Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.OA.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. See Table 1 of the Standards.

Essential Understandings

- Real-world and mathematical situations can be represented using drawings and equations.
- An unknown can be in any position of a mathematical situation.

Common Misconceptions

Some students end their solution to a two-step problem after they complete the first step.

Students can misunderstand the use of the equal sign even if they have proficient computational skills. The equal sign means "is the same as" but most primary students think that the equal sign tells you that the "answer is coming up."

Students might rely on a key word or phrase in a problem to suggest an operation that will lead to an incorrect solution. For example, they might think that the word left always means that subtraction must be used to find a solution. Students need to solve problems where keywords are contrary to such thinking. It is important that students avoid using keywords to solve problems.

Academic Vocabulary/ Language

- add
- subtract
- adding to
- comparing
- unknown number
- equation
- symbol

Tier 2

- represent
- solve
- explain

Learning Targets	I can solve real-world multi-step problems by applying addition and subtraction concepts. I can apply adding to and taking from strategies when solving addition and subtraction problems with two numbers between 0 and 100. When solving real-world addition and subtractions problems, I can construct a model or drawing to represent the problem to explain the solution for the unknown in all positions.

Assessment of Learning

- Students will use addition and subtraction within 100 to solve real world problems involving one and two steps.
- Students will solve addition and subtraction problems within 100 with the unknown in all positions.
- Students will use drawings and equations to represent their solutions.
- Students will write equations to explain their solutions, using a symbol to represent the unknown.

Sample Questions/Activities

1. Some students are in the cafeteria. 24 more students came in. Now there are 60 students in the cafeteria. How many were in the cafeteria to start with? Use drawings and equations to show your thinking.
2. DeSean's teacher wrote this equation on the board: 65 - ▲ = 21. Write a story problem that could be represented using this equation. Be prepared to explain your thinking.
3. Carrie has 15 fewer grapes in her bowl then Beth. Beth has 32 grapes in her bowl. How many grapes does Carrie have in her bowl? Use drawings and equations to show your thinking.
4. Todd set a goal of reading 100 pages this week. He read 23 pages yesterday and 42 pages today. How many more pages does Todd need to read to meet his goal? Use drawings and equations to show your thinking.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Students now build on their work with one-step problems to solve two-step problems. Second graders need to model and solve problems for all the situations shown in Table 1 and represent their solutions with equations. The problems should involve sums and differences less than or equal to 100 using the numbers 0 to 100. It is vital that students develop the habit of checking their answer to a problem to determine if it makes sense for the situation and the questions being asked. Ask students to write word problems for their classmates to solve. Start by giving students the answer to a problem. Then tell students whether it is an addition or subtraction problem situation. Also let them know that the sums and differences can be less than or equal to 100 using the numbers 0 to 100. For example, ask students to write an addition word problem for their classmates to solve which requires adding four two-digit numbers within 100 as the answer. Students then share, discuss and compare their solution strategies after they solve the problems. Encourage students to represent problems using equations that include a symbol for the unknown.

TABLE 1. COMMON ADDITION ADDITION AND SUBTRACTION SITUATIONS.

	RESULT UNKNOWN	CHANGE UNKNOWN	START UNKNOWN
ADD TO	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? 2 + 3 = ?	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? 2 + ? = 5	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? ? + 3 = 5
TAKE FROM	Five apples were on the table. I ate two apples. How many apples are on the table now? 5 – 2 = ?	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? 5 – ? = 3	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? ? – 2 = 3
	TOTAL UNKNOWN	**ADDEND UNKNOWN**	**BOTH ADDENDS UNKNOWN[1]**
PULL TOGETHER/ TAKE APART[2]	Three red apples and two green apples are on the table. How many apples are on the table? 3 + 2 = ?	Five apples are on the table. Three are red and the rest are green. How many apples are green? 3 + ? = 5, 5 – 3 = ?	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? 5 = 0 + 5, 5 = 5 + 0 5 = 1 + 4, 5 = 4 + 1 5 = 2 + 3, 5 = 3 + 2
	DIFFERENCE UNKNOWN	**BIGGER UNKNOWN**	**SMALLER UNKNOWN**
COMPARE[3]	("How many more?" version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? ("How many fewer?" version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? 2 + ? = 5, 5 – 2 = ?	(Version with "more"): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? (Version with "fewer"): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? 2 + 3 = ?, 3 + 2 = ?	(Version with "more"): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have? (Version with "fewer"): Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have? 5 – 3 = ?, ? + 3 = 5

[1] These take apart situations can be used to show all the decompositions of a given number. The associated equations, which have the total on the left of the equal sign, help children understand that the = sign does not always mean "makes" or "results in" but always does mean "is the same number as."

[2] Either addend can be unknown, so there are three variations of these problem situations. *Both Addends Unknown* is a productive extension of this basic situation, especially for small numbers less than or equal to 10.

[3] For the *Bigger Unknown* or *Smaller Unknown* situations, one version directs the correct operation (the version using more for the *Bigger Unknown* and using less for the *Smaller Unknown*). The other versions are more difficult.

Ohio | Department of Education

Connections Across Standards

Students will apply place value strategies (2.NBT.4-6, 9).

Connect to measurement and data (2.MD.5-6, 8, 10).

1.NBT.4 (Prior Grade Standard) Add within 100, including adding a two-digit number and a one-digit number and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; record the strategy with a written numerical method (drawings and, when appropriate, equations) and explain the reasoning used. Understand that when adding two-digit numbers, tens are added to tens; ones are added to ones; and sometimes it is necessary to compose a ten.	**3.NBT.2 (Future Grade Standard)** Fluently add and subtract within 1,000 using strategies and algorithms [G] based on place value, properties of operations, and/or the relationship between addition and subtraction.

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.OA.2 Fluently [G] add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers. See standard 1.OA.6 for a list of mental strategies. **Essential Understanding** ● Fluency means being efficient, accurate, and flexible with addition and subtraction strategies.	**Common Misconceptions** Students may overgeneralize the idea that answers to addition problems must be bigger. Adding 0 to any number results in a sum that is equal to that number. Provide word problems involving 0 and have students model them using drawings with an empty space for 0. Students are usually proficient when they focus on a strategy relevant to particular facts. When these facts are mixed with others, students may revert to counting as a strategy and ignore the efficient strategies they learned. Provide a list of facts from two or more strategies and ask students to name a strategy that would work for that fact. Students explain why they chose that strategy then show how to use it.	**Academic Vocabulary/ Language** ▪ add ▪ subtract ▪ sum ▪ mental strategies **Tier 2** ▪ fluently
Learning Targets	I can add and subtract numbers within 20 applying accurate and efficient mental strategies.	

Assessment of Learning

- Students will use mental strategies to fluently add and subtract within 20.
- Students will develop mental addition and subtraction strategies that are efficient, accurate and flexible.
- Students will work towards memorization of all sums of two one-digit numbers by the *end* of second grade.

Sample Questions/Activities

1. Mrs. Malone posted the problem 9 + 5 on the board and asked her students to solve the problem using a mental strategy. Kevin said, "I started at 9 and counted 5 more. I got an answer of 14." Ryan said, "I know that 9 and 1 is 10, so I broke 5 into 1 and 4. 9 and 1 is 10. Then I added 4 more and got an answer of 14." Are Kevin and Ryan correct? Which strategy do you like more? Explain.
2. Solve the problem 13 - 9 two different ways. Explain each strategy. Then choose the strategy you think is the most efficient and explain why.
3. How could you use the problem 8 + 4 = 12 to solve the problem 12 - 8 = ▲? Explain your thinking.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Provide many activities that will help students develop a strong understanding of number relationships, addition and subtraction so they can develop, share and use efficient strategies for mental computation. An efficient strategy is one that can be done mentally and quickly. Students gain computational fluency, using efficient and accurate methods for computing, as they come to understand the role and meaning of arithmetic operations in number systems. Efficient mental processes become automatic with use.

Provide activities in which students apply the commutative and associative properties to their mental strategies for sums less than or equal to 20 using the numbers 0 to 20.

Have students study how numbers are related to 5 and 10 so they can apply these relationships to their strategies for knowing 5 + 4 or 8 + 3. Students might picture 5 + 4 on a ten-frame to mentally see 9 as the answer. bFor remembering 8 + 7, students might think "since 8 is 2 away from 10, take 2 away from 7 to make 10 + 5 = 15."

Provide opportunities for students to share their strategies with one another. Explain to students that their goal is to have addition and subtraction strategies that are accurate, efficient and flexible. Thinking critically about the strategies that their classmates share will help students to find strategies that make sense. Make posters for student-developed mental strategies for addition and subtraction within 20. Use names for the strategies that make sense to the students and include examples of the strategies.

Present a particular strategy along with the specific addition and subtraction facts relevant to the strategy. Have students use objects and drawings to explore how these facts are alike.

<table>
<tr><td colspan="2">Connections Across Standards
Apply addition and subtraction to length (2.MD.5-6).
Apply addition and subtraction using money (2.MD.8).
Apply addition and subtraction to interpreting data. See Table 1, page 95. (2.MD.10).
Explain and apply addition and subtraction strategies, place value, and properties of operations (2.NBT.9).
Fluently add and subtract within 100 (2.NBT.5).</td></tr>
<tr><td>1.OA.6 (Prior Grade Standard)
Add and subtract within 20, demonstrating fluency [G] with various strategies for addition and subtraction within 10. Strategies may include counting on; making ten, e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14; decomposing a number leading to a ten, e.g., 13 − 4 = 13 − 3 − 1 = 10 − 1 = 9; using the relationship between addition and subtraction, e.g., knowing that 8 + 4 = 12, one knows 12 − 8 = 4; and creating equivalent but easier or known sums, e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13.</td><td>3.NBT.2 (Future Grade Standard)
Fluently add and subtract within 1,000 using strategies and algorithms [G] based on place value, properties of operations, and/or the relationship between addition and subtraction.</td></tr>
</table>

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.OA.3 Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.	**Common Misconceptions** Knowing that even numbers end in 0, 2, 4, 6, 8 or odd numbers end in 1, 3, 5, 7, and 9 does not ensure that students understand the meaning of evenness. An example of this is a child may say that 358 is odd because you can pair 3 and 5 and 8 is leftover.	**Academic Vocabulary/ Language** · odd · even · equation · sum · addend **Tier 2** · determine · object · paring · express
Essential Understandings ● Whole numbers are odd or even. ● When pairing an even numbered group of objects, no members are left over. ● When pairing an odd numbered group of objects, one member is left over. An even number may be decomposed into two equal addends, e.g., 10 = 5 + 5; 8 = 4 + 4.		
Learning Targets	Construct a model of equal groups or an array to explain the mathematical concept of odd and even numbers. Apply the conceptual understanding of odd and even to reason about the solution when pairing an odd numbered group of objects or when decomposing an even numbered group into two equal addends. I can explain to another person what "even" means using objects and an equation that shows the even number as a sum of two equal addends.	

Assessment of Learning

- Students will determine whether a group of objects (up to 20) has an odd or even number of members.
- Students will use different strategies to determine if a number is even or odd, including pairing up objects, counting objects by 2's, or expressing an even number as a sum of two equal addends.
- Students will understand that all whole numbers are even or odd.

Sample Questions/Activities

1. Is 18 an even or odd number? Prove your answer two different ways.
2. Mr. Scott is teaching line dancing this week in P.E. Each student needs a partner to learn line dancing. If Mrs. Johnson's homeroom has 25 students, will each student have a partner? Why or why not? Explain your thinking.
3. I'm thinking of a secret number. The number has two digits. The number is greater than 10 but less than 20. The number is an odd number. The sum of the digits is 8. What is my secret number?

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Students need to understand that a collection of objects can be one thing (a group) and that a group contains a given number of objects. Investigate separating no more than 20 objects into two equal groups. Find the numbers (the total number of objects in collections up to 20 members) that will have some objects and no objects remaining after separating the collections into two equal groups. Students should understand that all whole numbers are either even or odd. Odd numbers will have some objects remaining while even numbers will not. For an even number of objects in a collection, show the total as the sum of equal addends (repeated addition).

