Ohio's Model Curriculum | Mathematics

with Instructional Supports

Grade 2

Ohio | Department of Education

Mathematics Model Curriculum
with Instructional Supports
Grade 2

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Introduction

PURPOSE OF THE MODEL CURRICULUM

Just as the standards are required by Ohio Revised Code, so is the development of the model curriculum for those standards. Throughout the development of the standards (2016-17) and the model curriculum (2017-18), the Ohio Department of Education (ODE) has involved educators from around the state at all levels, Pre-K–16. The model curriculum reflects best practices and the expertise of Ohio educators, but it is not a complete a curriculum nor is it mandated for use. The purpose of Ohio's model curriculum is to provide clarity to the standards, a foundation for aligned assessments, and guidelines to assist educators in implementing the standards.

COMPONENTS OF THE MODEL CURRICULUM

The model curriculum contains two sections: Expectations for Learning and Content Elaborations.

Expectations for Learning: This section begins with an introductory paragraph describing the cluster's position in the respective learning progression, including previous learning and future learning. Following are three subsections: Essential Understandings, Mathematical Thinking, and Instructional Focus.

- **Essential Understandings** are the important concepts students should develop. When students have internalized these conceptual understandings, application and transfer of learning results.
- **Mathematical Thinking** statements describe the mental processes and practices important to the cluster.
- **Instructional Focus** statements are key skills and procedures students should know and demonstrate.

Together these three subsections guide the choice of lessons and formative assessments and ultimately set the parameters for aligned state assessments.

Content Elaborations: This section provides further clarification of the standards, links the critical areas of focus, and connects related standards within a grade or course.

COMPONENTS OF INSTRUCTIONAL SUPPORTS

The Instructional Supports section contains the **Instructional Strategies** and **Instructional Tools/Resources** sections which are designed to be fluid and improving over time, through additional research and input from the field. The **Instructional Strategies** are descriptions of effective and promising strategies for engaging students in observation, exploration, and problem solving targeted to the concepts and skills in the cluster of standards. Descriptions of common misconceptions as well as strategies for avoiding or overcoming them and ideas for adapting instructions to meet the needs of all students are threaded throughout. The **Instruction Tools/Resources** are links to relevant research, tools, and technology. In our effort to make sure that our Instructional Supports reflect best practices, this section is under revision and will be published in 2018.

Standards for Mathematical Practice—Grade 2

The Standards for Mathematical Practice describe the skills that mathematics educators should seek to develop in their students. The descriptions of the mathematical practices in this document provide examples of how student performance will change and grow as they engage with and master new and more advanced mathematical ideas across the grade levels.

MP.1 Make sense of problems and persevere in solving them.
In Grade 2, students realize that doing mathematics involves solving problems and discussing how they solved them. Students explain to themselves the meaning of a problem and look for ways to solve it. They may use concrete objects or pictures to help them conceptualize and solve problems. They may check their thinking by asking themselves, "Does this make sense?" They make conjectures about the solution and plan out a problem-solving approach. An example for this might be giving a student an equation and having him/her write a story to match.

MP.2 Reason abstractly and quantitatively.
Younger students recognize that a number represents a specific quantity. They connect the quantity to written symbols. Quantitative reasoning entails creating a representation of a problem while attending to the meanings of the quantities. Second graders begin to know and use different properties of operations and relate addition and subtraction to length.

In Grade 2 students represent situations by decontextualizing tasks into numbers and symbols. For example, in the task, "There are 25 children in the cafeteria, and they are joined by 17 more children. How many students are in the cafeteria?" Students translate the situation into an equation, such as $25 + 17 = \square$ and then solve the problem. Students also contextualize situations during the problem solving process. For example, while solving the task above, students might refer to the context of the task to determine that they need to subtract 19 if 19 children leave.

MP.3 Construct viable arguments and critique the reasoning of others.
Second graders may construct arguments using concrete referents, such as objects, pictures, drawings, and actions. They practice their mathematical communication skills as they participate in mathematical discussions involving questions like "How did you get that?", "Explain your thinking.", and "Why is that true?" They not only explain their own thinking, but listen to others' explanations. They decide if the explanations make sense and ask appropriate questions.

