ACAP
Alabama Comprehensive Assessment Program

# Grade 2
# Mathematics

# Alabama Educator Instructional Supports

## Alabama Course of Study Standards

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# Introduction

The *Alabama Course of Study Instructional Supports: Math* is a companion manual to the 2016 *Revised Alabama Course of Study: Math* for Grades K–12. Instructional supports are foundational tools teachers may use to help students become independent learners as they build toward mastery of the *Alabama Course of Study* content standards.

- The purpose of the instructional supports found in this manual is to help teachers engage their students in exploring, explaining, and expanding their understanding of the content standards.

The content standards contained within the course of study may be accessed on the Alabama State Department of Education (ALSDE) website at www.alsde.edu.

Educators are reminded that content standards indicate minimum content—what all students should know and be able to do by the end of each grade level or course. Local school systems may have additional instructional or achievement expectations and may provide instructional guidelines that address content sequence, review, and remediation.

## Organization

The organizational components of this manual include standards, guiding questions, connections to instructional supports, key academic terms, and examples of activities. The definition of each component is provided below:

| | |
|---|---|
| **Content Standard:** | The content standard is the statement that defines what all students should know and be able to do at the conclusion of a given grade level or course. Content Standards contain minimum required content and complete the phrase "Students will." |
| **Guiding Questions:** | Each guiding question is designed to create a framework for the given standard. Therefore, each question is written to help teachers convey important concepts within the standard. By utilizing guiding questions, teachers are engaging students in investigating, analyzing, and demonstrating knowledge of the underlying concepts reflected in the standard. |

**Connection to Instructional Supports**:

The purpose of each instructional support is to engage students in exploring, explaining, and expanding their understanding of the content standards provided in the 2016 *Revised Alabama Course of Study: Math*. An emphasis is placed on the integration of the eight Standards for Mathematical Practice.

*Mathematical Practices*

The Standards for Mathematical Practice describe the varieties of expertise that mathematics educators at all levels should seek to develop in their students. They rest on the National Council of Teachers of Mathematics (NCTM) process standards and the strands of mathematical proficiency specified in the National Research Council's report *Adding It Up: Helping Children Learn Mathematics.*

The Standards for Mathematical Practice are the same for all grade levels and are listed below.

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

**Key Academic Terms:**

The academic terms included in each instructional support. These academic terms are derived from the standards and are to be incorporated into instruction by the teacher and used by the students.

**Instructional Activities:**

A representative set of sample activities and examples that can be used in the classroom. The set of activities and examples is not intended to include all the activities and examples defined by the standard. These will be available in Fall 2020.

**Additional Resources:**

Additional resources include resources that are aligned to the standard and may provide additional instructional strategies to help students build toward mastery of the designated standard. These will be available in Fall 2020.

| Operations and Algebraic Thinking |
|---|
| Represent and solve problems involving addition and subtraction. |
| **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. |

## Guiding Questions with Connections to Mathematical Practices:

### How can a word problem be represented in a variety of ways?

*M.P.4. Model with Mathematics.* Represent all addition and subtraction situation types from Appendix A in the *Alabama Course of Study* with manipulatives, drawings, or equations. For example, use blocks to represent 24 students in the classroom, and a situation where some students leave the classroom to go to the media center, leaving 16 students in the classroom.

### How can an addition or subtraction equation be represented by a related equation to best represent a given situation?

*M.P.7. Look for and make use of structure.* Represent any addition or subtraction equation in other related equations, by rearranging the addends and their placement in relation to the equal sign depending on context. For example, $13 + 9 = 22$ is related to: $9 + 13 = 22$, $22 = 13 + 9$, $22 = 9 + 13$, $22 - 13 = 9$, $9 = 22 - 13$, $22 - 9 = 13$, and $13 = 22 - 9$.

### How can the context of a situation with an unknown number help to determine which operation(s) to use in a word problem?

*M.P.2. Reason abstractly and quantitatively.* Determine which operation to use in a word problem by making sense of the situation. For example, the situation "Mason has 19 dinosaur toys. Together, he and Rachel have 45 dinosaur toys. How many dinosaur toys does Rachel have?" can be represented by using either an addition equation, $19 + \square = 45$, or a subtraction equation, $45 - 19 = \square$. This is an example of an "Add to – Change Unknown" situation from Appendix A in the *Alabama Course of Study*.

### How does a two-step problem relate to a one-step problem?

*M.P.6. Attend to precision.* Interpret a two-step problem as a series of one-step problems. For example, the situation "Jude has 18 markers. He throws away 7 that were dried out before buying 10 more at the store. How many markers does Jude have?" can be represented as $18 - 7 + 10$ and is the same as first subtracting 7 from 18 and then adding 10 to the answer to find the total number of markers. Students often struggle with multi-step word problems, so *M.P.6* should be emphasized.