Connections Across Standards

Skip count by tens, fives, and hundreds (2.NBT.2).
Partition rectangles into rows and columns (2.G.2).
Skip count with pennies, nickels, and dimes (2.MD.8).
Tell time to the nearest five minutes (2.MD.7).

1.OA.5 (Prior Grade Standard)	**3.NBT.2 (Future Grade Standard)**
Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).	Fluently add and subtract within 1,000 using strategies and algorithms [G] based on place value, properties of operations, and/or the relationship between addition and subtraction.

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.OA.4 Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.	**Common Misconceptions** Students may confuse the terms row and column and interchange them when writing a repeated addition sentence. The focus should be on the repeated addition of the representation.	**Academic Vocabulary/ Language** ▪ total ▪ addition ▪ rectangular arrays ▪ equation ▪ sum ▪ addend **Tier 2** ▪ rows ▪ columns ▪ express
Essential Understandings ● Each row in an array has an equal number of objects. ● Each column in an array has an equal number of objects. ● Adding rows or columns of an array will result in the same solution. ● The number of objects in an array is the same when the array is turned (rotated).		

Learning Targets	I construct an array by showing equal rows and equal columns. I can apply the understanding of an array of equal rows and equal columns to repeated addition. I can explain how the orientation of the rows and columns does not change the results of repeated addition. I can write an equation to find the number of objects in an array.

Assessment of Learning

- Students will understand an array is arranged in equal rows and columns.
- Students will understand that the total number of objects in an array can be found using repeated addition (e.g., 5 + 5 + 5 = 15) or by skip counting (e.g., 5, 10, 15).
- Students will understand that turning or rotating an array will change the repeated addition sentence (e.g., 4 + 4 + 4 vs 3 + 3 + 3 + 3) but not the total number of objects.

Sample Questions/Activities

1. Mr. Seabrook asked his students to use 12 tiles to make a rectangular array. Lou and Patrick each made an array and showed Mr. Seabrook. Mr. Seabrook said, "Your arrays are different but you are both correct." How is this possible? Explain.
2. Is 4 rows of 5 objects equal to 5 rows of 4 objects? Explain your thinking.
3. Look at the array below. Write two different equations that could be used to find the total number of dots in the array.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

A rectangular array is an arrangement of objects in horizontal rows and vertical columns. Arrays can be made out of any number of objects that can be put into rows and columns. All rows contain the same number of items and all columns contain an equal number of items. Have students use objects to build all the arrays possible with no more than 25 objects. Their arrays should have up to 5 rows and up to 5 columns. Students should understand that rotating an array does not change the total number of objects in the array. Ask students to draw the arrays on grid paper and write two different equations under the arrays: one showing the total as a sum by rows and the other showing the total as a sum by columns. Both equations will show the total as a sum of equal addends.

The equation by rows: 20 = 5 + 5 + 5 +5

The equation by columns: 20 = 4 + 4 + 4 + 4 + 4

Connections Across Standards

Skip count by tens, fives, and hundreds (2.NBT.2).
Partition rectangles into rows and columns (2.G.2).
Skip count with pennies, nickels, and dimes (2.MD.8).

1.NBT.4 (Prior Grade Standard) Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, 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. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.	**3.OA.7 (Future Grade Standard)** Fluently [G] multiply and divide within 100, using strategies such as the relationship between multiplication and division, e.g., knowing that $8 \times 5 = 40$, one knows $40 \div 5 = 8$, or properties of operations. Limit to division without remainders. By the end of Grade 3, know from memory all products of two one-digit numbers.

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.NBT.1

Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones.

Understanding the following as special cases:
a. 100 can be thought of as a bundle of ten tens — called a "hundred."
b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

Essential Understandings

- A group of ten tens is now referred to as a "hundred."
- A three-digit number is made up of hundreds, tens, and ones.
- A numeral can stand for a different amount depending on its place or position in a number.
- The digits to the left hold a larger value than the digit(s) to the right.

Common Misconceptions

Some students may not move beyond thinking of the number 358 as 300 ones plus 50 ones plus 8 ones to the concept of 8 singles, 5 bundles of 10 singles or tens, and 3 bundles of 10 tens or hundreds. Use base-ten blocks to model the collecting of 10 ones (singles) to make a ten (a rod) or 10 tens to make a hundred (a flat). It is important that students connect a group of 10 ones with the word ten and a group of 10 tens with the word hundred.

Academic Vocabulary/ Language

- digit
- hundreds
- tens
- ones
- bundle

Tier 2

- represent

Learning Targets	I understand that the three digits of a three-digit number represent hundreds, tens, and ones. I can illustrate that ten tens can be combined to make a hundred. I can model that hundreds (e.g., 100, 200, 300, etc.) are made up of 1, 2, 3, etc. hundreds, 0 tens, and 0 ones. I can explain how a numeral can stand for a different amount depending on its place or position in a number by using a model to represent the number.

Assessment of Learning

- Students will understand that three-digit numbers have three digits because the number is made up of hundreds, tens and ones.
- Students will decompose and represent three-digit numbers using proportional objects, such as base ten blocks, beans and sticks, etc.
- Students will understand that place determines value (e.g. The digit 3 in the ones place has a value of 3, while the digit 3 in the hundreds place has a value of 300.)
- Students will understand that digits to the left have a larger value than digits to the right.

Sample Questions/Activities

1. Taylor was carrying base ten blocks back to her desk when she dropped them and the blocks spilled onto the floor. As she cleaned up the blocks, Taylor counted 15 rods (tens), 36 unit cubes (ones) and 3 flats (hundreds). What is the value of the blocks that Taylor cleaned up off of the floor? How do you know?
2. Use base ten blocks to represent the number 325 in two different ways. Explain how you know both ways represent the same number.
3. Joe wrote the number 4 on his paper. He said by adding a 0 to the right of the 4 he could make the value of the 4 ten times bigger. Do you agree or disagree? Why?

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

The understanding that 100 is 10 tens or 100 ones is critical to the understanding of place value. Students should understand that the place of a digit determines the value of a digit. Zero doesn't have a value itself, but serves as a placeholder. Adding a zero to a number makes that number ten times bigger because it causes all of the digits to shift one place to the left. Using proportional models like base-ten blocks and bundles of tens along with numerals on place-value mats provides connections between physical and symbolic representations of a number. These models can be used to compare two numbers and identify the value of their digits. Students should have experience modeling three-digit numbers using base-ten blocks in multiple ways. For example, 236 can be 236 ones, or 23 tens and 6 ones, or 2 hundreds, 3 tens and 6 ones, or 20 tens and 36 ones. Use activities and games that have students match different representations of the same number.

Connections Across Standards

When adding and subtracting students should use place value understanding of hundreds, tens, and ones (2.NBT.6-9).
Using pennies, nickels, and dimes to further place value understanding (2.MD.8).
Use repeated addition of 5 (2.OA.4).
Represent and interpret data (2.MD.10).

1.NBT.2 (Prior Grade Standard)	**3.NBT.2 (Future Grade Standard)**
Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases: 10 can be thought of as a bundle of ten ones — called a "ten;" the numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones; and the numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).	Fluently add and subtract within 1,000 using strategies and algorithms [G] based on place value, properties of operations, and/or the relationship between addition and subtraction.

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.NBT.2 Count forward and backward within 1,000 by ones, tens, and hundreds starting at any number; skip-count by 5's starting at any multiple of 5.	**Common Misconceptions** Students may struggle to skip count when starting at a different number. For example, when they try to count by 10's starting at 23 or by counting by 5's beginning at 65. This is a great skill to practice when you have extra minutes throughout the day. Using a 100's chart as well as a 300's chart helps students recognize patterns when counting	**Academic Vocabulary/ Language** ▪ ones ▪ tens ▪ hundreds ▪ multiple **Tier 2** ▪ count ▪ skip-count
Essential Understanding ● Skip counting is a repeating pattern.		

Learning Targets	I can count forward or backward by ones, tens, and hundreds within 1,000. I can skip count by 1's, 10's and 100's starting at any number. I can extend the pattern of skip counting by 5's up to 1,000 starting at any multiple of 5.

Assessment of Learning

- Students will count forward or backward by ones, tens and hundreds within 1,000.
- Students will be able to count by 1's, 10's or 100's starting at any number within 1,000.
- Students will be able to count by 5's starting at any multiple of 5 within 1,000.
- Students will understand that skip counting is a repeating pattern.
- Students will use the patterns they see in skip counting to predict the next number in a sequence.

Sample Questions/Activities

1. Destiny was skip counting by 100's using base ten blocks. She said, "356, 456…" What were the next three numbers Destiny said? Explain.
2. Gina has a piggy bank full of nickels. She counted all of the nickels and counted to 245. Then Gina found 4 more nickels. What number did Gina end on when she counted 4 more nickels? How do you know?
3. Look at the following numbers: 40, 31, 53, 65, 80, 22
   How could you know, without actually counting, which of the numbers you would say, if you started at 5 and skip counted by 5's? Prove your answer.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Students should have lots of opportunities to practice skip counting. Starting at numbers other than 1, 5 or 10 to skip count helps build an understanding of skip counting. Students can begin to see skip counting as a repeating pattern by looking at the numbers students say as they count by 5's or 10's. Provide games and other situations that allow students to practice counting and skip-counting, both forward and backward. Students can use nickels, dimes and dollar bills to skip count by 5, 10 and 100. Pictures of the coins and bills can be attached to models familiar to students: a nickel on a five-frame with 5 dots or pennies and a dime on a ten-frame with 10 dots or pennies.

Provide games and other situations that allow students to practice skip-counting. Students can use nickels, dimes and dollar bills to skip count by 5, 10 and 100. Pictures of the coins and bills can be attached to models familiar to students: a nickel on a five-frame with 5 dots or pennies and a dime on a ten-frame with 10 dots or pennies.

Connections Across Standards

When adding and subtracting students should use place value understanding of hundreds, tens, and ones (2.NBT.6-9).
Tell time to nearest five minutes (2.MD.7).
Using pennies, nickels, and dimes to further place value understanding (2.MD.8).
Use repeated addition of 5 (2.OA.4).
Represent and interpret data (2.MD.10).

1.NBT.5 (Prior Grade Standard) Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used. **1.NBT.6** Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), 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.	**3.NBT.2 (Future Grade Standard)** Fluently add and subtract within 1,000 using strategies and algorithms [G] based on place value, properties of operations, and/or the relationship between addition and subtraction.

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.NBT.3

Read and write numbers to 1,000 using base-ten numerals, number names, expanded form [G], and equivalent representations, e.g., 716 is 700 + 10 + 6, or 6 + 700 + 10, or 6 ones and 71 tens, etc.

Essential Understandings

- Words can be used to represent numbers.
- When there are no ones and/or tens, the digit zero must be used in that ones and/or tens place to preserve the value of the number.
- Three-digit numbers can be composed and decomposed using multiple representations.
- Numbers written in expanded form can be expressed as an equation.
- Numbers have equivalent representations.

Common Misconceptions

Some students may not move beyond thinking of the number 358 as 300 ones plus 50 ones plus 8 ones to the concept of 8 singles, 5 bundles of 10 singles or tens, and 3 bundles of 10 tens or hundreds. Use base-ten blocks to model the collecting of 10 ones (singles) to make a ten (a rod) or 10 tens to make a hundred (a flat). It is important that students connect a group of 10 ones with the word ten and a group of 10 tens with the word hundred.

Academic Vocabulary/ Language

- base-ten numerals
- number names
- expanded form
- equivalent representations
- ones
- tens
- hundred

Tier 2

- explain

Learning Targets

I can read and write any number from 1 to 1,000 using base-ten numerals, number names, or expanded form.
I can read and create equivalent representations of numbers, such as 716 is 700 + 10 + 6 or 6 ones and 71 tens, etc.
When translating the word form of numbers to numerals, I can explain why the digit zero must be used in the ones and/or tens place to preserve the value of the number when there are no ones and/or tens in the number.