Students critique the strategies and reasoning of their classmates. For example, to solve $74 - 18$, students may use a variety of strategies, and after working on the task, they might discuss and critique each other's' reasoning and strategies, citing similarities and differences between various problem-solving approaches.
Continued on next page

Standards for Mathematical Practice, continued

MP.4 Model with mathematics.
In early grades, students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart or list, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed.

In Grade 2 students model real-life mathematical situations with a number sentence or an equation and check to make sure that their equation accurately matches the problem context. They use concrete manipulatives and pictorial representations to explain the equation. They create an appropriate problem situation from an equation. For example, students create a story problem for the equation $43 + 17 = \square$ such as "There were 43 gumballs in the machine. Tom poured in 17 more gumballs. How many gumballs are now in the machine?"

MP.5 Use appropriate tools strategically.
In Grade 2, students consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be better suited. For instance, second graders may decide to solve a problem by drawing a picture rather than writing an equation.

Students may use tools such as snap cubes, place value (base ten) blocks, hundreds number boards, number lines, rulers, virtual manipulatives, and concrete geometric shapes (e.g., pattern blocks, three-dimensional solids). Students understand which tools are the most appropriate to use. For example, while measuring the length of the hallway, students can explain why a yardstick is more appropriate to use than a ruler.

MP.6 Attend to precision.
As children begin to develop their mathematical communication skills, they try to use clear and precise language in their discussions with others and when they explain their own reasoning.

Second grade students communicate clearly, using grade-level appropriate vocabulary accurately and precise explanations and reasoning to explain their process and solutions. For example, while measuring an object, students carefully line up the tool correctly to get an accurate measurement. During tasks involving number sense, students consider if their answer is reasonable and check their work to ensure the accuracy of solutions.
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Standards for Mathematical Practice, continued

MP.7 Look for and make use of structure.

Second grade students look for patterns and structures in the number system. For example, students notice number patterns within the tens place as they connect skip counting by 10s to corresponding numbers on a 100s chart. Students see structure in the base-ten number system as they understand that 10 ones equal a ten and 10 tens equal a hundred. Students adopt mental math strategies based on patterns (making ten, fact families, doubles). They use structure to understand subtraction as a missing addend problems (e.g., $50 - 33 = \square$ can be written as $33 + \square = 50$ and can be thought of as "How much more do I need to add to 33 to get to 50?")

MP.8 Look for and express regularity in repeated reasoning.

Second grade students notice repetitive actions in counting and computation (e.g., number patterns to skip count). When children have multiple opportunities to add and subtract, they look for shortcuts, such as using estimation strategies and then adjust the answer to compensate. Students continually check for the reasonableness of their solutions during and after completing a task by asking themselves, "Does this make sense?"

Mathematics Model Curriculum
with Instructional Supports
Grade 2

STANDARDS	MODEL CURRICULUM
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. See Table 1, page 95.	**Expectations for Learning** In Grade 1, students developed the understanding of equality and solved one-step word problems within 20. In Grade 2, students solve one- and two-step addition and subtraction word problems within 100 with unknowns in all positions. (See Table 1, page 95.) In future learning, students will solve two-step word problems using the four operations with whole numbers. **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. **MATHEMATICAL THINKING** • Interpret word problems to determine the operation(s) to be used. • Represent and solve real-world mathematical situations accurately. • Justify the mathematical models used. • Reflect on whether the results are reasonable. • Use grade-level appropriate mathematical language to explain reasoning. **INSTRUCTIONAL FOCUS** • Solve problems using addition and subtraction within 100. See Table 1, page 95. • Solve for an unknown (represented by an empty box or picture) in any position. • Create a model or draw a picture and use an equation to represent the problem situation. • Use and explain different strategies or properties of operations.

	Content Elaborations • Ohio's K-8 Critical Areas of Focus, Grade 2, Number 2, pages 13-14 • Ohio's K-8 Learning Progressions, Operations and Algebraic Thinking, pages 8-10 **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).

INSTRUCTIONAL SUPPORTS FOR THE MODEL CURRICULUM

Instructional Strategies

This section is under revision and will be published in 2018.

Instructional Tools/Resources

This section is under revision and will be published in 2018.