## Key Academic Terms:

add, subtract, compare, unknown, equation, equal addends, sum, minuend, subtrahend, difference, adding to, taking from, putting together, taking apart, comparing with unknowns

| Operations and Algebraic Thinking |
|---|
| Add and subtract within 20. |
| **2.OA.2** Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers. |

## Guiding Questions with Connections to Mathematical Practices:

### How can mental strategies help to add and subtract numbers?

*M.P.7. Look for and make use of structure.* Apply the use of mental strategies (counting on, making 10, decomposing to 10, doubling, relating addition to subtraction, creating equivalent sums) to add and subtract numbers. For example, $11 + 7$ is the same as $10 + 1 + 7$.

### What does adding or subtracting a zero mean?

*M.P.2. Reason abstractly and quantitatively.* Recognize that adding does not always result in a larger number, and subtracting does not always result in a smaller number, since adding or subtracting a zero does not change a number. For example, starting with 9 cookies and not giving any away, $9 - 0 = 9$, results in the same number of cookies.

## Key Academic Terms:

add, subtract, mental strategies, counting on, making 10, decompose, equivalent sums, doubling

| Operations and Algebraic Thinking |
| --- |
| Work with equal groups of objects to gain foundations for multiplication. |
| **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. |

## Guiding Questions with Connections to Mathematical Practices:

### How can it be determined if a number is even or odd?

*M.P.7. Look for and make use of structure.* Organize groups of objects in a way that pairs them up, matches from one row to another, or groups them into two equal groups to determine if a number is even or odd. For example, 17 pennies laid out in two rows on a desk, organized so that the rows line up with each other, will have one row that is one penny longer than the other row, so 17 is an odd number.

### How does writing an equation help to compose an even or odd number?

*M.P.2. Reason abstractly and quantitatively.* Demonstrate any even number as the sum of two numbers if it has two equal addends. For example, $12 = 6 + 6$, so 12 is an even number. However, 13 is an odd number because there is a pair of consecutive numbers that will add together to make a sum of 13, but there is not a whole number that can be added to itself to make a sum of 13.

## Key Academic Terms:

add, subtract, even, odd, equation, equal addends, whole number, pair, match, sum

| Operations and Algebraic Thinking |
| --- |
| Work with equal groups of objects to gain foundations for multiplication. |
| **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. |

## Guiding Questions with Connections to Mathematical Practices:

### How can arrays help with solving addition problems?

*M.P.7. Look for and make use of structure.* Interpret a rectangular array as a display of objects relating to the numbers in an addition problem. For example, an array that has 5 rows and 3 columns of objects can represent $3 + 3 + 3 + 3 + 3$ or $5 + 5 + 5$. Use skip-counting to find the total.

### How are rows and columns in an array related to addition equations?

*M.P.8. Look for and express regularity in repeated reasoning.* Recognize that an array has rows and columns that represent addends in an addition equation, and can be interpreted in different ways. For example, an array that has 4 rows and 5 columns can be represented as $4 + 4 + 4 + 4 + 4 = 20$ or $5 + 5 + 5 + 5 = 20$.

## Key Academic Terms:

add, array, row, column, equation, addend, skip-counting, sum, total

| Number and Operations in Base Ten |
| --- |
| Understand place value. |
| **2.NBT.5** 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. Understand the following as special cases:<br>**2.NBT.5a** 100 can be thought of as a bundle of ten tens, called a "hundred." |

## Guiding Questions with Connections to Mathematical Practices:

### How can place value understanding help to represent a three-digit number?

*M.P.7. Look for and make use of structure.* Recognize the specific words used to identify the place values of digits, such as hundreds, tens, and ones, and use the words to represent numbers. For example, the number 278 can be represented as 2 hundreds, 7 tens, and 8 ones, 27 tens and 8 ones, or 278 ones.

### How does a bundle of 10 tens relate to a bundle of 10 ones?

*M.P.8. Look for and express regularity in repeated reasoning.* Relate the previous understanding that a bundle of 10 ones makes 1 ten to the idea of a bundle of 10 tens making 1 hundred, and explain how that relates to place values. For example, use base-ten blocks to make a ten (a rod) and then put 10 tens together to make a hundred (a flat), and write each of the numbers (1 one, 1 ten, and 1 hundred) in numerical form to see the place value of each.

## Key Academic Terms:

digit, place value, hundreds, tens, ones, bundle, three-digit number

| Number and Operations in Base Ten |
|---|
| Understand place value. |
| **2.NBT.5** 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. Understand the following as special cases:<br>**2.NBT.5b** 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). |

## Guiding Questions with Connections to Mathematical Practices:

### How can hundreds be composed to make multiple hundreds?

*M.P.7. Look for and make use of structure.* Construct bundles of hundreds to compose a given number of hundreds. For example, a bundle of 5 hundreds makes 500.

### How can three-digit numbers be represented in different ways?

*M.P.2. Reason abstractly and quantitatively.* Recognize that a number with three digits can be decomposed in multiple ways. For example, 461 can be decomposed to 4 hundreds, 6 tens, and 1 one, or 46 tens and 1 one, 461 ones, or 3 hundreds and 161 ones, etc.