Assessment of Learning

- Students will understand that there are multiple ways to represent numbers.
- Students will understand that numbers can be represented using words, models, equivalent equations, etc.
- Students will understand the important role of zero as a place holder. When a number has no tens or ones, the zero must be used to preserve the value of the number.
- Students will understand how to represent a number in expanded form.

Sample Questions/Activities

1. Represent the number 283 three different ways.
2. Rosa cleaned up the base ten blocks from the math center. She picked up flats with a value of 400, rods with a value of 80 and unit cubes with a value of 6. What is the total value of the blocks Rosa cleaned up? Explain.
3. Jake represented the number 480 using 48 tens. Amy represented 480 by using 4 hundreds and 80 ones. Who is correct? How do you know?

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

The understanding that 100 is 10 tens or 100 ones is critical to the understanding of place value. Using proportional models like base-ten blocks and bundles of tens along with numerals on place-value mats provides connections between physical and symbolic representations of a number. Writing a number in expanded form (e.g., 215 as 200 + 10 + 5) helps students to further deepen their understanding of place value. These models can be used to compare two numbers and identify the value of their digits. Model three-digit numbers using base-ten blocks in multiple ways. For example, 236 can be 236 ones, or 23 tens and 6 ones, or 2 hundreds, 3 tens and 6 ones, or 20 tens and 36 ones. Use activities and games that have students match different representations of the same number, finding equivalent representations.

Connections Across Standards

When adding and subtracting students should use place value understanding of hundreds, tens, and ones (2.NBT.6-9).
Tell time to nearest five minutes (2.MD.7).
Using pennies, nickels, and dimes to further place value understanding (2.MD.8).
Use repeated addition of 5 (2.OA.4).
Represent and interpret data (2.MD.10).

1.NBT.2 (Prior Grade Standard)	**3.NBT.2 (Future Grade Standard)**
Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases: 10 can be thought of as a bundle of ten ones — called a "ten;" the numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones; and the numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).	Fluently add and subtract within 1,000 using strategies and algorithms [G] based on place value, properties of operations, and/or the relationship between addition and subtraction.

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.NBT.4

Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.

Essential Understandings

- Numbers have equivalent representations.
- Numbers can be compared.
- Symbols >, =, and < can be used to record the comparison between numbers.
- When comparing numbers, start with the greatest place value.

Common Misconceptions

The use of the learning aids (such as alligator mouth) must be accompanied by the connection to the symbols: < (less than), > (greater than), and = (equal to). More importantly, students need to begin to develop the understanding between comparing numbers and place value. In Grade 2, it means that this number has more hundreds, or the same number of hundreds, but with more tens, making it greater. Finally, students need to begin to understand that both inequality symbols (<. >) can create true statements about any two numbers where one is greater/smaller than the other, (15 < 28 and 28 >15).

Academic Vocabulary/ Language

- hundreds
- tens
- ones
- less than <
- greater than >
- equal =

Tier 2

- compare
- record

Learning Targets	I can explain how the value of the digits in a three digit number changes with their placement. I can compare 3-digit numbers using >, =, and < by observing the value of their digits.

Assessment of Learning

- Students will understand that they can use their understanding of place value to compare numbers.
- Students will understand that when comparing numbers they should start with the greatest place value.
- Students will understand that the symbols >, < or = can be used to record the comparison.

Sample Questions/Activities

1. Charles has 586 stickers in his collection. Terry has 568 stickers in his collection. Who has more stickers? How do you know?
2. Brianna and Harper were working together to compare 901 and 309. Brianna said they only had to compare the digits in the hundreds place and since 9 is greater than 3 she knew 901 > 309. Do you agree or disagree? Why?
3. Claire has 248 jelly beans. Milo has more jelly beans than Claire. Finn has less jelly beans than Claire. Jasper has the same number of jelly beans as Claire. How many jelly beans could each kid have? Represent each comparison using the symbols >, < or =. Explain.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Students should understand that numbers can be compared. Students should have opportunities to use place value understanding to compare numbers. The comparisons can be recorded using the symbols >, < or =. On a number line, have students use a clothespin or marker to identify the number that is ten more than a given number or five more than a given number. Have students create and compare all the three-digit numbers that can be made using numbers from 0 to 9. For instance, using the numbers 1, 3, and 9, students will write the numbers 139, 193, 319, 391, 913 and 931. When students compare the numerals in the hundreds place, they should conclude that the two numbers with 9 hundreds would be greater than the numbers showing 1 hundred or 3 hundreds. When two numbers have the same digit in the hundreds place, students need to compare their digits in the tens place to determine which number is larger.

Connections Across Standards

When adding and subtracting students should use place value understanding of hundreds, tens, and ones (2.NBT.6-9).
Tell time to nearest five minutes (2.MD.7).
Using pennies, nickels, and dimes to further place value understanding (2.MD.8).
Use repeated addition of 5 (2.OA.4).
Represent and interpret data (2.MD.10).

1.NBT.3 (Prior Grade Standard)	**3.NBT.1 (Future Grade Standard)**
Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.	Use place value understanding to round whole numbers to the nearest 10 or 100.

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.NBT.5

Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

Essential Understandings

- When adding and subtracting numbers, the place and value of the digits is important for determining either the sum or the difference.
- The digit in the ones place will remain the same when finding 10 more or 10 less.
- There is a relationship between addition and subtraction.
- When adding or subtracting, sometimes it is necessary to compose or decompose tens or hundreds.
- Fluency is being efficient, accurate, and flexible with addition and subtraction strategies

Common Misconceptions

When adding two-digit numbers, some students might start with the digits in the ones place and record the entire sum. Then they add the digits in the tens place and record this sum.

When subtracting two-digit numbers, students might start with the digits in the ones place and subtract the smaller digit from the larger digit. Then they move to the tens and the hundreds places and subtract the smaller digits from the larger digits.

Academic Vocabulary/ Language

- addition
- subtraction
- efficiency
- accurately
- relationship
- place value
- operations

Tier 2

- explain
- solve

Learning Targets

I can add and subtract within 100 efficiently and accurately using a variety of strategies.
I can apply my understanding of the relationship between addition and subtraction to use as a strategy when adding and subtracting within 100.
I can use the strategy of breaking numbers apart or putting numbers together to make numbers easier when adding and subtracting.

Assessment of Learning

- Students will use strategies based on place value to add and subtract within 100.
- Students will demonstrate fluency by using accurate, efficient and flexible strategies to add and subtract within 100.
- Students will use the relationship between addition and subtraction to fluently add and subtract within 100.

Sample Questions/Activities

1. One of your classmates solved the problem 56 - 34 = ? and shared their strategy. They said, "I know that I need to add 2 to the number 4 to get 6. I also know that I need to add 20 to 30 to get 50. So, the answer is 22." Is your classmate correct? Explain why or why not.
2. Solve the problem 48 + 27 two different ways. Choose the strategy you think is the most efficient and explain why.
3. Look at the student's work below. Is their work correct? Why or why not? If the work is not correct, what mistake did the student make and how could you fix it? Explain.

Step One:	Step Two:
38	38
+54	+54
12	812

4. Provide students with opportunities to use strategies such as these to add and subtract within 100.
   Place Value Strategy*: I broke 67 and 25 into tens and ones. 6 tens plus 2 tens equals 8 tens. Then, I added the ones. 7 ones plus 5 ones equals 12 ones. Then I combined my tens and ones. 8 tens plus 12 ones equals 92.*
   Decomposing into Tens*: I decided to start with 67 and break 25 apart. I knew I needed 3 more to get 70, so I broke off a 3 from the 25. I then added my 20 from the 22 left and got to 90. I had 2 left. 90 plus 2 is 92. So, 67 + 25 = 92.*
   Commutative Property: *I broke 67 and 25 into tens and ones so I had to add 60 + 7 + 20 + 5. I added 60 and 20 first to get 80. Then I added 7 to get 87. Then I added 5 more. My answer is 92.*

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Students should use their understanding of place value to develop fluency in addition and subtraction within 100. Fluency is being efficient, accurate, and flexible with addition and subtraction strategies. Students must understand that when adding or subtracting two-digit numbers, tens are added or subtracted from tens, ones are added or subtracted from ones. Provide problems that help students to discover that when adding or subtracting, sometimes it is necessary to compose or decompose tens or hundreds. Dedicated problem solving time and allowing students to share their strategies with one another will help students to see that there are a variety of accurate strategies. Exposure to multiple strategies helps students to see that there are multiple strategies that arrive at the same correct solution. Listening to their peers' strategies and asking questions about those strategies helps students to find strategies that make sense to them.

Connections Across Standards

Solve one- and two-step word problems within 100 (2.OA.1).

<table>
<tr><td colspan="2">Fluently add and subtract within 20 (2.OA.2).
Understand that the three digits of a three-digit number represents hundreds, tens, and ones (2.NBT.1).
Solve problems involving length (2.MD.5).
Solve problems with money (2.MD.8).
Solve problems involving data (2.MD.10).</td></tr>
<tr><td>1.OA.6 (Prior Grade Standard)
Add and subtract within 20, demonstrating fluency [G] with various strategies for addition and subtraction within 10. Strategies may include counting on; making ten, e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14; decomposing a number leading to a ten, e.g., 13 − 4 = 13 − 3 − 1 = 10 − 1 = 9; using the relationship between addition and subtraction, e.g., knowing that 8 + 4 = 12, one knows 12 − 8 = 4; and creating equivalent but easier or known sums, e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13.</td><td>3.NBT.2 (Future Grade Standard)
Fluently add and subtract within 1,000 using strategies and algorithms [G] based on place value, properties of operations, and/or the relationship between addition and subtraction.</td></tr>
</table>

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.NBT.6	Add up to four two-digit numbers using strategies based on place value and properties of operations.	**Common Misconceptions** When adding two-digit numbers, some students might start with the digits in the ones place and record the entire sum. Then they add the digits in the tens place and record this sum.	**Academic Vocabulary/ Language** ▪ add ▪ subtract ▪ two-digit number ▪ place value ▪ operations **Tier 2** ▪ solve
Essential Understandings ● When adding and subtracting numbers, the place and value of the digits is important for determining either the sum or the difference. ● The digit in the ones place will remain the same when finding 10 more or 10 less. ● The digits in the tens place and the ones place will remain the same when finding 100 more or 100 less.			
Learning Targets	I can apply a variety of strategies based on place value and properties of operations when I add up to four two-digit numbers.		

Assessment of Learning

- Students will add up to four two-digit numbers using a variety of strategies.
- Students will use their understanding of place value to add up to four two-digit numbers.
- Students will explain, listen to, and ask questions about strategies that are shared.
- Students will understand that sometimes they need to compose or decompose a ten to solve the problem.

Sample Questions/Activities

1. James said he could use what he knows about making 10 to solve the problem 32 + 7 + 8 + 23. How could making ten help you solve this problem efficiently? Explain your thinking.
2. Solve the problem 43 + 34 + 57 using two different strategies. Choose the strategy you think is more efficient and explain why.
3. Mrs. Ramone's class is collecting canned food for the school Food Drive. On Monday, they collected 22 cans. On Tuesday, they collected 36 cans. On Wednesday, they collected 18 cans. On Thursday, they collected 24 cans. How many total cans did Mrs. Ramone's class collect? Show your work and explain your thinking.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Initially, students apply base-ten concepts and use direct modeling with physical objects or drawings to find different ways to solve problems. They move to inventing strategies that do not involve physical materials or counting by ones to solve problems. Student-invented strategies likely will be based on place-value concepts, the commutative and associative properties, and the relationship between addition and subtraction. These strategies should be done mentally or with a written record for support. It is vital that student-invented strategies be shared, explored, recorded and tried by others. Recording the expressions and equations in the strategies horizontally encourages students to think about the numbers and the quantities they represent instead of the digits. Not every student will invent strategies, but all students can and will try strategies they have seen that make sense to them. Different students will prefer different strategies.

Connections Across Standards

Solve one- and two-step word problems within 100 (2.OA.1).
Fluently add and subtract within 20 (2.OA.2).
Understand that the three digits of a three-digit number represents hundreds, tens, and ones (2.NBT.1).
Solve problems involving length (2.MD.5).
Solve problems with money (2.MD.8).
Solve problems involving data (2.MD.10).