STANDARDS	MODEL CURRICULUM
OPERATIONS AND ALGEBRAIC THINKING **Add and subtract within 20.** **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.	**Expectations for Learning** In Kindergarten and Grade 1, students used models and strategies to develop fluency within 5 and 10 for addition and subtraction. In Grade 2, students develop mental strategies to fluently add and subtract within 20. (See standard 1.OA.6 for a list of strategies.) Later in Grade 2, students will fluently add and subtract within 100 (2.NBT.5). *(Fluency is the ability to use efficient, accurate, and flexible methods for computing. Fluency does not imply timed tests)*. **ESSENTIAL UNDERSTANDINGS** • Fluency means being efficient, accurate, and flexible with addition and subtraction strategies. **MATHEMATICAL THINKING** • Compute using mental strategies with grade-level numbers. • Recognize some strategies may be more efficient than others. • Explore and generalize concepts based on patterns and structures. **INSTRUCTIONAL FOCUS** • Use efficient mental strategies to compute accurately and flexibly within 20. • Explain why some strategies may be more efficient than others. • Use number relationships to help students develop mental strategies. (Mental strategies may include the following*: counting on, making 10, decomposing a number, using the relationship between addition and subtraction, creating equivalent but easier or known sums, etc.*) *Continued on next page*

	Content Elaborations • Ohio's K-8 Critical Areas of Focus Grade 2, Number 2, pages 13-14 • Ohio's K-8 Learning Progressions, Operations and Algebraic Thinking, pages 8-10 • Ohio's K-8 Learning Progressions, Number and Operations in Base Ten, pages 4-5 **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).

INSTRUCTIONAL SUPPORTS FOR THE MODEL CURRICULUM

Instructional Strategies

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Instructional Tools/Resources

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STANDARDS	MODEL CURRICULUM
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. **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.	**Expectations for Learning** In previous grades, students learned that addition involves combining groups of objects. In Grade 2, this cluster explores number patterns which sets the foundation for multiplicative thinking through repeated addition. In Grade 3, students will apply the patterns, strategies, and decompositions used in repeated addition to multiplication and division situations. They will also in Grade 3 move from arrays to area models for multiplication and division situations. **ESSENTIAL UNDERSTANDINGS** **Even or Odd** • 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. **Rectangular Arrays** • 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). **MATHEMATICAL THINKING** • Explore and generalize concepts based on patterns and structures. • Determine the reasonableness of an answer. • Use grade-level appropriate mathematical language to explain reasoning. *Continued on next page*

Expectations for Learning, continued

INSTRUCTIONAL FOCUS

Even or Odd

- Represent a group of objects as odd or even by creating models, drawing pictures, and writing equations.
- Use strategies to determine if a group of objects has an odd or even number of members.
- Identify whole numbers between 0 and 25 as odd or even.
- Generalize a rule for why a number is odd or even.
- Write an equation to represent an even number as the sum of two equal addends.

Rectangular Arrays

- Explore rectangular arrays by creating models.
- Discuss and write addition equations to represent the total number of objects in an array (with no more than 25 objects) as the sum of equal rows or equal columns, e.g., 3 + 3 = 6 and 2 + 2 + 2 = 6.

Content Elaborations

- Ohio's K-8 Critical Areas of Focus Grade 2, Number 2, pages 13-14
- Ohio's K-8 Critical Areas of Focus, Grade 2, Number 4, page 16
- Ohio's K-8 Learning Progressions, Operations and Algebraic Thinking, pages 8-10
- Ohio's K-8 Learning Progressions, Number and Operations in Base Ten, pages 4-5

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).

INSTRUCTIONAL SUPPORTS FOR THE MODEL CURRICULUM

Instructional Strategies

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Instructional Tools/Resources

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STANDARDS	MODEL CURRICULUM
NUMBER AND OPERATIONS IN BASE TEN **Understand place value.** **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. Understand 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). **2.NBT.2** Count forward and backward within 1,000 by ones, tens, and hundreds starting at any number; skip-count by 5s starting at any multiple of 5. **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. **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.	**Expectations for Learning** In Grade 1, the foundation was developed for place value of tens and ones, and students read and wrote numerals to 120. This cluster is extending students' understanding of the base-ten system to include hundreds. In Grade 2, students develop the conceptual understanding of a group of ten tens as one "hundred". Students compare two three-digit numbers using symbols. Students count forward and backward within 1,000 starting at any number. They skip count by tens and hundreds starting at any number and skip count by fives starting at any multiple of five. Skip-counting builds the essential foundation for repeated addition, leading to multiplication in Grade 3. Students read and write numbers to 1,000 using base-ten numerals, number names, expanded form, and equivalent representations. In Grade 3, students will use their understanding of the base-ten system to round to the nearest 10 or 100. **ESSENTIAL UNDERSTANDINGS** **Place Value** • 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. **Counting** • Skip counting is a repeating pattern. **Reading and Writing Numbers** • 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. *Continued on next page*