## Key Academic Terms:

digit, place value, hundreds, tens, ones, compose, decompose, three-digit number

| Number and Operations in Base Ten |
| --- |
| Understand place value. |
| **2.NBT.6** Count within 1000; skip-count by 5s, 10s, and 100s. |

## Guiding Questions with Connections to Mathematical Practices:

### How can place value understanding help with counting?

*M.P.7. Look for and make use of structure.* Use place value understanding to relate counting single- and double-digit numbers to counting numbers with three digits. For example, the next three numbers when counting from 19 are 20, 21, and 22, and that relates to the next three numbers when counting from 819: 820, 821, and 822.

### What patterns emerge when skip-counting by 5s?

*M.P.8. Look for and express regularity in repeated reasoning.* Observe that skip-counting by 5s leads to a pattern in the ones place of alternating numbers, and the tens place pattern is to go up by one every other time. For example, skip-counting by 5s starting at 2 results in 2, 7, 12, 17, 22, 27, and so on.

### What patterns emerge when skip-counting by 10s and 100s?

*M.P.8. Look for and express regularity in repeated reasoning.* Observe that skip-counting by 10s leaves the digit in the ones place the same, while the digit in the tens place go up by one each time. When skip-counting by 100s, both the ones and tens digits remain the same, while the digit in the hundreds place go up by 1 each time. For example, skip-counting by 100 starting at 47 results in 47, 147, 247, 347, and so on.

### How are skip-counting by 5s, 10s, and 100s all related?

*M.P.7. Look for and make use of structure.* Find the pattern for skip-counting by 10s within the pattern of skip-counting by 5s by looking at every other number, and find the pattern for skip-counting by 100s within the pattern of skip-counting by 10s by looking at every tenth number. For example, look at the underlined numbers in this list for skip-counting by 5s starting at 6: <u>6</u>, 11, <u>16</u>, 21, <u>26</u>, 31. The underlined numbers are skip-counting by 10s, starting at 6. The patterns become apparent when using a 100s chart.

## Key Academic Terms:

skip-count, place value, numerical pattern, digit, single-digit number, double-digit number, three-digit number

| Number and Operations in Base Ten |
| --- |
| Understand place value. |
| **2.NBT.7** Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. |

## Guiding Questions with Connections to Mathematical Practices:

### How can place value understanding help to represent numbers using number names?

*M.P.7. Look for and make use of structure.* Connect place value with the names of each place represented in a number to understand how to say the number. For example, the number 357 has a 3 in the hundreds place, a 5 in the tens place, and a 7 in the ones place, so it can be read as "three hundred fifty-seven."

### How can place value understanding help to write numerals from numbers represented in standard (number name) form?

*M.P.7. Look for and make use of structure.* Recognize that number names relate to place value and can be used to determine the location of digits. For example, seven hundred twenty-nine has a 7 in the hundreds place, a 2 in the tens place, and a 9 in the ones place. As such, the number seven hundred twenty-nine can be written as 729.

### How can a number be represented in expanded form?

*M.P.7. Look for and make use of structure.* Decompose a number into digits and attach value to each digit to represent the number in expanded form. For example, 408 has the digit 4 in the hundreds place (i.e., 400), the digit 0 in the tens place, and the digit 8 in the ones place; therefore, the expanded form of 408 is $400 + 8$.

### How can a visual representation connect the different forms of a number?

*M.P.4. Model with mathematics.* Use drawings and manipulatives to represent a number in different forms. For example, the number 245 can be represented by 2 hundreds ("flats"), 4 tens ("rods"), and 5 ones ("units"), which can be written as 2 hundreds + 4 tens + 5 ones.

## Key Academic Terms:

place value, base-ten numeral, number name, expanded form, standard form, digit, decompose

| Number and Operations in Base Ten |
| --- |
| Understand place value. |
| **2.NBT.8** Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits using >, =, and < symbols to record the results of comparisons. |

## Guiding Questions with Connections to Mathematical Practices:

### How can place value understanding help to compare three-digit numbers?

*M.P.7. Look for and make use of structure.* Compare place value between two numbers to decide which number is greater, and then represent the comparison using the appropriate symbol. For example, 635 is greater than 580 because it has 6 hundreds and 580 only has 5 hundreds. Similarly, even though 635 and 642 have the same number of hundreds, 635 is less than 642 because the former only has 3 tens and the latter has 4 tens. These comparisons can be represented with symbols as $635 > 580$ and $635 < 642$.

### How can visual representations help compare numbers?

*M.P.4. Model with mathematics.* Use drawings or manipulatives to help compare numbers. For example, when comparing 289 and 245, draw two hundreds (“flats”) first. Since they are the same, move to the next largest place value and draw 8 tens (“rods”) and 4 tens (“rods”). Since there are more tens (“rods”) in 289 than 245, $289 > 245$.