1.NBT.4 (Prior Grade Standard)	**3.NBT.2 (Future Grade Standard)**
Add within 100, including adding a two-digit number and a one-digit number and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; record the strategy with a	Fluently add and subtract within 1,000 using strategies and algorithms [G] based on place value, properties of operations, and/or the relationship between addition and subtraction.

written numerical method (drawings and, when appropriate, equations) and explain the reasoning used. Understand that when adding two-digit numbers, tens are added to tens; ones are added to ones; and sometimes it is necessary to compose a ten.	

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.NBT.7

Add and subtract within 1,000 using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; record the strategy with a written numerical method (drawings and, when appropriate, equations) and explain the reasoning used. Understand that in adding or subtracting three-digit numbers, hundreds are added or subtracted from hundreds, tens are added or subtracted from tens, ones are added or subtracted from ones; and sometimes it is necessary to compose or decompose tens or hundreds.

Essential Understandings

- The digit in the ones place will remain the same when finding 10 more or 10 less.
- The digits in the tens place and the ones place will remain the same when finding 100 more or 100 less.
- There is a relationship between addition and subtraction.
- When adding or subtracting three-digit numbers, hundreds are added or subtracted from hundreds, tens are added or subtracted from tens, ones are added or subtracted from ones.
- When adding or subtracting, sometimes it is necessary to compose or decompose tens or hundreds.
- When adding and subtracting numbers, the place and value of the digits is important for determining either the sum or the difference.

Common Misconceptions

When adding three-digit numbers, some students might start with the digits in the ones place and record the entire sum. Then they add the digits in the tens place and the ones place and record these sums.

When subtracting three-digit numbers, students might start with the digits in the ones place and subtract the smaller digit from the larger digit. Then they move to the tens and the hundreds places and subtract the smaller digits from the larger digits.

Academic Vocabulary/ Language

- add
- subtract
- place value
- ones
- tens
- hundreds
- properties of operations
- compose
- decompose
- concrete model

Tier 2

- strategy
- relate
- drawing
- written method

Learning Targets	I can apply strategies of place value and regrouping when I add and subtract numbers from 0 to 1,000. I can record the strategy that I used to add or subtract with a picture, numbers or an equation and explain my reasoning. I understand that when I add or subtract three-digit numbers, hundreds are added or subtracted from hundreds, tens are added or subtracted from tens and ones are added or subtracted from ones. I understand that when I add or subtract three-digit numbers, sometimes it is necessary to compose or decompose tens or hundreds.

Assessment of Learning

- Students will use concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction to add and subtract within 1,000.
- Students will record the strategy used to add and subtract within 1,000 with a written numerical method (drawings and, when appropriate, equations) and explain the reasoning used.
- Students will demonstrate when adding or subtracting three-digit numbers, hundreds are added or subtracted from hundreds, tens are added or subtracted from tens and ones are added or subtracted from ones.

Sample Questions/Activities

1. Lewis was working on subtracting three-digit numbers. Look at Lewis' work below. Determine if Lewis' answer is correct or incorrect. If Lewis is incorrect, explain his mistake and what the correct answer should be.

$$\begin{array}{r} 845 \\ -237 \\ \hline 612 \end{array}$$

2. Solve the problem 354 + 287 using two different strategies. Choose the strategy you think is most efficient and explain why.
3. Jacob needed to read 1,000 pages over the summer for the Main Street Elementary Summer Reading Club. He read 489 pages in June and 499 pages in July. Did Jacob read 1,000 pages? If not, how many more pages does Jacob need to read before the first day of school? Explain.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

As students move to addition and subtraction within 1,000, it is important for students to connect the efficient and accurate strategies they used with smaller numbers to their work with bigger numbers. It is vital that student-invented strategies be shared, explored, recorded and tried by others. Recording the expressions and equations in the strategies horizontally encourages students to think about the numbers and the quantities they represent instead of the digits. Not every student will invent strategies, but all students can and will try strategies they have seen that make sense to them. Different students will prefer different strategies. Students will decompose and compose tens and hundreds when they develop their own strategies for solving problems where regrouping is necessary. They might use the make-ten strategy (37 + 8 = 40 + 5 = 45, add 3 to 37 then 5) or (62 - 9 = 60 – 7 = 53, take off 2 to get 60, then 7 more) because no ones are exchanged for a ten or a ten for ones. Have students analyze problems before they solve them. Present a variety of subtraction problems within 1,000. Ask students to identify the problems requiring them to decompose the tens or hundreds to find a solution and explain their reasoning.

Provide many activities that will help students develop a strong understanding of number relationships, addition and subtraction so they can develop, share and use efficient strategies for mental computation. An efficient strategy is one that can be done mentally and quickly. Students gain computational fluency, using efficient and accurate methods for computing, as they come to understand the role and meaning of arithmetic operations in number systems. Efficient mental processes become automatic with use. Students need to build on their flexible strategies for adding

<table>
<tr><td colspan="2">within 100 in Grade 1 to fluently add and subtract within 100, add up to four two-digit numbers, and find sums and differences less than or equal to 1,000 using numbers 0 to 1,000.</td></tr>
<tr><td colspan="2">Connections Across Standards
Solve one- and two-step word problems within 100 (2.OA.1).
Fluently add and subtract within 20 (2.OA.2).
Understand that the three digits of a three-digit number represents hundreds, tens, and ones (2.NBT.1).
Solve problems involving length (2.MD.5).
Solve problems with money (2.MD.8).
Solve problems involving data (2.MD.10).</td></tr>
<tr><td>1.NBT.4 (Prior Grade Standard)
Add within 100, including adding a two-digit number and a one-digit number and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; record the strategy with a written numerical method (drawings and, when appropriate, equations) and explain the reasoning used. Understand that when adding two-digit numbers, tens are added to tens; ones are added to ones; and sometimes it is necessary to compose a ten.</td><td>3.NBT.2 (Future Grade Standard)
Fluently add and subtract within 1,000 using strategies and algorithms [G] based on place value, properties of operations, and/or the relationship between addition and subtraction.</td></tr>
</table>

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.NBT.8

Mentally add 10 or 100 to a given number 100-900, and mentally subtract 10 or 100 from a given number 100-900.

Essential Understandings

- When adding and subtracting numbers, the place and value of the digits is important for determining either the sum or the difference.
- The digit in the ones place will remain the same when finding 10 more or 10 less.
- The digits in the tens place and the ones place will remain the same when finding 100 more or 100 less.
- There is a relationship between addition and subtraction.
- When adding or subtracting three-digit numbers, hundreds are added or subtracted from hundreds, tens are added or subtracted from tens, ones are added or subtracted from ones.

Common Misconceptions

Students may think that the 4 in 46 represents 4, not 40 if base ten language is not used.
The strategy for mentally adding and subtracting 10 or 100 is an invented strategy that does not happen naturally. It will need to be modeled for students in order for them to gain a better understanding of the values of the numerical places.

Academic Vocabulary/ Language

- add
- subtract
- tens
- hundred
- place value
- operations

Tier 2

- mentally add/subtract

Learning Targets	I can mentally add or subtract 10 or 100 from any number from 100 to 900. I can apply my understanding of the 0 digit when I am finding 10 more or 10 less or 100 more or 100 less. I can create a model to explain the properties of the 0 digit when adding or subtracting 10 or 100.

Assessment of Learning

- Students will mentally add or subtract 10 or 100 from any number from 100 to 900.
- Students will understand that when finding 10 more or 10 less, the digit in the ones place will not change.
- Students will understand that when finding 100 more or 100 less, the digit in the tens place and ones place will not change.

Sample Questions/Activities

1. 518 people were in their seats in the auditorium to see the new play. 60 seats were empty. How many total seats are there in the auditorium. Explain.
2. Kathy has saved $682 to buy a new laptop. She earned $100 for mowing lawns this week, $10 for watering her neighbor's flowers, and $200 for babysitting on Friday and Saturday. How much money does Kathy have now? How do you know?
3. Joseph has 279 fruit candies in a bag. He gives 100 fruit candies to his sister. He gives 20 fruit candies to his best friend. He eats 30 fruit candies. How many fruit candies does Joseph have left in the bag? Explain your thinking.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Mental math is a powerful tool for students. Using place value understanding to quickly and mentally add or subtract 10 or 100 can build students' number sense and confidence. Encourage students to share their solutions and thinking. Have students justify why when finding 10 more or 10 less, the digit in the ones place will not change and why when finding 100 more or 100 less, the digit in the tens place and ones place will not change. Have students model these problems using base ten blocks to build a concrete understanding of what happens when they add or subtract 10 or 100. A firm understanding of this concept leads to computational fluency.

Connections Across Standards

Solve one- and two-step word problems within 100 (2.OA.1).
Fluently add and subtract within 20 (2.OA.2).
Understand that the three digits of a three-digit number represents hundreds, tens, and ones (2.NBT.1).
Solve problems involving length (2.MD.5).
Solve problems with money (2.MD.8).
Solve problems involving data (2.MD.10).

1.NBT.4 (Prior Grade Standard)	**3.NBT.2 (Future Grade Standard)**
Add within 100, including adding a two-digit number and a one-digit number and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; record the strategy with a written numerical method (drawings and, when appropriate, equations) and explain the reasoning used. Understand that when adding two-digit numbers, tens are added to tens; ones are added to ones; and sometimes it is necessary to compose a ten.	Fluently add and subtract within 1,000 using strategies and algorithms [G] based on place value, properties of operations, and/or the relationship between addition and subtraction.

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.NBT.9

Explain why addition and subtraction strategies work, using place value and the properties of operations. Explanations may be supported by drawings or objects.

Essential Understandings

- When adding and subtracting numbers, the place and value of the digits is important for determining either the sum or the difference.
- The digit in the ones place will remain the same when finding 10 more or 10 less.
- The digits in the tens place and the ones place will remain the same when finding 100 more or 100 less.
- There is a relationship between addition and subtraction.
- When adding or subtracting, sometimes it is necessary to compose or decompose tens or hundreds.

Common Misconceptions

Students may think that the 4 in 46 represents 4, not 40.

When adding two or three-digit numbers, some students might start with the digits in the ones place and record the entire sum. Then they add the digits in the tens place and the hundreds place and record these sums.

When subtracting two-digit or three-digit numbers, students might start with the digits in the ones place and subtract the smaller digit from the larger digit. Then they move to the tens and the hundreds places and subtract the smaller digits from the larger digits.

Academic Vocabulary/ Language

- addition
- subtraction
- place value
- properties
- operations

Tier 2

- explain

Learning Targets	I can use my understanding of place value to explain the properties of addition and subtraction. I can explain why various addition or subtraction strategies work using numbers, drawings, or objects. I can give examples to explain why place value and properties of operations strategies works when adding and subtracting numbers.

Assessment of Learning

- Students will explain their strategies for addition and subtraction by using pictures, words and/or equations.
- Students will share their strategies with their classmates.
- Students will listen to and ask questions about the strategies their classmates share.
- Students will determine strategies for addition and subtraction that are flexible, accurate and efficient.

Sample Questions/Activities

1. Mr. Swift wrote the problem 32 + 49 on the board. Keisha added 30 + 40 and got 70, added 2 + 9 and got 11. She then added 70 + 11 and got a final answer of 81. Gianna split 32 into 31 and 1, added the 1 to 49 and got 50. She then added 31 + 50 to get a final answer of 81. Which strategy do you like best? Explain.
2. Use three different strategies to solve the problem 125 + 378. Circle the strategy you think is the most efficient. Be prepared to justify your thinking.
3. Natalia's school has 421 students. Her cousin Rose has 257 less students at her school. How many students attend Rose's school? Explain.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

It is vital that student-invented strategies be shared, explored, recorded and tried by others. Recording the expressions and equations in the strategies horizontally encourages students to think about the numbers and the quantities they represent instead of the digits. Not every student will invent strategies, but all students can and will try strategies they have seen that make sense to them. Different students will prefer different strategies. Students will decompose and compose tens and hundreds when they develop their own strategies for solving problems where regrouping is necessary. They might use the make-ten strategy (37 + 8 = 40 + 5 = 45, add 3 to 37 then 5) or (62 - 9 = 60 – 7 = 53, take off 2 to get 60, then 7 more) because no ones are exchanged for a ten or a ten for ones.

