MA.3.AR.1.2

Overarching Standard: MA.3.AR.1 *Solve multiplication and division problems.*

Benchmark of Focus

MA.3.AR.1.2: Solve one- and two-step real-world problems involving any of four operations with whole numbers.

Example: A group of students are playing soccer during lunch. How many students are needed to form four teams with eleven players each and to have two referees?

Benchmark Clarifications:

Clarification 1: Instruction includes understanding the context of the problem, as well as the quantities within the problem.

Clarification 2: Multiplication is limited to factors within 12 and related division facts. Refer to Situations Involving Operations with Numbers (Appendix A).

Related Benchmark/Horizontal Alignment
- MA.3.NSO.2.1/2.2/2.3/2.4
- MA.3.AR.2.1/2.2/2.3

Vertical Alignment

Previous Benchmarks	**Next Benchmarks**
MA.2.AR.1.1	MA.4.AR.1.1/1.2

Terms from the K-12 Glossary
- Expression
- Equation

Purpose and Instructional Strategies
The purpose of this benchmark is for students to apply all four operations to solve one- and two-step real-world problems. This benchmark continues the work done in grade 2 solving real-world problems using addition and subtraction (MA.2.AR.1.1).
- Instruction should facilitate students' understanding of contexts and quantities within word problems.
- The emphasis on teaching problem-solving strategies should focus on the comprehension of problem contexts and what quantities represent in them. Examples of questions that help students comprehend word problems are:
    - What is happening in the real-world problem?
    - What do you need to find out?
    - What do the quantities represent in the problem?
    - What will the solution represent in the problem? (MTR.1.1, MTR.4.1,MTR.6.1)
- Teachers should model answering these questions through rectangular arrays, base-ten

blocks, counters and think-alouds. In addition, teachers should help students explore estimation strategies to determine reasonable ranges for solutions (e.g., rounding, finding low and high estimates) and teach problem-solving strategies that build comprehension (e.g., "Three Reads") (MTR.4.1, MTR.5.1, MTR.6.1).

**Common Misconceptions or Errors**

- Students may have difficulty creating effective models (e.g., drawings, equations) that will help them solve real-world problems. To assist students, provide opportunities for them to estimate solutions and try different models before solving. Beginning instruction by showing problems without their quantities is a strategy for helping students determine what steps and operations will be used to solve.

- Students may also have difficulty identifying when real-world problems require two steps to solve and will complete only one of the steps. Focusing on comprehension of real-world problems helps students determine what step(s) are required to solve.

Strategies to Support Tiered Instruction

- Instruction provides opportunities for students to estimate solutions and try different models before solving.
- Instruction includes opportunities to create models (e.g., equations, drawings, manipulatives) to help solve real-world problems. The teacher uses guided questioning to support comprehension, considering levels of reading proficiency for students who may struggle with word problems—some students may need to hear the problems read aloud. The teacher provides opportunities to estimate solutions and try different models before solving, beginning instruction by showing problems without their quantities is a strategy to help students determine what steps and operations will be used to solve.
  - For example, the teacher reads aloud the following problem: Keisha and Diego are selling pies for a fundraiser. Each pie costs five dollars. If Keisha sells 15 pies and Diego sells 5 pies, how much money did they earn for the fundraiser?
    - The teacher uses questioning to ensure comprehension (e.g., "What do you need to find out?" "What do the quantities represent in the problem?" "What will the solution represent in the problem?").
    - The teacher models how to represent this problem using an equation and a drawing:
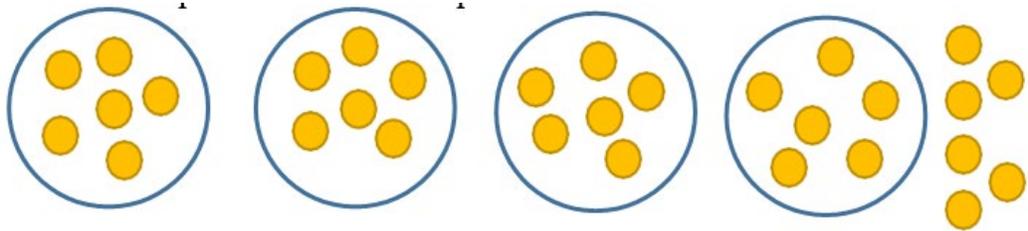
$$(15 + 5) \times 5$$
$$20 \times 5$$