### Why is the place value furthest to the left compared first when comparing three-digit numbers?

*M.P.3. Construct viable arguments and critique the reasoning of others.* Explain why it’s important to compare the furthest left place values first when comparing numbers. For example, explain that the value of the digit in the hundreds place is greater than any single digit number of tens or ones; therefore, when comparing two 3-digit numbers, if the value in the hundreds place is greater in one number, then there is no need to compare the values in the remaining places.

## Key Academic Terms:

place value, digit, compare, greater than (>), equal to (=), less than (<), three-digit number

| Number and Operations in Base Ten |
|---|
| Use place value understanding and properties of operations to add and subtract. |
| **2.NBT.9** Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. |

## Guiding Questions with Connections to Mathematical Practices:

### How can place value understanding help to fluently add and subtract numbers?

*M.P.7. Look for and make use of structure.* Decompose numbers into tens and ones and add each place value grouping together, and then add the sums together. For example, $46 + 25$ is the same as adding 6 ones and 5 ones for a total of 11 ones, and then adding 4 tens and 2 tens for a total of 6 tens: 11 ones and 6 tens added together is 71.

*M.P.7. Look for and make use of structure.* Decompose the subtrahend or minuend in a subtraction problem to use place value for subtraction. For example, 61 – 18 can be thought of as 61 – 10 (i.e., 51), and then subtracting 1 from the answer of 51 to get to 50. Then use the remaining 7 ones to get the final difference of $50 – 7 = 43$.

### How can the properties of operations help to fluently add and subtract numbers?

*M.P.2. Reason abstractly and quantitatively.* Decompose numbers and use the properties of operations to add or subtract the parts of the numbers. For example, $62 + 29$ can be expanded to $60 + 2 + 20 + 9$ and then rearranged to $60 + 20 + 2 + 9 = 80 + 11 = 91$.

### How does the relationship between addition and subtraction help to fluently subtract numbers?

*M.P.2. Reason abstractly and quantitatively.* Rewrite a subtraction problem as a missing addend problem. For example, 49 – 21 can be rewritten as $21 + \square = 49$. Recognize that $21 + 20 = 41$, and $41 + 8 = 49$. Add the $20 + 8$ to get a sum of 28. Because $21 + 28 = 49$, know that $49 – 21 = 28$.

## Key Academic Terms:

place value, addition, subtraction, sum, difference, addend, minuend, subtrahend, decompose, properties of operations

| Number and Operations in Base Ten |
|---|
| Use place value understanding and properties of operations to add and subtract. |
| **2.NBT.10** Add up to four two-digit numbers using strategies based on place value and properties of operations. |

## Guiding Questions with Connections to Mathematical Practices:

### How can place value understanding help to add up to four two-digit numbers?

*M.P.2. Reason abstractly and quantitatively.* Connect adding two numbers using place value to adding more than two numbers in succession. For example, $53 + 26 + 34 + 17$ decomposed into a group of tens and a group of ones would be: $5 + 2 + 3 + 1$ tens and $3 + 6 + 4 + 7$ ones. The group of 11 tens added to the group of 20 ones totals 130.

### How can the properties of operations help to add up to four two-digit numbers?

*M.P.7. Look for and make use of structure.* Connect adding two numbers using the properties of operations to adding more than two numbers in succession. For example, $49 + 26 + 13 + 51$ can be rearranged as $49 + 51 + 26 + 13$ so that it is easier to mentally add the numbers together using benchmarks of 10 or 100. Since $49 + 51 = 100$, and $26 + 13 = 39$, the sum is 139.

## Key Academic Terms:

place value, addition, subtraction, benchmark number, two-digit number, properties of operations

| Number and Operations in Base Ten |
| --- |
| Use place value understanding and properties of operations to add and subtract. |
| **2.NBT.11** Add and subtract within 1000 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. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds. |

## Guiding Questions with Connections to Mathematical Practices:

### How do addition and subtraction within 1000 relate to addition and subtraction within 100?

*M.P.2. Reason abstractly and quantitatively.* Connect place value understanding and the properties of operations used to add and subtract within 100 to add and subtract within 1000. For example, just as two-digit numbers can be decomposed into tens and ones, three-digit numbers can be decomposed into hundreds, tens, and ones.

### How can addition and subtraction within 1000 be modeled in a variety of ways?

*M.P.4. Model with mathematics.* Model addition and subtraction by using manipulatives and drawings, and use the model to explain thinking. For example, a model to add two three-digit numbers could use drawings of squares to represent hundreds, lines to represent tens, and dots to represent ones. The two numbers are drawn, and then the total number of squares, lines, and dots leads to the number of hundreds, tens, and ones in the sum.

### When does a hundred or ten need to be decomposed in a subtraction problem?

*M.P.7. Look for and make use of structure.* Recognize that subtracting a larger value from a smaller value requires the decomposition of the value that is one place value greater. For example, 719 – 646 needs 1 hundred to be decomposed into 10 tens for the subtraction in the tens place, changing the first digit to 6 hundreds, 11 tens, and 9 ones. Then subtract 6 hundreds, 4 tens, and 6 ones to find the difference of 7 tens and 3 ones, or 73.