Have students analyze problems before they solve them. Present a variety of subtraction problems within 1000. Ask students to identify the problems requiring them to decompose the tens or hundreds to find a solution and explain their reasoning.

Connections Across Standards

Solve one- and two-step word problems within 100 (2.OA.1).
Fluently add and subtract within 20 (2.OA.2).
Understand that the three digits of a three-digit number represents hundreds, tens, and ones (2.NBT.1).
Solve problems involving length (2.MD.5).
Solve problems with money (2.MD.8).
Solve problems involving data (2.MD.10).

1.NBT.4 (Prior Grade Standard)	**3.NBT.2 (Future Grade Standard)**
Add within 100, including adding a two-digit number and a one-digit number and adding a two-digit number and a multiple of 10, using concrete models or	Fluently add and subtract within 1,000 using strategies and algorithms [G] based on place value, properties of operations,

drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; record the strategy with a written numerical method (drawings and, when appropriate, equations) and explain the reasoning used. Understand that when adding two-digit numbers, tens are added to tens; ones are added to ones; and sometimes it is necessary to compose a ten.	and/or the relationship between addition and subtraction.

Ohio's New Learning Standards-Clear Learning Targets

Math Grade 2

2.MD.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes

Essential Understandings

- Length is measured by using an appropriate tool.
- Length is found by counting intervals rather than counting the marks on a measurement tool.
- The length of an object remains constant regardless of where it is placed on a measurement tool.
- Starting points on a measurement tool may vary.
- Units must be of equal size.
- Measurements can be nonstandard or standard units.
- All measurements include a margin of error.
- Numerals on a measuring tool indicate the number of length units.

Common Misconceptions

When some students see standard rulers with numbers on the markings, they believe that the numbers are counting the marks instead of the units or spaces between the marks.

Some students might think that they can only measure lengths with a ruler starting at the left edge. Provide situations where the ruler does not start at zero. For example, a ruler is broken and the first inch number that can be seen is 2. If a pencil is measured and it is 9 inches on this ruler, the students must subtract 2 inches from the 9 inches to adjust for where the measurement started.

Academic Vocabulary/ Language

- measure
- length
- ruler
- yardstick
- meter stick
- measuring tape

Tier 2

- appropriate tools

Learning Targets	I can apply my understanding of measurement when measuring the length of an object. I can measure the length of an object by selecting the right tool, such as rulers, yardsticks, meter sticks and measuring tapes.

Assessment of Learning

- Students will understand that length is measured with an appropriate tool.
- Students will understand that traits of the object being measured determines which measuring tool is appropriate.
- Students will understand that length is determined by counting the number of units or intervals, rather than marks on the measuring tool.
- Students will understand that an object's length is constant regardless of where an object is placed on a measuring tool (e.g., A crayon has a length of 4 inches whether the crayon covers the interval from 0 inches to 4 inches or 5 inches to 9 inches.)

Sample Questions/Activities

1. Chris wants to find out how long his writing journal is. Would it be more appropriate to use a ruler or a yardstick to measure the length of his journal? Why?
2. Scarlett, Gina and Bruce have identical markers. They all use an inch ruler to measure the length of their markers. Scarlett says the marker is 6 inches long. Gina says the marker is 6 inches long. Bruce says the marker is 7 inches long. What mistake did Bruce make? Explain.
3. Roxanne says that her eraser is 2 inches long no matter where she places the eraser on the ruler. Is she correct? Why or why not?

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Second graders are transitioning from measuring lengths with informal or nonstandard units to measuring with these standard units: inches, feet, centimeters, and meters. The measure of length is a count of how many units are needed to match the length of the object or distance being measured. Students have to understand what a length unit is and how it is used to find a measurement. They need many experiences measuring lengths with appropriate tools so they can become very familiar with the standard units and estimate lengths. Use language that reflects the approximate nature of measurement, such as the length of the room is about 26 feet.

Connections Across Standards

Using addition and subtraction within 100 to solve one- and two-step word problems (2. OA.1).
Fluently add and subtract within 100 (2. NBT.5).

1.MD.1 (Prior Grade Standards)	**3.MD.2 (Future Grade Standard)**
Order three objects by length; compare the lengths of two objects indirectly by using a third object. **1.MD.2** Express the length of an object as a whole number of length units by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*	Measure and estimate liquid volumes and masses of objects using standard units of grams, kilograms, and liters. Add, subtract, multiply, or divide whole numbers to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. Excludes multiplicative comparison problems involving notions of "times as much".

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.MD.2

Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.

Essential Understandings

- There is a relationship between the size of the unit and the number of units required to cover the length.
- Length is measured by using an appropriate tool.
- Length is found by counting intervals rather than counting the marks on a measurement tool.
- The length of an object remains constant regardless of where it is placed on a measurement tool.
- Starting points on a measurement tool may vary.
- Numerals on a measuring tool indicate the number of length units.

Common Misconceptions

When some students see standard rulers with numbers on the markings, they believe that the numbers are counting the marks instead of the units or spaces between the marks.

Some students might think that they can only measure lengths with a ruler starting at the left edge. Provide situations where the ruler does not start at zero. For example, a ruler is broken and the first inch number that can be seen is 2. If a pencil is measured and it is 9 inches on this ruler, the students must subtract 2 inches from the 9 inches to adjust for where the measurement started.

Academic Vocabulary/ Language

- measure
- measurement
- size
- length
- unit

Tier 2

- describe
- relate
- object

Learning Targets	I can measure the length of an object using two different unit sizes. I can compare the two different measurements of an object and explain how the measurement relates to the size of the unit.

Assessment of Learning

- Students will measure the length using two different units (e.g., inches and feet) and explain why the two lengths are different.
- Students will understand that it will take more of a smaller unit to measure the length of an object.
- Students will understand that an object's length CAN be measured in smaller units, it is just more efficient to measure bigger lengths with larger units (e.g., This distance from Columbus to Cincinnati could be measured in feet, but using miles makes measuring the length efficient.).
- The size of the object being measured determines the appropriate measuring tool (e.g., a meter stick is not an appropriate tool for measuring the length of a crayon).

Sample Questions/Activities

1. Ben measured the length of the classroom in feet. He says when he changes the measurement from feet to inches, the measurement will be a larger number. Explain why you think Ben is right or wrong.
2. Jaci and Anna want to measure the length of the playground. Jaci uses a ruler and Anna uses a yardstick. Who will have a larger number as their answer? Why?
3. Measure the height of your table or desk with a yardstick. How tall is the table in feet? How tall is the table in inches? Explain how both of the measurements can be used to describe the height of your table/desk.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Students should have experiences using different measurement tools and different units of measure. Attributes of the object being measured will determine which measurement tool and which unit are the most appropriate. Have students measure the same length with different-sized units then discuss what they noticed. Ask questions to guide the discussion so students will see the relationship between the size of the units and measurement, i.e. the measurement made with the smaller unit is more than the measurement made with the larger unit and vice versa. Students should understand that smaller units can always be used to measure the length of an object but that using larger units may be more efficient.

Connections Across Standard

Using addition and subtraction within 100 to solve one- and two-step word problems (2. OA.1).
Fluently add and subtract within 100 (2. NBT.5).

1.MD.1 (Prior Grade Standards) Order three objects by length; compare the lengths of two objects indirectly by using a third object. **1.MD.2** Express the length of an object as a whole number of length units by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*	**3.MD.2 (Future Grade Standard)** Measure and estimate liquid volumes and masses of objects using standard units of grams, kilograms, and liters. Add, subtract, multiply, or divide whole numbers to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. Excludes multiplicative comparison problems involving notions of "times as much".

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

<table>
<tr>
<td>2.MD.3</td>
<td>Estimate lengths using units of inches, feet, centimeters, and meters.</td>
<td rowspan="2">Common Misconceptions
When some students see standard rulers with numbers on the markings, they believe that the numbers are counting the marks instead of the units or spaces between the marks.

Some students might think that they can only measure lengths with a ruler starting at the left edge. Provide situations where the ruler does not start at zero. For example, a ruler is broken and the first inch number that can be seen is 2. If a pencil is measured and it is 9 inches on this ruler, the students must subtract 2 inches from the 9 inches to adjust for where the measurement started.</td>
<td rowspan="2">Academic Vocabulary/ Language
▪ estimate
▪ length
▪ unit
▪ inch
▪ feet
▪ centimeter
▪ meter

Tier 2
▪ compare
▪ record</td>
</tr>
<tr>
<td colspan="2">Essential Understandings
● Length is measured by using an appropriate tool.
● There is a relationship between the size of the unit and the number of units required to cover the length.
● Lengths can be estimated.</td>
</tr>
<tr>
<td>Learning Targets</td>
<td colspan="3">I can estimate the length of an object in inches, feet, centimeters, and meters by applying my understanding of the units size compared to the object being measured.
I can verify the reasonableness of the answer by using approximate language to talk about the length estimates, such as, "This is about 6 inches long."</td>
</tr>
</table>

Assessment of Learning

- Students will estimate the length of an object in inches, feet, centimeters, and meters.
- Students will express their estimates using approximate language, such as “about” or “almost”.
- Students will improve their estimates as they get more experience measuring length.

Sample Questions/Activities

1. Display and measure together the length of a common classroom object in inches. Ask students to find 5 other objects in the classroom that would be about the same length as the object you measured together.
2. Ask students to measure objects in the classroom in centimeters. For each measurement, ask students to estimate first and record their estimate. Ask students to then measure the length of the object in centimeters and record the actual measurement. Share students’ findings and compare their estimates to the actual measurements.
3. Nicole measured an object in her desk and said the object was “about 5 inches” long. What are some objects that Nicole could have measured? Explain.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Insist that students always estimate lengths before they measure. Estimation helps them focus on the attribute to be measured, the length units, and the process. After they find measurements, have students discuss the estimates, their procedures for finding the measurements and the differences between their estimates and the measurements. Students should understand that an estimate should be an educated guess based on the information they have. For example, if students have determined that the scissors they use are 6 inches long, then an estimate of 12 inches for the length of their pencil is not a good estimate. Having students determine a benchmark for a centimeter (e.g., the tip of their pinkie finger) and an inch (e.g. their thumb from their knuckle to the tip) can help students to make more accurate estimates.

Connections Across Standards

Using addition and subtraction within 100 to solve one- and two-step word problems (2. OA.1).
Fluently add and subtract within 100 (2. NBT.5).

1.MD.1 (Prior Grade Standards) Order three objects by length; compare the lengths of two objects indirectly by using a third object. **1.MD.2** Express the length of an object as a whole number of length units by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*	**3.MD.2 (Future Grade Standard)** Measure and estimate liquid volumes and masses of objects using standard units of grams, kilograms, and liters. Add, subtract, multiply, or divide whole numbers to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. Excludes multiplicative comparison problems involving notions of "times as much".

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.MD.4

Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

Essential Understandings

- Length is measured by using an appropriate tool.
- Numerals on a measuring tool indicate the number of length units.
- Lengths can be compared.

Common Misconceptions

When some students see standard rulers with numbers on the markings, they believe that the numbers are counting the marks instead of the units or spaces between the marks.

Some students might think that they can only measure lengths with a ruler starting at the left edge. Provide situations where the ruler does not start at zero. For example, a ruler is broken and the first inch number that can be seen is 2. If a pencil is measured and it is 9 inches on this ruler, the students must subtract 2 inches from the 9 inches to adjust for where the measurement started.

Academic Vocabulary/ Language

- measure
- length
- standard unit
- difference

Tier 2

- determine
- expressing
- object

Learning Targets	I can accurately measure lengths in standard units by applying measurement principles. I can apply my understanding of subtraction when comparing the standard measurement of two objects and represent their difference using a standard length unit.

Assessment of Learning

- Students will measure and compare the lengths of two objects in standard units.
- Students will compare two lengths using subtraction.