20 (2 tens)
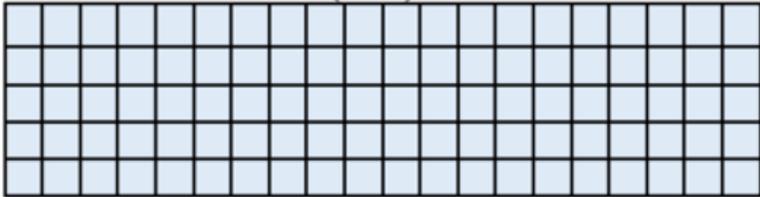
Total amount earned: $20 \times 5 = 100$ dollars

- The teacher repeats with additional two-step problems, guiding students to create appropriate models to support problem-solving.
  - o For example, the teacher reads aloud the following problem: Antwan is helping the art teacher get ready for art club. There are a total of 30 paintbrushes. The art teacher asked Antwan to put 6 paintbrushes on each of the 4 tables in the room and then put the rest on the counter. How many paint brushes will he put on the counter?
    - The teacher uses questioning to ensure comprehension (e.g., "What do you need to find out?" "What do the quantities represent in the problem?" "What will the solution represent in the problem?").
    - the teacher models the problem using counters, prompting the students to demonstrate each step of the problem while writing the corresponding equations for each step.

$$6 \times 4 = 24$$
$$30 - 24 = 6$$

    - The teacher repeats with additional two-step problems, guiding students to create appropriate models using manipulatives to support problem- solving. Some students may benefit from "acting out" the story in the problem to support the problem-solving process.
- Instruction includes guided practice identifying and completing two steps in a real-world problem. The teacher uses guided questioning to support comprehension considering levels of reading proficiency for students who may struggle with word problems—some students may need to hear the problems read aloud. The teacher uses explicit prompts for each step.
  - o For example, the teacher reads aloud the following problem: Suni is taking piano lessons. Her piano teacher told her to practice for 90 minutes this week. On Monday, she practiced 15 minutes. She practiced 20 minutes on Tuesday and 25 minutes on Wednesday. How much more time does she still need to practice this week?
    - The teacher uses guided questioning and prompts to help students to identify the steps (e.g., "What do you already know?" "What do you need to find out?" "What do we need to do before we can find out the remaining time she has left to practice?"). Through questioning, the teacher guides students to identify the first step: adding the amount of time Suni has already practiced.
    - The teacher uses a model to represent the problem and an equation to represent the first step.
    15 + 20 + 25 = 60
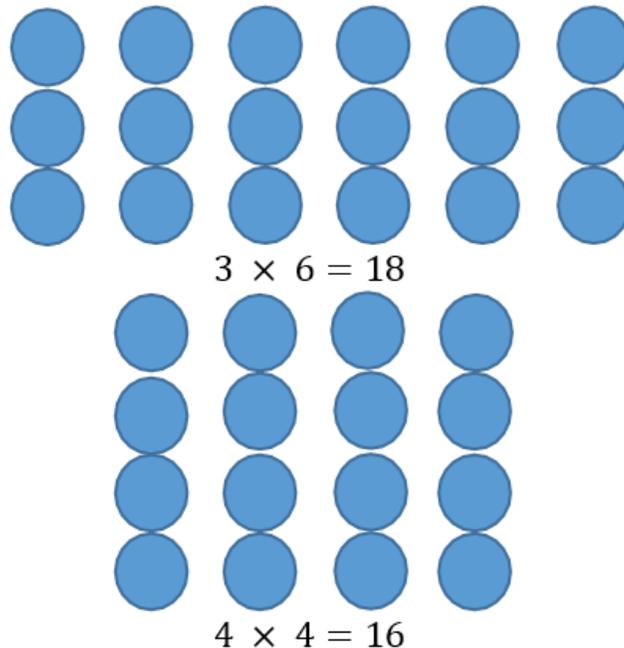 - o After students complete the first step, the teacher uses questioning to prompt next step (e.g., "What does the sum we just found show us?" "What do you need to find out to solve this problem?" "What should we do next?"). The problem may need to be reread aloud.
    15 + 20 + 25 = 60
    60+__ = 90
    90 – 60 = 30 minutes

Monday	Tuesday	Wednesday	Remaining Time
15	20	25	?
Total = 90 minutes			

- The teacher repeats with additional two-step problems, guiding students to identify and solve each step.
  o For example, the teacher reads aloud the following problem: Rahim is learning about instruments in music class. He learns that guitars have six strings and mandolins have four strings. If there are three guitars and four mandolins in the classroom, how many strings are there altogether on the guitars and mandolins?
    - The teacher uses guided questioning and prompts to help students to identify the steps (e.g., "What do you already know?" "What do you need to find out?" "What do we need to do before we can find out the remaining time she has left to practice?"). Through questioning, the teacher guides students to identify the first step: Multiplying the number of strings by the number of each instrument.
    - The teacher guides the students to create a model (using manipulatives such as counters) with corresponding equations.