## Key Academic Terms:

place value, addition, subtraction, three-digit number, properties of operations, compose, decompose

| Number and Operations in Base Ten |
| --- |
| Use place value understanding and properties of operations to add and subtract. |
| **2.NBT.12** Mentally add 10 or 100 to a given number 100 – 900, and mentally subtract 10 or 100 from a given number 100 – 900. |

## Guiding Questions with Connections to Mathematical Practices:

**How do mental addition and subtraction of 10 or 100 with a given number relate to skip-counting by 10s or 100s?**

*M.P.2. Reason abstractly and quantitatively.* Connect adding or subtracting 10 to skip-counting by 10s. For example, skip-count backward by 10s to show 865 is 10 less than 875.

*M.P.2. Reason abstractly and quantitatively.* Connect adding or subtracting 100 to skip-counting by 100s. For example, skip-count forward by 100s to show 489 is 100 more than 389.

**How can mental addition and subtraction of 10 or 100 help to solve problems involving multiples of 10 and 100?**

*M.P.8. Look for and express regularity in repeated reasoning.* Decompose any multiple of 10 or 100 to show repeated addition to solve problems. For example, $279 + 40$ can be decomposed to $279 + 10 + 10 + 10 + 10$ and can be solved mentally by skip-counting four times by 10 starting at 279 and ending at 319.

## Key Academic Terms:

place value, addition, subtraction, more than, less than, multiple, decompose

| **Number and Operations in Base Ten** |
|---|
| Use place value understanding and properties of operations to add and subtract. |
| **2.NBT.13** Explain why addition and subtraction strategies work, using place value and the properties of operations. (Explanations may be supported by drawings or objects.) |

## Guiding Question with Connections to Mathematical Practices:

### How can strategies for addition and subtraction be explained in a variety of ways?

*M.P.3. Construct viable arguments and critique the reasoning of others.* Explain a strategy for an addition or subtraction problem using words, drawings, or objects. For example, explain the thinking that leads to adding hundreds together first, then tens together, and then ones together, and finally combining all three place value groups to find an answer by drawing a model to show why it works.

## Key Academic Terms:

place value, addition, subtraction

| Measurement and Data |
|---|
| Measure and estimate lengths in standard units. |
| **2.MD.14** Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes. |

## Guiding Questions with Connections to Mathematical Practices:

### What is length and how is it measured?

*M.P.2. Reason abstractly and quantitatively.* Understand length as the distance between two points, and identify the appropriate tools for measuring it. For example, the length of a bookshelf (i.e., the distance from one side to the other) can be measured with tools such as a yardstick, a meter stick, or a measuring tape.

### How are measurement tools used?

*M.P.5. Use appropriate tools strategically.* Understand that when using a ruler or other measurement device, the end marked with “0” is aligned with one edge of the object while the number on the device that is aligned with the other edge of the object indicates the length. For example, the length of a book can be determined as 7 inches if the end of a ruler (US customary) marked with “0” is aligned with one edge of the book and the number “7” on the ruler is aligned with the other edge of the book.

### What is a unit of length and why is it important?

*M.P.6. Attend to precision.* Define a unit of length as a measurement that can be an inch, centimeter, or other unit that is of equal size and has no spaces between units and explain the significance of identifying the unit. For example, when measuring an object, choose a homemade ruler made from paperclip lengths with no gaps or overlaps, and identify the length unit as a paperclip.

## Key Academic Terms:

length, ruler, yardstick, meter stick, measuring tape, inches, feet, centimeters, meters, distance, unit of length

| Measurement and Data |
| --- |
| Measure and estimate lengths in standard units. |
| **2.MD.15** 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. |

## Guiding Questions with Connections to Mathematical Practices:

### How can an object have different measurements to describe its length?

*M.P.2. Reason abstractly and quantitatively.* Recognize that a unit is a standard of measurement, and that the same length can be measured using different units. For example, the height of a picture frame can be measured using either units of inches or units of centimeters. If the frame is about 11 inches tall, then it is also about 28 centimeters tall.

### How does the size of the unit impact the measurement of an object?

*M.P.2. Reason abstractly and quantitatively.* Recognize that if the same object is measured with two different units of measurement, then the unit that produces a larger number is smaller than the other unit because it requires more of that unit to cover the same distance. For example, if the length of a rug is first measured as 100 inches and then measured as 254 centimeters, then it can be determined that a centimeter is a smaller unit than an inch because it requires more centimeters than inches to cover the same distance.