Sample Questions/Activities

1. Leslie says her marker is longer than her glue stick. How could Leslie prove she is correct? Explain your thinking.
2. Choose two objects in your desk (e.g., scissors, crayon, marker, pencil, etc.). Estimate each object's length in inches. Measure each object to find its length in inches. Compare the lengths of the objects. Which object is shorter? How much shorter? Explain.
3. Measure the length in centimeters of a common classroom object (e.g., glue stick, marker, crayon, etc.). Find an object in the room that you estimate is shorter than the target object, longer than the target object, and the same length as the target object. Measure the exact length of each object. Place the objects in order from shortest to longest. Prove the order is correct.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Students should understand that lengths can be estimated, measured and compared. Insist that students always estimate lengths before they measure. Estimation helps them focus on the attribute to be measured, the length units, and the process. After they find measurements, have students discuss the estimates, their procedures for finding the measurements and the differences between their estimates and the measurements. Students should have opportunities to estimate how objects' lengths compare and then prove their comparison using exact measurements.

Connections Across Standards

Using addition and subtraction within 100 to solve one- and two-step word problems (2. OA.1).
Fluently add and subtract within 100 (2. NBT.5).

1.MD.1 (Prior Grade Standards)	**3.MD.2 (Future Grade Standard)**
Order three objects by length; compare the lengths of two objects indirectly by using a third object. **1.MD.2** Express the length of an object as a whole number of length units by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*	Measure and estimate liquid volumes and masses of objects using standard units of grams, kilograms, and liters. Add, subtract, multiply, or divide whole numbers to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. Excludes multiplicative comparison problems involving notions of "times as much".

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.MD.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same whole number units, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem. Drawings need not show details, but should show the mathematics in the problem. (This applies wherever drawings are mentioned in the Standards.)

Essential Understandings

- Addition and subtraction strategies can be used to solve real-world measurement problems.
- A symbol can be used to represent an unknown number.

Common Misconceptions

A misconception that many students have is that it is valid to assume that a key word or phrase in a problem suggests the same operation will be used every time. For example, they might assume that the word left always means that subtraction must be used to find a solution. Providing problems in which key words like this are used to represent different operations is essential. Requiring students to include the unit of measure in their answer will help them when they do work with measurement and conversions in the upper grades. For example, if they solve a problem where they add 6 feet and 3 feet, their answer should be 9 feet rather than just 9.

Academic Vocabulary/ Language

- addition
- subtraction
- units
- length
- equations
- symbols
- unknown number

Tier 2

- solve
- drawing
- represent
- word problems

Learning Targets	I can apply my understanding of addition and subtraction to solve world problems involving lengths. I can add or subtract measurements within 100 units in word problems using numbers, drawings, and equations. I can create a drawing or equation using symbols for the unknown to model the addition or subtraction when solving problems using lengths.

Assessment of Learning

- Students will use addition and subtraction strategies to solve word problems involving lengths in whole number units.
- Students will tackle word problems involving the same standard units (e.g., inches and inches or feet and feet).
- Students will use drawings and equations with a symbol for the unknown to represent a word problem.
- Students will find the unknown length in a word problem.

Sample Questions/Activities

1. Marissa used a ruler to draw a line on her paper. Katie used a ruler to draw a line on her paper that is 3 inches longer than the line Marissa drew. If Katie's line is 12 inches long, how long is the line that Marissa drew? Explain using an equation with a symbol for the unknown.
2. Portia and Sonny need 80 centimeters of ribbon to make a craft. Portia has 46 centimeters of ribbon. Sonny has 29 centimeters of ribbon. Do Portia and Sonny have enough ribbon to make their craft? If not, how much more ribbon do they need? Explain.
3. Grace measured her height and found she was 42 inches tall. Thomas measured his height and found he was 3 inches shorter than Grace. How tall is Thomas? Explain using an equation with a symbol for the unknown.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Provide one- and two-step word problems that include different lengths measurement made with the same unit (inches, feet, centimeters, and meters). Students add and subtract within 100 to solve problems for these situations: adding to, taking from, putting together, taking apart, and comparing, and with unknowns in all positions. Students use drawings and write equations with a symbol for the unknown to solve the problems. Encourage students to use the same accurate and efficient strategies they used for other work with addition and subtraction. Help students to see that units of measurement connected to the numbers does not change the mathematics needed to solve the problem.

Connections Across Standards

Measure to determine how much longer one object is than another (2. MD.4).
Generate measurement data by measuring lengths of several objects to the nearest whole unit and/or by making repeated measurements of the same objects (2. MD. 9).
Using addition and subtraction within 100 to solve one- and two-step word problems (2. OA.1).
Fluently add and subtract within 100 (2. NBT.5).

1.MD.1 (Prior Grade Standards)	**3.MD.2 (Future Grade Standard)**
Order three objects by length; compare the lengths of two objects indirectly by using a third object. **1.MD.2** Express the length of an object as a whole number of length units by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*	Measure and estimate liquid volumes and masses of objects using standard units of grams, kilograms, and liters. Add, subtract, multiply, or divide whole numbers to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. Excludes multiplicative comparison problems involving notions of "times as much".

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.MD.6

Represent whole numbers as lengths from 0 on a number line diagram [G] with equally spaced points corresponding to the numbers 0, 1, 2,..., and represent whole number sums and differences within 100 on a number line diagram.

Essential Understandings

- There is a relationship between number lines and measurement tools.
- A number line diagram is similar to a ruler in that whole numbers are 1 unit apart.
- Each number on a number line denotes the distance from the labeled point from 0, not the number itself.

Common Misconceptions

Students may count the lines on a number line instead of counting the spaces to measure an object.

When creating a number line diagram, students may not space the lines equally along the line and not understand the need for standard units.

Students should also be shown that a number line doesn't have to begin with zero. A number line can begin with any number as long as the numbers continue in order and are equally spaced. Open numbers lines are a useful tool for adding and subtracting within 100.

Academic Vocabulary/ Language

- whole number
- length
- number line
- equal
- sum
- difference

Tier 2

- represent
- diagram
- corresponding
- word problems

Learning Targets

I can relate measurement to the number line.
I can apply my understanding of measurement when using whole numbers as lengths from 0 on a number line diagram, by using equally spaced points corresponding to the numbers 0, 1, 2 and so on.
I can use a number line diagram to support my understanding when solving problems of addition and subtraction of whole numbers.

Assessment of Learning

- Students will understand the relationship between a number line and a measurement tool (e.g., a ruler is a number line that begins at 0 and ends at 12).
- Students will relate their understanding of a number line to the units on a measuring tool, understanding that the whole numbers represent units of measurement.
- Students will understand that addition and subtraction of measurement units can be represented using a number line.

Sample Questions/Activities

1. Robert represented the problem 57 - 23 using a number line. What could Robert's number line look like? Explain.
2. There were 27 students on the bus. 19 students got off the bus. How many students are on the bus? Use a number line to show your thinking and solution.
3. Sasha said that a ruler was just a number line that only went to 12. Is Sasha right? Why or why not? Give multiple reasons to support your answer.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Provide one- and two-step word problems that include different lengths measurement made with the same unit (inches, feet, centimeters, and meters). Students add and subtract within 100 to solve problems for these situations: adding to, taking from, putting together, taking apart, and comparing, and with unknowns in all positions. Students use drawings and write equations with a symbol for the unknown to solve the problems. Have students represent their addition and subtraction within 100 on a number line. They can use notebook or grid paper to make their own number lines. First they mark and label a line on paper with whole-number units that are equally spaced and relevant to the addition or subtraction problem. Then they show the addition or subtraction using curved lines segments above the number line and between the numbers marked on the number line. For 49 + 5, they start at 49 on the line and draw a curve to 50, then continue drawing curves to 54. Drawing the curves or making the "hops" between the numbers will help students focus on a space as the length of a unit and the sum or difference as a length.

Connections Across Standards

Measure to determine how much longer one object is than another (2. MD.4).
Generate measurement data by measuring lengths of several objects to the nearest whole unit and/or by making repeated measurements of the same objects (2. MD. 9).
Using addition and subtraction within 100 to solve one- and two-step word problems (2. OA.1).
Fluently add and subtract within 100 (2. NBT.5).

1.MD.2 (Prior Grade Standard)	**3.MD.4 (Future Grade Standard)**
Express the length of an object as a whole number of length units by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.	Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by creating a line plot [G], where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.MD.7 Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.	**Common Misconceptions** Some students might confuse the hour and minutes hands. For the time of 3:45, they say the time is 9:15. Also, some students name the numeral closest to the hands, regardless of whether this is appropriate. For instance, for the time of 3:45 they say the time is 3:09 or 9:03. Assess students' understanding of the roles of the minute and hour hands and the relationship between them. Provide opportunities for students to experience and measure times to the nearest five minutes and the nearest hour. Have them focus on the movement and features of the hands.	**Academic Vocabulary/ Language** ▪ analog ▪ digital ▪ clock ▪ time ▪ minutes ▪ hours ▪ a.m. ▪ p.m. **Tier 2** ▪ nearest
Essential Understandings ● Time can be measured to the nearest 5 minutes. ● Time can be measured using an analog clock or digital clock. ● Time can be recorded using hours and to the nearest 5 minutes, e.g., Twenty-five minutes after eleven is represented as 11:25. ● A day is measured as an interval of 24 hours. ● A day is divided equally into a.m. time and p.m. time.		

Learning Targets	I can tell time to the nearest five minutes on an analog and digital clock. I can write time to the nearest five minutes on an analog and digital clock using a colon to separate hours and minutes.

Assessment of Learning

- Students will understand that time can be measured to the nearest 5 minutes.
- Students will understand that time can be measured using an analog or digital clock.
- Students will understand that a day has 24 hours, which are divided equally into a.m. or p.m.
- Students will record time using hours and the nearest five minutes using a colon to separate hours and minutes (e.g., 10:35).

Sample Questions/Activities

1. Isaac looked at the clock below and wrote the time as 1:04. Is Isaac correct? Why or why not?

2. List 3 activities you might do while the clock says 8:00 a.m. and 3 activities you might do while the clock says 8:00 p.m. Explain why the activities are different in the a.m. versus the p.m.
3. Kai's teacher asked him to write the time shown on the clock below using the format hour:minutes. Kai looked at the clock and wrote the time as 4:60. Is Kai correct? Why or why not?

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Second graders expand their work with telling time from analog and digital clocks to the nearest hour or half-hour in Grade 1 to telling time to the nearest five minutes using a.m. and p.m. Students should understand that time can be told to the hour and the nearest 5 minutes (e.g., 10:55). Provide numerous opportunities for students to read and write time to the nearest five minutes using both digital and analog clocks. Provide opportunities for students to read a time to the nearest five minutes and think about activities done during that time as both a.m. and p.m. (e.g., at 9:00 a.m. students might be beginning their school day, but at 9:00 p.m. students might be going to sleep). Relate telling time to the nearest 5 minutes to the skip counting by 5's students learned, except that skip counting on a clock begins at 0 and ends at 60. Students should understand that when skip counting reaches 60, a new hour begins and is written with two zeros after the colon (e.g., 3:00).

<table>
<tr><td colspan="2">Connections Across Standards
Use place value (2.NBT.2, 4-8).
Partition circles (2.G.3).
Solve problems involving addition and subtraction (2.OA.1).</td></tr>
<tr><td>1.MD.3a (Prior Grade Standard)
a. Tell and write time in hours and half-hours using analog and digital clocks.</td><td>3.MD.1a (Future Grade Standard)
a. Tell and write time to the nearest minute. Measure time intervals in minutes (within 90 minutes). Solve real-world problems involving addition and subtraction of time intervals (elapsed time) in minutes, e.g., by representing the problem on a number line diagram or clock.</td></tr>
</table>

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.MD.8

Solve problems with money.

a. Identify nickels and quarters by name and value.

b. Find the value of a collection of quarters, dimes, nickels, and pennies.

c. Solve word problems by adding and subtracting within 100, dollars with dollars and cents with cents (not using dollars and cents simultaneously) using the $ and ¢ symbols appropriately (not including decimal notation).

