number effects the direction (right/left) and distance from the origin. Repeat for second number of ordered pair. The student should be able to plot an ordered pair AND when pointing to a location, state the ordered pair that names it.	Label the axis and the center of the coordinate plane shown.  Starting at the origin, explain the direction and distance you would move to plot the point (4, 7). 

Performance Level Descriptors

Limited: Graph whole-number coordinate pairs in the first quadrant of a coordinate plane.
Basic: Graph whole number coordinate pairs in the first quadrant of a coordinate grid to solve routine problems;
Proficient: Compare and analyze two related numerical patterns within sequences of ordered pairs, and graph the ordered pairs on the coordinate plane.
Accelerated: N/A
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Students need to understand the underlying structure of the coordinate system and see how axes make it possible to locate points anywhere on a coordinate plane. This is the first-time students are working with coordinate planes, and only in the first quadrant. It is important that students create the coordinate grid themselves. This can be related to two number lines and reliance on previous experiences with moving along a number line.
Multiple experiences with plotting points are needed. Provide points plotted on a grid and have students name and write the ordered pair. Have students describe how to get to the location. Encourage students to articulate directions as they plot points.

(Prior Grade Standard)	6.NS.8 (Future Grade Standard)
N/A	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.G.2	Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.	**Common Misconceptions** When playing games with coordinates or looking at maps, students may think the order in plotting a coordinate point is not important. Have students plot points so that the position of the coordinates is switched. For example, have students plot (3, 4) and (4, 3) and discuss the order used to plot the points. Have students create directions for others to follow so that they become aware of the importance of direction and distance.	**Vocabulary** ▪ Coordinate System ▪ Coordinate Plane ▪ First Quadrant ▪ Point ▪ Lines ▪ Axis ▪ X-axis ▪ Y-axis ▪ Origin ▪ Ordered Pairs ▪ X-Coordinates ▪ Y-Coordinates ▪ Represent
Essential Question(s) How can you use the coordinate graph to solve problems?			
Essential Skills	Graph points in the first quadrant. Interpret coordinate values of points in real world context and mathematical problems. Represent real world and mathematical problems by graphing points in the first quadrant.		

Examples	Questions
Students should be able to play games/activities like "Battle Ship".	John's house is located at the origin of a coordinate plane. Label his school which is 5 blocks east and 8 blocks north.

Performance Level Descriptors

Limited: N/A
Basic: N/A
Proficient: N/A
Accelerated: Solve routine real-world and mathematical problems by graphing points in the first quadrant of a coordinate grid.
Advanced: Solve non-routine real-world and mathematical problems by graphing points in the first quadrant of a coordinate grid.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Multiple experiences with plotting points are needed. Provide points plotted on a grid and have students name and write the ordered pair. Have students describe how to get to the location. Encourage students to articulate directions as they plot points.

Present real-world and mathematical problems and have students graph points in the first quadrant of the coordinate plane. Gathering and graphin data is a valuable experience for students. It helps them to develop an understanding of coordinates and what the overall graph represents.
Students also need to analyze the graph by interpreting the coordinate values in the context of the situation.

(Prior Grade Standard)	6.G.3 (Future Grade Standard)
N/A	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

Ohio's Learning Standards-Clear Learning Targets
Math, Grade 5

5.G.3	Identify and describe commonalities and differences between types of triangles based on angle measures (equiangular, right, acute, and obtuse triangles) and side lengths (isosceles, equilateral, and scalene triangles).	**Common Misconceptions** Students think that when describing geometric shapes and placing them in subcategories, the last category is the only classification that can be used.	**Vocabulary** ▪ Attribute ▪ Category ▪ Subcategory ▪ Hierarchy ▪ Properties ▪ Two Dimensional ▪ Understand ▪ Equiangular Triangle ▪ Right Triangle ▪ Acute Triangle ▪ Obtuse Triangle ▪ Isosceles Triangle ▪ Equilateral Triangle ▪ Scalene Triangle
Essential Question(s) How can the attributes of two-dimensional triangles be organized?			
Essential Skills	Recognize that some two-dimensional shapes can be classified into more than one category based on their attributes. Recognize if a two-dimensional triangle is classified into a category, that it belongs to all subcategories of that category.		

Examples	Questions
All rectangles have four right angles and squares are rectangles, so all squares have right angles.	Why is a square always a rectangle?‖ Why is a rectangle not always a square?‖

Performance Level Descriptors

Limited: N/A
Basic: Classify two-dimensional figures into categories by their attributes or properties.
Proficient: N/A
Accelerated: Classify two-dimensional figures into multiple categories and subcategories by their attributes or properties.
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Students classify two- dimensional shapes in a hierarchy based on properties. Details learned in earlier grades need to be used in the descriptions of the attributes of shapes. The more ways that students can classify and discriminate shapes, the better they can understand them.

Students can use graphic organizers such as flow charts or T-charts to compare and contrast the attributes of geometric figures. Have students create a T-chart with a shape on each side. Have them list attributes of the shapes, such as number of side, number of angles, types of lines, etc. they need to determine what's alike or different about the two shapes to get a larger classification for the shapes.

4.G.2 (Prior Grade Standard)	6.G.1 (Future Grade Standard)
Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.	Through composition into rectangles or decomposition into triangles, find the area of right triangles, other triangles, special quadrilaterals, and polygons; apply these techniques in the context of solving real-world and mathematical problems.

Ohio's Learning Standards-Clear Learning Targets
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5.G.4	Identify and describe commonalities and differences between types of quadrilaterals based on angle measures, side lengths, and the presence or absence of parallel and perpendicular lines, e.g., squares, rectangles, parallelograms, trapezoids, and rhombuses.	**Common Misconceptions** Students think that when describing geometric shapes and placing them in subcategories, the last category is the only classification that can be used.	**Vocabulary** ▪ Attribute ▪ Category ▪ Subcategory ▪ Properties ▪ Two-Dimensional ▪ Classify ▪ Quadrilateral ▪ Parallel Lines ▪ Perpendicular Lines ▪ Parallelogram ▪ Trapezoid ▪ Rhombus
Essential Question(s) How can the attributes of two-dimensional quadrilateral figures be organized?			
Essential Skills	Recognize that some two-dimensional shapes can be classified into more than one category based on their attributes. Recognize if a two-dimensional quadrilateral is classified into a category, that it belongs to all subcategories of that category.		

Examples	Questions
Quadrilaterals → Parallelograms → Rectangles → Squares	Name the three groups of quadrilaterals that a square belongs to.

Performance Level Descriptors

Limited: N/A
Basic: Classify two-dimensional figures into categories by their attributes or properties.
Proficient: N/A
Accelerated: Classify two-dimensional figures into multiple categories and subcategories by their attributes or properties.
Advanced: N/A

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Students classify two- dimensional shapes in a hierarchy based on properties. Details learned in earlier grades need to be used in the descriptions of the attributes of shapes. The more ways that students can classify and discriminate shapes, the better they can understand them.

Students can use graphic organizers such as flow charts or T-charts to compare and contrast the attributes of geometric figures. Have students create a T-chart with a shape on each side. Have them list attributes of the shapes, such as number of side, number of angles, types of lines, etc. they need to determine what's alike or different about the two shapes to get a larger classification for the shapes.

Pose questions such as, "Why is a square always a rectangle?" and "Why is a rectangle not always a square?"

4.G.2 (Prior Grade Standard)	6.G.1 (Future Grade Standard)
Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.	Through composition into rectangles or decomposition into triangles, find the area of right triangles, other triangles, special quadrilaterals, and polygons; apply these techniques in the context of solving real-world and mathematical problems.