## Key Academic Terms:

unit, length, inches, feet, centimeters, meters, length unit, distance

| Measurement and Data |
|---|
| Measure and estimate lengths in standard units. |
| **2.MD.16** Estimate lengths using units of inches, feet, centimeters, and meters. |

## Guiding Questions with Connections to Mathematical Practices:

### What is a measurement estimate?

*M.P.2. Reason abstractly and quantitatively.* Understand that an estimate is an approximation of measurement rather than an actual measurement. For example, the height of a room that is 8 feet, 3 inches can be estimated to be about 8 feet.

### How can the reasonableness of an estimate be verified?

*M.P.2. Reason abstractly and quantitatively.* Connect an estimated measurement to a known measurement to assess the reasonableness of the estimate. For example, if a book is shorter than a piece of paper, and it is known that the piece of paper is 11 inches long, the estimate for the length of the book should be less than 11 inches.

*M.P.6. Attend to precision.* Recognize that many estimations can be verified by taking actual measurements. For example, if a person estimates that the height of a mailbox is 45 inches, then a measurement device such as a measuring tape could be used to determine the actual height.

### What strategies can be used for estimating distances?

*M.P.2. Reason abstractly and quantitatively.* Extend previous knowledge of measurements of known objects by using a “mental ruler” to make estimations. For example, if someone knows a paperclip is about 1 inch, imagine repeating the paperclip 6 times to measure a dollar bill to estimate the length as 6 inches.

## Key Academic Terms:

estimate, inches, feet, centimeters, meters

| **Measurement and Data** |
|---|
| Measure and estimate lengths in standard units. |
| **2.MD.17** Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit. |

## Guiding Question with Connections to Mathematical Practices:

### How can the difference in length between two objects be determined?

*M.P.5. Use appropriate tools strategically.* Measure two objects using the same standard length unit, and then recognize that the length of a shorter object subtracted from the length of the longer object produces the difference in length between the objects. For example, if the length of a pen is measured at 6 inches and the length of an eraser is measured at 2 inches, then the pen is 4 inches longer than the eraser because $6 - 2 = 4$, or it can be said that the eraser is 4 inches shorter than the pen.

## Key Academic Terms:

unit, length, difference, comparison

| Measurement and Data |
|---|
| Relate addition and subtraction to length. |
| **2.MD.18** Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. |

## Guiding Questions with Connections to Mathematical Practices:

### How can addition and subtraction be used to determine unknown numbers in problems about length?

*M.P.2. Reason abstractly and quantitatively.* Recognize that addition can be used for problems involving the combined length of objects. For example, if Joe stacks 5 blocks that are each 2 inches tall, then the total height of Joe's stack is 10 inches because $2 + 2 + 2 + 2 + 2 = 10$.

*M.P.2. Reason abstractly and quantitatively.* Recognize that subtraction can be used for problems involving the difference of object lengths. For example, if Anna's plant is 60 centimeters tall and 18 centimeters taller than Michael's plant, to find the height of Michael's plant, draw a tape diagram that shows the height of Anna's plant and the difference between Michael's and Anna's plants. Then write the equation $60 = \square + 18$ and find the height of 42 centimeters.

### How can a drawing of a ruler be used to create an equation with an unknown number?

*M.P.1. Make sense of problems and persevere in solving them.* Recognize that finding the difference in length is an additive comparison, as shown in Appendix A of the *Alabama Course of Study*. For example, the difference between 6 and 2 can be modeled on a number line by placing an arrow of length 6 going to the right from 0 and then an arrow of length 2 going to the left from 6. This models the equation 6 – 2, and the difference is 4.

## Key Academic Terms:

length, addition, subtraction, difference, tape diagram, number line

| Measurement and Data |
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| Relate addition and subtraction to length. |
| **2.MD.19** Represent whole numbers as lengths from 0 on a number line diagram 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. |

## Guiding Questions with Connections to Mathematical Practices:

### How is a ruler related to a number line?

*M.P.2. Reason abstractly and quantitatively.* Compare a number line to a ruler and explain the similarities between number lines and rulers. For example, both a number line and a ruler have equally spaced intervals or tick marks that are used to represent distances or lengths.

### How can the location of a number on a number line be determined?

*M.P.6. Attend to precision.* Accurately approximate the location of a number on a number line by using knowledge of length units and placing marks appropriately when needed. For example, when given an open number line (a line with no tick marks) and the numbers 2, 16, and 20, label the number line 0 on the far left and 20 on the far right; mark the 2 slightly to the right of 0 and mark the 16 slightly to the left of 20.

### How can the sum of two whole numbers be represented on a number line?

*M.P.5. Use appropriate tools strategically.* Understand that addition can be represented on a number line by counting forward or to the right. For example, the sum of 10 and 5 can be represented by locating 10 on a number line and then counting 5 tick marks forward or to the right, ending on a point which is located 15 units from 0.

### How can the difference of two whole numbers be represented on a number line?

*M.P.5. Use appropriate tools strategically.* Understand that subtraction can be represented on a number line by counting backward or to the left. For example, the difference of 17 and 5 can be represented by locating 17 on a number line and then counting 5 tick marks backward or to the left, ending on a point which is located 12 units from 0.