$$3 \times 6 = 18$$

$$4 \times 4 = 16$$

    - After students complete the first step, the teacher uses questioning to prompt next step (e.g., "What have we learned about the numbers of strings?" "What do you need to find out to solve this problem?" "What should we do next?"). The problem may need to be reread aloud.
    - 18 + 16 = 34 total strings
    - The teacher repeats with additional two-step problems, guiding students to identify and solve each step using manipulatives. Some students may benefit from "acting out" the story in the problem to support the problem- solving process.

Questions to ask students:

Sample problem: Rita found 4 eggs. Joe found 3 times as many eggs as Rita. They put their eggs in the same basket. How many eggs were in the basket?

- Explain how you solved the scenario using precise mathematical vocabulary.
  - Sample answer that indicates understanding: *I had to multiply 3 × 4 to get 12 eggs for Joe and add that to Rita's 4 eggs for a total of 16 eggs. I know my answer makes sense because Joe should have more eggs than Rita, and together the total should be more than both because I am combining them.*

- Explain how your model represents the problem.
  - Sample answer that indicates understanding: *I made a row with 4 tiles to represent Rita's eggs. I made an array with 3 rows of 4 to represent Joe's eggs, which ended up being 12. All of the tiles together give me the total 16 eggs in the basket.*

- What equation could represent this problem?
  - Sample answer that indicates understanding: *I think the equation* $(3 \times 4) + 4 = 16$ *represents the problem because Joe has 3 times as many eggs as Rita, so 3 × 4, and Rita has 4 eggs, so you need to add those together to get 16.*

Instructional Tasks

Instructional Task 1

Solve the problem: Oak Hill Elementary third grade students are taking a field trip to the zoo. There are 71 students who paid to attend the field trip. Of those that paid, 8 students cannot go on the day of the trip. There needs to be 7 groups at the zoo and each group must have an equal number of students. How many students will be in each group on the field trip?

Instructional Items

Instructional Item 1

For a school food drive, three students bring in cases of canned goods to donate. Uriel brings4 cases, Paola brings 6 cases, and Mika brings 5 cases. Each case contains 8 canned goods. How many canned goods in all does the school collect?

Instructional Item 2

A bookstore has 8 boxes of books. Each box contains 10 books. On Monday, the bookstore sold 16 books. How many books remain to be sold?

Achievement Level Descriptors

Benchmark	Context	Assessment Limits
MA.3.AR.1.2 Solve one- and two-step real-world problems involving any of four operations with whole numbers. Example: A group of students are playing soccer during lunch. How many students are needed to form four teams with eleven players each and to have two referees? Clarification 1: Instruction includes understanding the context of the problem, as well as the quantities within the problem. Clarification 2: Multiplication is limited to factors within 12 and related division facts. Refer to Situations Involving Operations with Numbers (Appendix A).	Real-world	Items involving addition or subtraction will not use numbers greater than 10,000.

ALD 2	ALD 3	ALD 4	ALD 5
solves one-step real-world problems involving addition and subtraction or involving multiplication and division where one of the factors and divisors is 1, 2, or 5.	solves one- and two-step real-world problems involving addition and subtraction and one-step problems involving multiplication and division where factors and divisors are less than or equal to 12.	solves one- and two-step real-world problems involving any of four operations with whole numbers.	explains the solution within the context of one- and two-step real-world problems and solves using any of four operations with whole numbers.

Additional Resources:

CPALMS Resources https://bit.ly/3LRF8qT

Kahn Academy: 2-Step Estimation Word Problems https://bit.ly/3hdDIst

Kahn Academy: Setting Up 2-Step Word Problems https://bit.ly/34SRHBL

Resources/Tasks to Support Your Child at Home:

As your child is creating models to represent one- and two-step word problems, challenge them to write equations with variables to represent each step in their model. Students can then try to represent all of the steps in one equation. *Students do not need to know the order of operations.*

Provide real-world opportunities to estimate sums or differences, including two-step problems. For example, rounding to estimate total cost of items at a store and estimating change that will be received; or rounding to estimate nutritional information of ingredients.

LearnZillion Video: Solving Two-Step Problems Using a Model https://bit.ly/3p7Brnd

Math Playground: Thinking Blocks Modeling Tool https://bit.ly/3JIo8Bu