Essential Understandings

- A nickel is worth 5 cents (5¢).
- A quarter is worth 25 cents (25¢).
- An amount of dollars is represented with the dollar symbol ($).
- A collection of pennies, nickels, dimes, and quarters can be counted.
- The size of a coin does not determine its value.
- The dollar symbol and cent symbol are not used simultaneously, i.e., do not use decimal notation. Note: Decimal notation, e.g., $1.33, will be used in 4th grade to represent values beyond 100 cents.

Common Misconceptions

Students might overgeneralize the value of coins when they count them. They might count them as individual objects. Also some students think that the value of a coin is directly related to its size, so the bigger the coin, the more it is worth. Place pictures of a nickel on the top of five-frames that are filled with pictures of pennies. In like manner, attach pictures of dimes and pennies to ten-frames and pictures of quarters to 5 x 5 grids filled with pennies. Have students use these materials to determine the value of a set of coins in cents.

Academic Vocabulary/ Language

- dollar
- quarter
- dime
- nickel
- penny
- symbols: $,¢
- value

Tier 2

- identify
- collection
- solve
- appropriately

Learning Target	I can name and tell the value of nickels and quarters. I can apply my understanding of skip counting to find the value of a collection of quarters, dimes, nickels, and pennies. I can apply my understanding of addition and subtraction to solve word problems involving money, dollars with dollars and cents with cents.

Assessment of Learning

- Students will identify nickels and quarters by name.
- Students will understand a nickel has a value of 5 cents and a quarter has a value of 25 cents.
- Students will find the value of a collection of quarters, dimes, nickels and pennies.
- Students will understand that a coin's size does not determine its value (e.g., a dime is smaller in size than a penny but is greater in value).
- Students will solve addition and subtraction problems within 100 involving money. The problems have either dollars with dollars or cents with cents.

Sample Questions/Activities

1. Isabel emptied out her piggy bank on the table. She counted 1 quarter, 3 dimes, 3 nickels and 4 pennies. What is the value of the coins in Isabel's piggy bank? Explain.
2. Chloe and Ava each have a handful of coins. Choe has 4 nickels, 3 dimes and 2 pennies. Ava has 4 dimes, 3 nickels and 2 pennies. Whose handful of coins has the greater value? How do you know?
3. Julia has 6 nickels. She gives 10 cents to her little brother. How much money does Julia have now? Explain.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

The topic of money begins in Kindergarten with the use of pennies for counting. The addition in second grade of nickels and quarters builds on that work in First grade with knowing the name and value of pennies and dimes. Help students learn money concepts and solidify their understanding of other topics by providing activities where students make connections between them. For instance, link the value of a dollar bill as 100 cents to the concept of 100 and counting within 1,000. Use play money - nickels, dimes, and dollar bills to skip count by 5s, 10s, and 100s. Reinforce place value concepts with the values of dollar bills, dimes, and pennies. Students use the context of money to find sums and differences less than or equal to 100 using the numbers 0 to 100. They add and subtract to solve one- and two-step word problems involving money situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions. Students use drawings and equations with a symbol for the unknown number to represent the problem. Students need to learn the relationships between the values of a penny, nickel, dime, quarter and dollar bill. Students should understand that the size of a coin or bill does not determine its value. Symbols are used to represent money, the ¢ to represent cents and the $ symbol to represent dollars.

Career Connection

Students will use play money to solve real-work, word problems. Arrange a field trip to your local bank or credit union where students can interview professionals who count money and interact with math in their work (e.g., bank teller, loan officer, investment banker).

Connections Across Standards

Use place value (2.NBT.2, 4-8).
Partition circles (2.G.3).
Solve problems involving addition and subtraction (2.OA.1).

1.MD.3b (Prior Grade Standard) b. Identify pennies and dimes by name and value.	**3.MD.1b (Future Grade Standard)** b. Solve word problems by adding and subtracting within 1,000 dollars with dollars and cents with cents (not using dollars and cents simultaneously) using the $ and ¢ symbol appropriately (not including decimal notation).

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.MD.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit or by making repeated measurements of the same object. Show the measurements by creating a line plot [G], where the horizontal scale is marked off in whole number units.

Essential Understandings

- Length measurement data can be generated and used to create a line plot in whole number units.
- Categorical data results from sorting objects into as many as four categories.

Common Misconceptions

Students may count the lines on a number line instead of counting the spaces to measure an object.

When creating a number line diagram, students may not space the lines equally along the line and not understand the need for standard units.

Students may try to put non numerical data (like "Favorite Pets" or "Pizza Toppings" into a line plot.

Academic Vocabulary

Language

- data
- measurement
- length
- whole number unit
- line plot
- horizontal scale

Tier 2

- generate
- object
- nearest
- repeated
- marked off

Learning Targets	I can measure several objects to the nearest whole unit. I can apply the concepts of measurement when marking off whole numbers units when creating a line plot. I can analyze the collected measurement data and create a line plot that represents the data.

Assessment of Learning

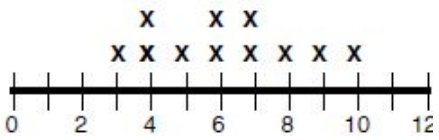
- Students will measure the length of several objects (e.g., the pencil lengths of the students in their group) or make repeated measurements of the same object (e.g., the distance a ball is kicked each time).
- Students will use the length measurements to create a line plot using whole number units.
- Students will understand that a line plot shows the frequency a numerical data piece occurs (e.g., how many plants measured 6 inches in height).
- Students will be able to analyze the data in a line plot (e.g., How many pencils were 3 inches in length? How many pencils were measured all together?).

Sample Questions/Activities

1. Sarah measured the length of several ribbons to the nearest inch. She wrote the measurements in the table below. Make a line plot to represent the data Sarah collected.

4		X		
3		X		X
2	X	X		X
1	X	X	X	X
	1 inch	2 inches	3 inches	4 inches

2. Ian measured the lengths of carrots he grew in his garden. He organized the lengths into a line plot. The shortest carrot was 3 inches long. The longest carrot was 7 inches long. Most of the carrots were 5 inches long. 1 carrot was 4 inches long. If Ian measured 6 carrots, what could Ian's line plot look like? Show your work and explain your thinking.
3. Phoebe created the line plot below after measuring the length of each pencil in her pencil box. How long was the shortest pencil? How long was the longest pencil? Write two true statements about this line plot.



Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Line plots are useful tools for collecting data because they show the frequency of numeric data along a numeric scale. They are made by simply drawing a number line then placing an X above the corresponding value on the line that represents each piece of data. Line plots are often misunderstood and misused. Line plots always have a number line (not categories). The frequency of that numeric data is represented with an X. Pose a question related to the lengths of several objects. Measure the objects to the nearest whole inch, foot, centimeter or meter. Create a line plot with whole-number units (0, 1, 2, ...) on the number line to represent the measurements.

Connections Across Standards Represent and solve problems involving addition and subtraction (2.OA.1). Add and subtract within 20 fluently (2.OA.2). Relate addition and subtraction to length (2.MD.6).	
1.MD.4 (Prior Grade Standard) Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.	**3.MD.4 (Future Grade Standard)** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by creating a line plot [G], where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.MD.10 Organize, represent, and interpret data with up to four categories; complete picture graphs when single-unit scales are provided; complete bar graphs when single-unit scales are provided; solve simple put-together, take-apart, and compare problems in a graph.

Essential Understandings

- Categorical data results from sorting objects into as many as four categories.
- Data can be organized and represented in a picture graph or bar graph.
- Given a graph, the data can be used to solve addition, subtraction, and comparison problems.

Common Misconceptions

Students initially put data into one list instead of into categories.

Students will need help understanding how to organize the data.

Students will see that data needs to be represented however, they may not understand that different representations of data can tell a different story about the data. When interpreting data, students tend to focus on individual pieces instead of the whole data set.

Academic Vocabulary/ Language

- categories
- single-unit scales
- picture graph
- data set
- put-together
- take-apart
- compare

Tier 2

- draw
- organize
- interpret
- represent

Learning Targets	I can organize, represent and interpret data with up to four categories. I can create picture graphs with a single-unit scale and interpret the data. I can create bar graphs with a single-unit scale and interpret the data. I can apply my understanding of addition, subtraction and compare problems to answer questions involving data from graphs.

Assessment of Learning

- Students will organize data with up to four categories.
- Students will use the data in categories to create a single-scale bar graph or single-scale picture graph.
- Students will interpret data in a bar graph or picture graph.
- Students will use the data in graphs to solve addition, subtraction and compare problems.

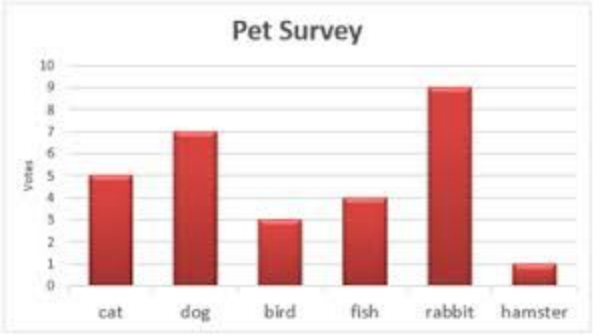
Sample Questions/Activities

1. Faye organized the hair bows in her bedroom. She had 4 pink bows, 3 blue bows, 8 purple bows and 1 polka dot bow. If this data was organized in a bar graph, what would the bar graph look like? Create a bar graph to represent Faye's hair bows.
2. Look at the picture graph below. How many total pies are in the bakery? How would the graph change if two more apple pies were added? How would the graph change if 5 strawberry pies were sold? Explain.

Pies in the Bakery

strawberry	●●
cherry	●●●●
apple	●
chocolate	●●●

3. Look at the bar graph below. How many students have either a dog or a cat? Do more students have a bird or a fish? How many more? How many total students took the Pet Survey?



Ohio Department of Education Model Curriculum Instructional Strategies and Resources

At first, students should create real object bar graphs and picture graphs so each row or bar consists of countable parts. These graphs show items in a category and do not have a numerical scale. For example, a real object graph could show the students' shoes (one shoe per student) lined end to end in horizontal or vertical rows by their color. Students would simply count to find how many shoes are in each row or bar. The graphs should be limited to 2 to 4 rows or bars. Students would then move to making horizontal or vertical bar graphs with two to four categories and a single-unit scale. Students should use the data to create a picture graph with up to four categories. The same picture should be used throughout the graph to prepare students for work with pictographs in grade 3. Use the information in the graphs to pose and solve simple put together, take-apart, and compare problems illustrated in Table 1. Students will need to organize, represent, and interpret data with up to four categories.

TABLE 1. COMMON ADDITION ADDITION AND SUBTRACTION SITUATIONS.

	RESULT UNKNOWN	CHANGE UNKNOWN	START UNKNOWN
ADD TO	Two bunnies sat on the grass. Three more bunnies hopped there. How many bunnies are on the grass now? 2 + 3 = ?	Two bunnies were sitting on the grass. Some more bunnies hopped there. Then there were five bunnies. How many bunnies hopped over to the first two? 2 + ? = 5	Some bunnies were sitting on the grass. Three more bunnies hopped there. Then there were five bunnies. How many bunnies were on the grass before? ? + 3 = 5
TAKE FROM	Five apples were on the table. I ate two apples. How many apples are on the table now? 5 – 2 = ?	Five apples were on the table. I ate some apples. Then there were three apples. How many apples did I eat? 5 – ? = 3	Some apples were on the table. I ate two apples. Then there were three apples. How many apples were on the table before? ? – 2 = 3
	TOTAL UNKNOWN	**ADDEND UNKNOWN**	**BOTH ADDENDS UNKNOWN[1]**
PULL TOGETHER/ TAKE APART[2]	Three red apples and two green apples are on the table. How many apples are on the table? 3 + 2 = ?	Five apples are on the table. Three are red and the rest are green. How many apples are green? 3 + ? = 5, 5 – 3 = ?	Grandma has five flowers. How many can she put in her red vase and how many in her blue vase? 5 = 0 + 5, 5 = 5 + 0 5 = 1 + 4, 5 = 4 + 1 5 = 2 + 3, 5 = 3 + 2
	DIFFERENCE UNKNOWN	**BIGGER UNKNOWN**	**SMALLER UNKNOWN**
COMPARE[3]	("How many more?" version): Lucy has two apples. Julie has five apples. How many more apples does Julie have than Lucy? ("How many fewer?" version): Lucy has two apples. Julie has five apples. How many fewer apples does Lucy have than Julie? 2 + ? = 5, 5 – 2 = ?	(Version with "more"): Julie has three more apples than Lucy. Lucy has two apples. How many apples does Julie have? (Version with "fewer"): Lucy has 3 fewer apples than Julie. Lucy has two apples. How many apples does Julie have? 2 + 3 = ?, 3 + 2 = ?	(Version with "more"): Julie has three more apples than Lucy. Julie has five apples. How many apples does Lucy have? (Version with "fewer"): Lucy has 3 fewer apples than Julie. Julie has five apples. How many apples does Lucy have? 5 – 3 = ?, ? + 3 = 5

[1] These take apart situations can be used to show all the decompositions of a given number. The associated equations, which have the total on the left of the equal sign, help children understand that the = sign does not always mean "makes" or "results in" but always does mean "is the same number as."