## Key Academic Terms:

open number line, sum, difference, whole number, interval, tick marks, length unit

| Measurement and Data |
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| Work with time and money. |
| **2.MD.20** Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m. |

## Guiding Questions with Connections to Mathematical Practices:

### What do a.m. and p.m. represent?

*M.P.7. Look for and make use of structure.* Recognize that a.m. designates the time interval between midnight and noon while p.m. designates the time interval between noon and midnight. For example, the time of an activity that occurs in the morning is designated with a.m., while the time of an activity that occurs in the afternoon is designated with p.m.

### What is an analog clock and how is it used to tell time?

*M.P.6. Attend to precision.* Recognize that an analog clock has moving hands that are used to indicate the hour (short hand) and the minute (long hand) by pointing to different locations around a circle that are labeled 1–12. For example, if the short hand is pointing to 3 and the long hand is pointing to 12, then the clock is showing that the time is either 3:00 a.m. or 3:00 p.m.

*M.P.6. Attend to precision.* Recognize that there are five tick marks between each number on a clock so that there is a total of 60 tick marks to represent the minutes in each hour and that the number 12 at the top of the clock corresponds to 0 minutes. For example, if the short hand is pointing between 2 and 3, and the long hand is pointing to 9, then the time is either 2:45 a.m. or 2:45 p.m.

## Key Academic Terms:

analog, digital, a.m., p.m. midnight, noon, morning, afternoon, evening, night, minute hand, hour hand, time interval, tick marks

| Measurement and Data |
|---|
| Work with time and money. |
| **2.MD.21** Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately.<br>Example: If you have 2 dimes and 3 pennies, how many cents do you have? |

## Guiding Questions with Connections to Mathematical Practices:

### What are the monetary values of quarters, dimes, nickels, and pennies?

*M.P.2. Reason abstractly and quantitatively.* Understand that different coins are used to represent different amounts of money expressed in cents (¢). For example, a quarter represents 25¢, a dime represents 10¢, a nickel represents 5¢, and a penny represents 1¢.

### How can different coins be used to represent the same amount of money?

*M.P.1. Make sense of problems and persevere in solving them.* Recognize that an amount of money may be represented using various combinations of coins. For example, a quarter is the same amount of money as 5 nickels or 2 dimes and 1 nickel because they all have a value of 25¢.

### What is the relationship between dollars and cents?

*M.P.2. Reason abstractly and quantitatively.* Recognize that 1 dollar ($1) is equivalent to 100 cents. For example, if Abby has a dollar bill ($1) and a quarter (25¢), then the total amount of money Abby has can be represented as 125¢.

## Key Academic Terms:

dollars, cents, quarter, dime, nickel, penny, dollar bill

| Measurement and Data |
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| Represent and interpret data. |
| **2.MD.22** 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 making a line plot where the horizontal scale is marked off in whole-number units. |

## Guiding Questions with Connections to Mathematical Practices:

### How is a line plot connected to rulers and number lines?

*M.P.2. Reason abstractly and quantitatively.* Explain the similarities between line plots and rulers and number lines. For example, notice that a line plot uses a section of a ruler that represents the measurement data.

### What is a line plot and how can it be used to show measurement data involving whole-number units?

*M.P.4. Model with mathematics.* Understand that a line plot is a graph that displays a distribution of data values (e.g., lengths) such that each data value is marked above a horizontal line with an X. For example, if a box of screws includes 3 screws that are each 1-inch long, 5 screws that are each 2-inches long, and 4 screws that are each 3-inches long, then a line plot can be constructed with three Xs stacked vertically above 1, five Xs stacked vertically above 2, and four Xs stacked vertically above 3.

## Key Academic Terms:

data, line plot, whole numbers, horizontal, vertical

| Measurement and Data |
|---|
| Represent and interpret data. |
| **2.MD.23** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. |

## Guiding Questions with Connections to Mathematical Practices:

### What is a picture graph and how is it used to represent data?

*M.P.4. Model with mathematics.* Understand that a picture graph is a visual representation of data that uses pictures or drawings. For example, if Ben surveys his classmates about their favorite pets and finds that 7 students like dogs, 6 students like cats, and 3 students like birds, then he can construct a graph of the data with pictures of a dog, a cat, a bird, and stick figures. More specifically, a graph with 3 rows and 2 columns can be constructed with the first column showing pictures of a dog, a cat, and a bird, and the second column showing 7 stick figures, 6 stick figures, and 3 stick figures next to the corresponding pictures.

### What is a bar graph and how is it used to represent data?

*M.P.4. Model with mathematics.* Understand that a bar graph is a visual representation of data that uses bars of different lengths. For example, if the rainfall in January was 5 inches, the rainfall in February was 4 inches, and the rainfall in March was 6 inches, then a graph can be constructed with the labels “January,” “February,” and “March” below a horizontal line and a vertical line with 6 equally spaced tick marks labeled from 1 to 6, like a number line. Three bars with heights of 5, 4, and 6 centered above the respective labels “January,” “February,” and “March” show the amount of rainfall for each of the three months.