Expectations for Learning, continued

ESSENTIAL UNDERSTANDINGS, CONTINUED

Comparing Numbers

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

MATHEMATICAL THINKING

- Explain mathematical reasoning.
- Explore and generalize concepts based on patterns or structures.
- Generalize patterns based on skip-counting.
- Pay attention to and make sense of quantities.
- Use grade-level appropriate mathematical language and notation to explain and justify reasoning.
- Determine reasonableness of results.

INSTRUCTIONAL FOCUS

Place Value

- Identify 100 as the same as ten-tens.
- Represent three-digit numbers with proportional objects (e.g., base ten blocks, sticks, etc.) and drawings.
- Compose and decompose three-digit numbers into hundreds, tens, and ones with proportional objects.
- Explain the need for zero as a place holder, e.g. one hundred four is 104.
- Identify and explain the value of each digit within a three-digit number.
- Identify and write the place (ones, tens, hundreds) of each digit in a three-digit numeral.
- Recognize and describe visual patterns in word form and expanded form of whole numbers to 1,000.
- Recognize and describe word patterns of whole numbers to 1,000.
- Recognize that numerals between 1–1,000 have repeating patterns.

Continued on next page

Expectations for Learning, continued

INSTRUCTIONAL FOCUS, CONTINUED

Counting Numbers

- Extend the counting sequence to 1,000 from different starting points.
- Describe patterns in skip counting and use those patterns to predict the next number in the counting sequence.
- Skip-count forward and backward from any number within 1,000 by ones, tens, and hundreds.
- Skip-count by fives forward and backward from any multiple of 5 within 1,000.

Reading and Writing Numbers

- Given a written or oral number name within 1,000, read and write the numeral.
- Explore numbers using equivalent representations, e.g., 310 is "three hundred ten ones," "two hundreds plus eleven tens," and "31 tens," etc.
- Read three-digit numbers when shown a numeral, a model of the number, or a pictorial representation of the number.
- Read and write numbers in expanded form with multiple representations for the same number.
- Write numbers in expanded form as an equation.

Comparing Numbers

- Compare two numbers up to 1,000 concretely, pictorially, or symbolically, using the symbols >, =, and <.
- Use mathematical language (greater than, less than, equal to) to describe the relationship between numbers.
- Connect the mathematical language to the use of symbols >, =, and < to compare two three-digit numbers.
- Read comparative statements from left to right.
- Explore three-digit numbers to discover that the value of the hundreds place helps determine the size of a three-digit number.
- Generalize the understanding that the value of the hundreds place may help to compare two three-digit numbers.
- Compare two different numbers that result in two true inequality statements. For example, 572 is greater than 324 (572 > 324), and 324 is less than 572 (324 < 572).

	Content Elaborations • Ohio's K-8 Critical Area of Focus, Grade 2, Number 1, page 12 • Ohio's K-8 Learning Progressions, Operations and Algebraic Thinking, pages 8-10 • Ohio's K-8 Learning Progressions, Number and Operations in Base Ten, pages 4-5 **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).

INSTRUCTIONAL SUPPORTS FOR THE MODEL CURRICULUM

Instructional Strategies

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Instructional Tools/Resources

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STANDARDS	MODEL CURRICULUM
NUMBER AND OPERATIONS IN BASE TEN **Use place value understanding and properties of operations to add and subtract.** **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. **2.NBT.6** Add up to four two-digit numbers using strategies based on place value and properties of operations. **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. **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. *Continued on next page*	**Expectations for Learning** In Grade 1, students added within 100 and subtracted multiples of 10 from multiples of 10 using strategies. They also mentally found 10 more or 10 less than a given two-digit number. In Grade 2, students add and subtract fluently within 100 using strategies. Students add up to four two-digit numbers using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction. When adding and subtracting within 1,000, students need to explain their strategies using models, drawings, and when appropriate, equations to justify their thinking. Students use their understanding of place value to mentally add and subtract 10 and 100 from a given number between 100–900. In Grade 3, students will extend their learning to add and subtract fluently to 1,000 using strategies. *(Fluency is the ability to use efficient, accurate, and flexible methods for computing. Fluency does not imply timed tests)*. **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. • 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. *Continued on next page*