[2] Either addend can be unknown, so there are three variations of these problem situations. *Both Addends Unknown* is a productive extension of this basic situation, especially for small numbers less than or equal to 10.

[3] For the *Bigger Unknown* or *Smaller Unknown* situations, one version directs the correct operation (the version using more for the *Bigger Unknown* and using less for the *Smaller Unknown*). The other versions are more difficult.

Ohio | Department of Education

Connections Across Standards Represent and solve problems involving addition and subtraction (2.OA.1). Add and subtract within 20 fluently (2.OA.2). Relate addition and subtraction to length (2.MD.6).	
1.MD.4 (Prior Grade Standard) Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.	**3.MD.4 (Future Grade Standard)** Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by creating a line plot [G], where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.G.1

Recognize and identify triangles, quadrilaterals, pentagons, and hexagons based on the number of sides or vertices. Recognize and identify cubes, rectangular prisms, cones, and cylinders.

Essential Understandings

- Two-dimensional shapes (that are closed and have straight sides meeting at corners/vertices) can be classified by the number of sides and/or vertices.
- Three-dimensional shapes (cubes, rectangular prisms, cones, and cylinders) can be recognized and identified.

Common Misconceptions

Some students may think that a shape is changed by its orientation. They may see a rectangle with the longer side as the base, but claim that the same rectangle with the shorter side as the base is a different shape. This is why is it so important to have young students handle shapes and physically feel that the shape does not change regardless of the orientation, as illustrated below.

Academic Vocabulary/ Language

- attribute
- angle
- face
- side
- vertices
- triangle
- quadrilateral
- pentagon
- hexagon
- cube
- rectangular prism
- cones
- cylinder

Tier 2

- recognize
- draw
- identify

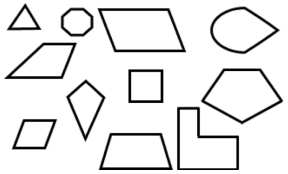
Learning Targets	I can recognize and identify triangles, quadrilaterals, pentagons and hexagons based on the number of sides or vertices. I can recognize and identify cubes, rectangular prisms, cones, and cylinders. I can compare the similarities and differences between two and three-dimensional shapes.

Assessment of Learning

- Students will understand that two-dimensional shapes are closed shapes with straight sides that meet at corners/vertices.
- Students will understand that two-dimensional shapes can be classified by the number of sides and/or vertices the shape has.
- Students will recognize and identify triangles, quadrilaterals, pentagons and hexagons based on the number of sides or vertices.
- Students will recognize and identify three-dimensional shapes (cubes, rectangular prisms, cones and cylinders).

Sample Questions/Activities

1. Circle all of the quadrilaterals in the collection of shapes below. Choose one shape that is a quadrilateral and explain why that shape is a quadrilateral. Choose one shape that is not a quadrilateral and explain why that shape is not a quadrilateral.



2. Jill and Finn looked at the set of shapes below. Jill said all the shapes were triangles but Finn disagreed. Who is correct? Explain.

3. Compare a cube and a square. How are they the same? How are they different?

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

In Grade 2, students continue to compose, decompose, and reason with shapes and their attributes. Students use formal language (e.g., sides, vertices) to recognize and identify two-dimensional shapes. Students should recognize and identify cubes, rectangular prisms, cones, and cylinders. Students should have numerous experiences with the defining characteristics of shapes. This helps students to understand that turning a triangle on its vertice, for example, does not change its classification. Students should go on shape hunts in the classroom for both two-dimensional and three-dimensional shapes. Students should engage in a variety of activities that focus students' thinking on shapes and their attributes, such as Guess My Shape. For example,

Teacher: Draw a closed shape that has 5 sides. What is the name of the shape?
Student: I drew a shape with 5 sides. ⬠ It is called a pentagon.

Teacher: I have 3 sides and 3 angles. What am I?
Student: A triangle. ◿ See, 3 sides, 3 angles.

Connections Across Standards Work with equal groups of objects (2.OA.4). Measure and estimate lengths in standard units (2.MD.1-4).	
1.G.1 (Prior Grade Standard) Distinguish between defining attributes, e.g., triangles are closed and three-sided, versus non-defining attributes, e.g., color, orientation, overall size; build and draw shapes that possess defining attributes.	**3.G.1 (Future Grade Standard)** Draw and describe triangles, quadrilaterals (rhombuses, rectangles, and squares), and polygons (up to 8 sides) based on the number of sides and the presence or absence of square corners (right angles).

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.G.2 Partition a rectangle into rows and columns of same-size squares and count to find the total number of them. **Essential Understanding** ● Rectangles can be partitioned into rows and columns.	**Common Misconceptions** Students may believe that a region model represents one out of two, three or four fractional parts without regard to the fact that the parts have to be equal shares, e.g., a rectangle divided by four equally spaced horizontal lines represents four fourths. 	**Academic Vocabulary/ Language** · partition · rectangle **Tier 2** · column · row

Learning Targets	I can apply my knowledge of arrays to partition rectangles into rows and columns. I can cut a rectangle into equal squares and count them and compare the size parts.

Assessment of Learning

- Students will understand that a rectangle can be partitioned into rows and columns of same-size squares.
- Students will use their understanding of arrays to partition a rectangle into rows and columns of same-size squares.
- Students will count the same-size squares to find the total number of them.

Sample Questions/Activities

1. Charlotte made a rectangle pan of brownies. She wants to cut the brownies into 8 equal pieces so her friends can taste the brownies she made. How could Charlotte cut the pan of brownies into 8 equal pieces? Explain your thinking.
2. Arthur partitioned his rectangle shaped paper into rows and columns of same-size squares. He colored 4 squares red, 4 squares blue, 4 squares yellow, 4 squares orange and 4 squares green. What could Arthur's paper look like? How many total same-size squares did Arthur have on his paper? Explain.
3. Polly has 4 rectangle shaped candy bars. She wants to share the 4 candy bars with her friends Sue and Henry. How could Polly share the candy bars so that all 3 kids have an equal amount of candy bars? Show your work and explain your thinking.

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

Modeling multiplication with partitioned rectangles promotes students' understanding of multiplication. Tell students that they will be drawing a square on grid paper. The length of each side is equal to 2 units. Ask them to guess how many 1 unit by 1 unit squares will be inside this 2 unit by 2 unit square. Students now draw this square and count the 1 by 1 unit squares inside it. They compare this number to their guess. Next, students draw a 2 unit by 3 unit rectangle and count how many 1 unit by 1 unit squares are inside. Now they choose the two dimensions for a rectangle, predict the number of 1 unit by 1 unit squares inside, draw the rectangle, count the number of 1 unit by 1 unit squares inside and compare this number to their guess. Students repeat this process for different-size rectangles. Finally, ask them what they observed as they worked on the task. It is vital that students understand different representations of fair shares. Provide a collection of different-size circles and rectangles cut from paper. Ask students to fold some shapes into halves, some into thirds, and some into fourths. They compare the locations of the folds in their shapes as a class and discuss the different representations for the fractional parts. To fold rectangles into thirds, ask students if they have ever seen how letters are folded to be placed in envelopes. Have them fold the paper very carefully to make sure the three parts are the same size. Ask them to discuss why the same process does not work to fold a circle into thirds.

Connections Across Standards

Work with equal groups of objects (2.OA.4).
Measure and estimate lengths in standard units (2.MD.1-4).

1.G.3 (Prior Grade Standard)	**3.G.2 (Future Grade Standard)**
Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of or four of the shares in real-world contexts. Understand for these examples that decomposing into more equal shares creates smaller shares.	Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as* $\frac{1}{4}$ *of the area of the shape.*

Ohio's Learning Standards-Clear Learning Targets

Math Grade 2

2.G.3

Partition circles and rectangles into two, three, or four equal shares; describe the shares using the words *halves, thirds,* or *fourths* and *quarters*, and use the phrases *half of, third of,* or *fourth of* and *quarter of*. Describe the whole as two halves, three thirds, or four fourths in real-world contexts. Recognize that equal shares of identical wholes need not have the same shape.

Essential Understandings

- When decomposing circles and rectangles into halves, thirds, or fourths, equal shares of identical wholes need not have the same shape.

Common Misconceptions

Students may believe that a region model represents one out of two, three or four fractional parts without regard to the fact that the parts have to be equal shares, e.g., a circle divided by two equally spaced horizontal lines represents three thirds.

Academic Vocabulary/ Language

- partition
- circle
- halves
- thirds
- half of
- a third of
- equal shares
- whole

Tier 2

- describe
- recognize
- identical

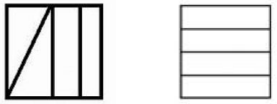
Learning Targets	I can partition circles and rectangles into two, three, or four equal parts. I can describe the equal shares with the terms *halves, thirds, fourths,* and *quarters*. I can describe the whole as two halves, three thirds, or four fourths in a real world situation. I can compare the equal shares of identical wholes and explain why they do not need to be the same shape.

Assessment of Learning

- Students will partition circles and rectangles into two, three, or four equal parts.
- Students will use vocabulary such as *halves*, *thirds*, *fourths*, or *quarters* to describe the equal shares.
- Students will describe a partitioned shape as two halves, three thirds or four fourths.
- Students will understand that the equal shares of identical wholes do not need to be the same shape.

Sample Questions/Activities

1. Mr. Emery gave 3 students a rectangle shaped piece of paper and asked his students to partition the rectangle into fourths. When he collected the papers, he saw that each student partitioned their papers into fourths in a different way. What could the 3 different students' papers look like? Explain how you know each rectangle is partitioned into fourths.
2. Look at the identical squares below. Are both squares partitioned into fourths? Why or why not? Justify your thinking.



3. Sebastian got a big chocolate chip cookie at the carnival and shared the cookie equally with his friends. He gave each friend a *quarter of* the chocolate cookie. How did Sebastian partition the cookie? How much cookie did each friend get? How do you know?

Ohio Department of Education Model Curriculum Instructional Strategies and Resources

It is vital that students understand different representations of fair shares. Students should have opportunities to partition identical shapes in different ways. Students should understand that the parts may not necessarily be the same shape as long as they are equal pieces. For example, a rectangle divided into fourths vertically results in rectangular parts or diagonally results in triangular parts. Provide a collection of different-size circles and rectangles cut from paper. Ask students to fold some shapes into halves, some into thirds, and some into fourths. They compare the locations of the folds in their shapes as a class and discuss the different representations for the fractional parts. To fold rectangles into thirds, ask students if they have ever seen how letters are folded to be placed in envelopes. Have them fold the paper very carefully to make sure the three parts are the same size. Ask them to discuss why the same process does not work to fold a circle into thirds.

Connections Across Standards

Work with equal groups of objects (2.OA.4).
Measure and estimate lengths in standard units (2.MD.1-4).

1.G.3 (Prior Grade Standard)	**3.G.2 (Future Grade Standard)**
Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.	Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as* $\frac{1}{4}$ *of the area of the shape.*