### How can the information presented in bar graphs be used to make comparisons?

*M.P.4. Model with mathematics.* Recognize that the information presented in bar graphs can be used to show relationships within data. For example, if a bar graph shows that 10 students in a gym class prefer soccer and 8 students prefer kickball, then it can be concluded that 2 more students prefer soccer than prefer kickball.

## Key Academic Terms:

data set, picture graph, bar graph, scale, column, row, horizontal, vertical, relation, corresponding, represent, interpret

| Geometry |
| --- |
| Reason with shapes and their attributes. |
| **2.G.24** Recognize and draw shapes having specified attributes such as a given number of angles or a given number of equal faces. (Sizes are compared directly or visually, not compared by measuring.) Identify triangles, quadrilaterals, pentagons, hexagons, and cubes. |

## Guiding Questions with Connections to Mathematical Practices:

### How can shapes be sorted by specified attributes?

*M.P.7. Look for and make use of structure.* Recognize when shapes have the same number of sides, the same number of angles, or other attributes in common, and sort them accordingly. For example, all shapes with 5 sides belong to the group called pentagons.

### When is a shape called a triangle, quadrilateral, pentagon, or hexagon?

*M.P.7. Look for and make use of structure.* Observe the number of sides a shape has to determine its classification. For example, a six-sided shape is called a hexagon.

### What is needed to determine if an angle is a right angle?

*M.P.5. Use appropriate tools strategically.* Define a right angle using known objects, such as the corner of a piece of paper. For example, find how many right angles are in a quadrilateral by placing an index card in each of the four angles and note how many of the angles line up perfectly with the corner of the index card.

### When is a shape called a cube?

*M.P.7. Look for and make use of structure.* Observe that when a three-dimensional object has six faces, all of which are squares of equal size, it is called a cube. For example, the dice in a board game are cubes.

## Key Academic Terms:

shape, attribute, angle, face, triangle, quadrilateral, pentagon, hexagon, cube, right angle, side, 2-dimensional, 3-dimensional

| Geometry |
| --- |
| Reason with shapes and their attributes. |
| **2.G.25** Partition a rectangle into rows and columns of same-size squares, and count to find the total number of them. |

## Guiding Question with Connections to Mathematical Practices:

### How can a rectangle be decomposed into equal-sized squares?

*M.P.6. Attend to precision.* Construct rows and columns in a rectangle, filling the entire space, to partition a rectangle. For example, use manipulatives of equal-sized square tiles to fill in a rectangle with 2 rows and 6 columns in a structured way and count to determine there are 12 squares.

## Key Academic Terms:

partition, rectangle, square, row, column, decompose

| Geometry |
|---|
| Reason with shapes and their attributes. |
| **2.G.26** Partition circles and rectangles into two, three, or four equal shares; describe the shares using the words *halves*, *thirds*, *half of*, *a third of*, etc.; and describe the whole as two halves, three thirds, or four fourths. Recognize that equal shares of identical wholes need not have the same shape. |

## Guiding Questions with Connections to Mathematical Practices:

### How can circles be partitioned into equal shares?

*M.P.6. Attend to precision.* Decompose a circle into equal-sized slices, all coming together at the center. For example, think of a circular pizza that has been sliced in half horizontally, and then sliced vertically to make 4 equal-sized slices.

### How are rectangles and circles partitioned the same, and how are they different?

*M.P.2. Reason abstractly and quantitatively.* Recognize that rectangles and circles can both be partitioned into equal shares, but the shapes of those partitions will be different. For example, a rectangle partitioned into 2 equal shares may be composed of 2 rectangles, while a circle partitioned into 2 equal shares will be composed of 2 shapes that each have one straight side and one rounded side.

### How can partitions of shapes be described?

*M.P.7. Look for and make use of structure.* Describe partitions of a shape with words that indicate the parts of the whole shape: there are two halves, or three thirds, or four fourths. If only one of the partitions is being described: half of, a third of, a fourth of, etc. For example, a rectangle that is partitioned into three equal shares is composed of three thirds, and one of those shares is a third of the whole rectangle.

### How can equal shares of identical rectangles be represented in different ways?

*M.P.3. Construct viable arguments and critique the reasoning of others.* Partition a rectangle in multiple ways to see that there are different ways to make equal shares of the same size that may not be the same shape. For example, a square can be partitioned into fourths by drawing a line down the middle vertically and then another line through the middle horizontally to make 4 smaller square equal shares, or it can have a line down the middle vertically and then two more vertical lines on either side of the first line, splitting the two halves in half to make 4 thin rectangular equal shares, or it can be partitioned diagonally to make 4 equal triangular shares.

## Key Academic Terms:

partition, circle, rectangle, equal shares, halves, thirds, fourths, half of, third of, fourth of, whole, vertical, horizontal, diagonal, decompose