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.	**Expectations for Learning, continued** **MATHEMATICAL THINKING** • Pay attention to and make sense of quantities. • Use grade-level appropriate mathematical language, models, and notation to explain and justify reasoning. • Determine reasonableness of results. • Explore and generalize concepts based on patterns and structures. **INSTRUCTIONAL FOCUS** • Use strategies to add and subtract within 100 efficiently, accurately, and flexibly. • Generalize computation strategies of addition and subtraction that will apply to larger numbers. • Create a model or draw a representation, and when appropriate, write an equation to record the addition or subtraction strategy. • Use strategies to add up to four two-digit numbers. • Use concrete models, drawings, place value, properties of operations, and other strategies for addition and subtraction within 1,000. • Identify problems that require decomposing the tens or hundreds to find a solution. • Listen to and ask questions about others' strategies. • Use mental strategies to add and subtract 10 or 100 from a given number 100–900. • Explain and justify why addition and subtraction strategies work. *Continued on next page*

	Content Elaborations • Ohio's K-8 Critical Areas of Focus, Grade 2, Number 2, pages 13-14 • Ohio's K-8 Learning Progressions, Number and Operations in Base Ten, pages 4-5 **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).

INSTRUCTIONAL SUPPORTS FOR THE MODEL CURRICULUM

Instructional Strategies

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STANDARDS	MODEL CURRICULUM
MEASUREMENT AND DATA **Measure and estimate lengths in standard units.** **2.MD.1** Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes. **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. **2.MD.3** Estimate lengths using units of inches, feet, centimeters, and meters. **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.	**Expectations for Learning** In Grade 1, students used nonstandard units (with no gaps or overlaps) to measure and compare lengths. In Grade 2, students select and use appropriate tools (rulers, yardsticks, meter sticks, and measuring tapes). They estimate and measure using standard whole units (inches, feet, centimeters, and meters). Students measure the length of an object using two different length units, (e.g., inches and feet), and describe how the two measurements relate to each other, (e.g., more inches than feet). Students compare the difference of two lengths using subtraction within 100. In Grade 3, students will use standard units to generate measurements with halves and fourths. **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. • There is a relationship between the size of the unit and the number of units required to cover the length. • 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. • Lengths can be estimated. • Lengths can be compared. *Continued on next page*

Expectations for Learning, continued

MATHEMATICAL THINKING

- Consider the object to be measured, and select appropriate measurement units, and the tool(s) to be used.
- Pay attention to and make sense of quantities.
- Explain using informal mathematical reasoning.
- Use mathematical language appropriate to the grade level and units appropriate to the measurement tool.
- Determine reasonableness of results.

INSTRUCTIONAL FOCUS

- Select and use appropriate tools: rulers, meter sticks, yard sticks, and measuring tapes.
- Use physical representations of standard units to measure length.
- Iterate with a physical unit repeatedly marking off its end point, in order to measure length.
- Discuss and describe how different units can give different measurements.
- Emphasize the use of approximate language using phrases such as "about how many."
- Estimate and measure lengths using inches, feet, centimeters, and meters.
- Compare two lengths using subtraction.
- Compare results of measuring with different nonstandard and standard length-units.

Content Elaborations

- Ohio's K-8 Critical Areas of Focus, Grade 2, Number 3, page 15
- Ohio's K-8 Learning Progressions, Measurement and Data, pages 12-14

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).

INSTRUCTIONAL SUPPORTS FOR THE MODEL CURRICULUM

Instructional Strategies

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Instructional Tools/Resources

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STANDARDS	MODEL CURRICULUM
MEASUREMENT AND DATA **Relate addition and subtraction to length.** **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.) **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.	**Expectations for Learning** In Grade 1, students used addition and subtraction within 100 to solve word problems and used a symbol for an unknown number. In Grade 2, students use addition and subtraction within 100 to solve word problems involving lengths given in the same whole number units. They use drawings and equations and continue to use symbols for an unknown number to represent problems. They represent whole numbers and sums and differences within 100 on a number line. In Grade 3, students will apply measurement skills to find area and perimeter. **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. • Addition and subtraction strategies can be used to solve real-world measurement problems. • A symbol can be used to represent an unknown number. **MATHEMATICAL THINKING** • Interpret word problems to determine the operation(s) to be used. • Represent and solve real-world mathematical situations accurately. • Draw a picture to create a model to make sense of a problem. • Justify mathematical models used. • Reflect on whether the results are reasonable. • Use grade-level appropriate mathematical language to explain reasoning. *Continued on next page*

Expectations for Learning, continued

INSTRUCTIONAL FOCUS

- Explore and explain the use of addition and subtraction to solve real-world problems involving lengths (given in the same whole number units).
- Use drawings and equations with a symbol for the unknown number to represent the problem.
- Find the unknown length unit in real-world situations.
- Explore the relationship between number lines and whole number measurement tools.
- Represent whole numbers as equally spaced lengths from 0 on a number line.
- Represent whole number sums and differences within 100 on a number line diagram.
- Use number line diagrams to solve real-world problems.

Content Elaborations

- Ohio's K-8 Critical Areas of Focus, Grade 2, Number 2, pages 13-14
- Ohio's K-8 Learning Progressions, Measurement and Data, pages 12 – 14

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).

INSTRUCTIONAL SUPPORTS FOR THE MODEL CURRICULUM

Instructional Strategies

This section is under revision and will be published in 2018.

Instructional Tools/Resources

This section is under revision and will be published in 2018.

STANDARDS	MODEL CURRICULUM
MEASUREMENT AND DATA **Work with time and money.** **2.MD.7** Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m. **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).	**Expectations for Learning** In Grade 1, students found the value (in connection to place value) of pennies and dimes. They learned to tell time (on digital and analog clocks) to the nearest hour and half-hour. In Grade 2, students solve problems with pennies, nickels, dimes, and quarters and their collective value (up to one dollar). Students solve word problems with addition and subtraction (within 100) using cents with cents and dollars with dollars; they do not use dollars and cents simultaneously. Students tell time to the nearest 5 minutes and use a.m. and p.m. correctly. In Grade 3, students will tell time to the nearest minute and solve elapsed time problems within 90 minutes. In Grade 4, students will be introduced to decimal notation and work with money problems involving both dollars and cents. **ESSENTIAL UNDERSTANDINGS** **Time** • 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. **Money** • 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.* *Continued on next page*

Expectations for Learning, continued

MATHEMATICAL THINKING

- Pay attention to and make sense of quantities.
- Use technology as a tool for measurement.
- Represent money and time symbolically.
- Use mathematical language appropriate to the grade level.

INSTRUCTIONAL FOCUS

Time

- Explore analog clocks to locate 5 minute interval markings.
- Tell time to the nearest 5 minutes.
- Use skip counting to represent 5 minute intervals (2.NBT.2).
- Write time symbolically using a colon (**:**) to separate hours and minutes; use two digits after the colon, e.g., five minutes after two o'clock is represented as 2:05).
- Explore and discuss the number of hours in a day.
    - The first half of a new day begins at midnight and is represented as a.m.
    - The second half of a day begins at noon and is represented as p.m.

Money

- Recognize and name a nickel
- Identify that a nickel's value is equal to 5 cents.
- Count by 5s using nickels.
- Recognize and name a quarter.
- Identify that a quarter's value is equal to 25 cents.
- Count by 25s using quarters.
- Identify and use "**¢**" as a symbol to represent coin values.
- Identify and use "**$**" as a symbol to represent dollars.
- Find the value of a collection of quarters, dimes, nickels, and pennies.
- Compare collections of coins based on their values.
- Use pennies, nickels, dimes, and quarters as manipulatives to reinforce place value up to 100 cents.
- Solve word problems by adding and subtracting within 100, whole dollars with whole dollars, and cents with cents.

	Content Elaborations • Ohio's K-8 Critical Areas of Focus, Grade 2, Number 2, pages 13-14 • Ohio's K-8 Critical Areas of Focus, Grade 2, Number 3, page 15 • Ohio's K-8 Learning Progressions, Measurement and Data, pages 12 – 14 **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).

INSTRUCTIONAL SUPPORTS FOR THE MODEL CURRICULUM

Instructional Strategies

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Instructional Tools/Resources

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STANDARDS	MODEL CURRICULUM
MEASUREMENT AND DATA **Represent and interpret data.** **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. **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. See Table 1, page 95.	**Expectations for Learning** In Grade 1, students organized and represented data with up to three categories. In Grade 2, they extend their learning of representing and interpreting data to four categories. Students measure lengths of several objects (to the nearest whole unit) and show the data by creating a line plot. They complete single-scale picture graphs or bar graphs. Also, students use addition and subtraction to solve problems involving data given in a graph (See Table 1, page 95). Then in Grade 3, students will create a scale to represent a data set and work with scaled graphs. **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. • 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. **MATHEMATICAL THINKING** • Organize, represent, and interpret data. • Pay attention to and make sense of quantities. • Informally explain mathematical reasoning. • Use mathematical language appropriate to the grade level. **INSTRUCTIONAL FOCUS** • Use measurement tools to gather measurement data. • Collect measurement data by making repeated measurements of the same object, e.g., the height of a growing plant or the distances between locations on a map. • Explore and record data using line plots in whole number units. • Explore and record data using picture graphs (when single unit scales are provided). • Explore and record data using bar graphs (when single unit scales are provided). • Organize and represent data with up to four categories. • Interpret data to solve addition, subtraction, and compare problems. See Table 1, page 95.

	Content Elaborations • Ohio's K-8 Critical Areas of Focus, Grade 2, Number 2, pages 13-14 • Ohio's K-8 Critical Areas of Focus, Grade 2, Number 3, page 15 • Ohio's K-8 Learning Progressions, Measurement and Data, pages 12 – 14 **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).

INSTRUCTIONAL SUPPORTS FOR THE MODEL CURRICULUM

Instructional Strategies

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Instructional Tools/Resources

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STANDARDS	MODEL CURRICULUM
GEOMETRY **Reason with shapes and their attributes.** **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. **2.G.2** Partition a rectangle into rows and columns of same-size squares and count to find the total number of them. **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.	**Expectations for Learning** In Grade 1, students composed shapes and reasoned with shapes and their attributes. They distinguished between defining attributes and non-defining attributes. Fraction concepts were introduced through the partitioning of circles and rectangles into two or four equal shares in real-world contexts. 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; they recognize and identify cubes, rectangular prisms, cones, and cylinders. Students build a foundation for multiplication by partitioning rectangles into rows and columns of same-size squares. Students extend their knowledge of fractions by partitioning circles or rectangles into two, three, or four equal shares. In Grade 3, students will build on their reasoning skills with shapes and attributes. They will explore fractions by partitioning shapes into parts with equal areas and expressing the area of each part as a unit fraction. In the domain Number and Operations – Fractions, students will develop an understanding of fractions as numbers by working with fractions models to find equivalent fractions and to compare fractions. Students are working at van Hiele Level 0 (Visualization) and moving toward Level 1 (Analysis). **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. • Rectangles can be partitioned into rows and columns. • When decomposing circles and rectangles into halves, thirds, or fourths, equal shares of identical wholes need not have the same shape. *Continued on next page*

Expectations for Learning, continued

MATHEMATICAL THINKING

- Use spatial reasoning.
- Create models and drawings to represent shapes.
- Recognize and use a pattern or structure.
- Use real-world contexts to partition circles and rectangles.
- Use grade-level appropriate mathematical language to explain reasoning.

INSTRUCTIONAL FOCUS

- Explore classifying triangles, quadrilaterals, pentagons, and hexagons based on the number of sides or vertices.
- Provide real-world experiences to recognize and name cubes, rectangular prisms, cones, and cylinders.
- Partition rectangles into rows and columns of same-size squares.
- Count to find the total number of same-size squares in a partitioned rectangle.
- Explore and describe part-whole relationships.
- Relate two, three, or four equal shares to circles and rectangles.
- Describe equal shares using the terms *halves, thirds, fourths, quarters* and the phrases *half of, third of, fourth of, quarter of* in real-world contexts.
- Explore the decomposition of shapes into halves, thirds, and fourths; equal shares of identical wholes need not have the same shape, e.g., a rectangle divided into fourths vertically results in rectangular parts or diagonally results in triangular parts.

Content Elaborations

- Ohio's K-8 Critical Areas of Focus, Grade 2, Number 4, page 16
- Ohio's K-8 Learning Progressions, K-5 Geometry, page 11

CONNECTIONS ACROSS STANDARDS

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

INSTRUCTIONAL SUPPORTS FOR THE MODEL CURRICULUM

Instructional Strategies

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