MA.3.AR.2.3

Overarching Standard: MA.3.AR.2 Develop an understanding of equity and multiplication and division.

Benchmark of Focus

MA.3.AR.2.3 Determine the unknown whole number in a multiplication or division equation, relating three whole numbers, with the unknown in any position

Benchmark Clarifications

Clarification 1: Instruction extends the development of algebraic thinking skills where the symbolicrepresentation of the unknown uses any symbol or a letter.

Clarification 2: Problems include the unknown on either side of the equal sign.

Clarification 3: 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.2.2/2.4
- MA.3.AR.1.2

Vertical Alignment

Previous Benchmarks	Next Benchmarks
MA.2.AR.2.2	MA.4.AR.2.2

Terms from the K-12 Glossary

- Equation
- Expression

Purpose and Instructional Strategies

The purpose of this benchmark is for students to find an unknown value represented by a symbol or letter in a multiplication or division equation, continuing the work from Grade 2, where students found unknown values in addition and subtraction equations.

- Instruction that emphasizes the relationship between related facts in a fact family helps students use known values to solve for unknown values. For example, a fact family couldbe used to help students determine the unknown value in the equation 72 ÷? = 9 (MTR.5.1).

$$72 \div ? = 9$$
$$72 \div 9 = ?$$
$$9 \times ? = 72$$
$$? \times 9 = 72$$

Students can use any of these related facts to determine that the unknown value is

8.Teachers should encourage students to use such equations to justify their solutions (MTR.6.1).

- In the primary grades, students used fact families to find missing addends and understandthe relationship between addition and subtraction.
- Understanding and using related facts to solve for unknown values is an important algebraic understanding for using inverse operations to solve equations in future mathematics courses (MTR.5.1).

Common Misconceptions or Errors

- By Grade 3, many students expect the solutions of equations to be an expression on the right side of the equal sign. When students determine unknown values in multiplicationor division equations, give examples with the product or quotient on the left side.

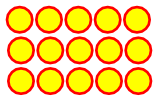
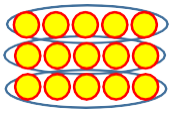
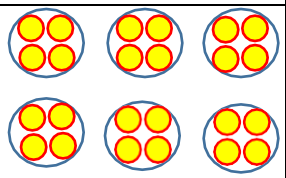
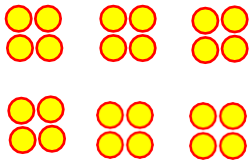
Strategies to Support Tiered Instruction

- Instruction includes opportunities to explore the meaning of the equal sign within the context of multiplication and division. The teacher provides clarification that the equal sign means "the same as" rather than "the answer is," supporting the understanding that the product and quotient can be on either the left or the right side of the equal sign.
Multiple examples are provided for students to solve for the unknown with the product or quotient on both the left and right side of the equation. The teacher uses the same equations written in different ways to reinforce the concept.
    - For example, the teacher shows the following equations, asking students to solve for the unknown. Students explain why each equation is true after solving, repeating with additional examples.

Example	Unknown	Sample Student Rationale
$3 \times 5 = ?$	15	Three groups of five is the same as fifteen. If I count by fives three times, I get fifteen.
$15 = \_ \times 5$	3	When I count by fives, I count three times before I get to fifteen.
$4 = 24 \div$	6	If I sort twenty-four into four equal groups, there are six in each group.
$\_ \div 4 = 6$	24	Four groups of six in each group is twenty-four. If I count by fours, six times, I get twenty-four and multiplication and division are inverse operations.

- Teacher provides opportunities to explore the meaning of the equal sign within the context of multiplication and division using visual representations (e.g., counters, drawings, base-ten blocks) to represent the equations. The teacher provides clarification that the equal sign means "the same as" rather than "the answer is," supporting the understanding that the product and quotient can be on either the left or the right side of the equal sign. Multiple examples are provided for students to solve for the unknown with the product or quotient on both the left and right side of the equation, using the same equations written in different ways to reinforce the concept.
    - For example, the teacher shows the following equations, asking students to solve for the unknown and explain why each equation is true after solving. Students use

counters, drawings, or base-ten blocks to represent the equation, repeating with additional operations.

$3 \times 5 =$	15		Three groups of five is the same as fifteen. If I make three rows of five counters, I have a total of fifteen.
$15 = \_ \times 5$	3		When I count by fives, I count three times before I get to fifteen. If I have fifteen counters and put them in rows of five, I have three rows.
$4 = 24 \div$	6		If I sort twenty-four into equal groups of four, there are six equal groups.
$\_ \div 4 = 6$	24		Six groups of four in each group is twenty-four. If I make six groups with four counters in each group, I have a total of twenty-four counters and multiplication and division are inverse operations.

Questions to ask students:

Ask students: What is the value of c in the following equation c = 7 x 4?

- Sample answer that demonstrates student understanding: I know that 7 groups of 4 is the same as 28, so c is 28.

Ask students: What is the value of c in the following equation 63 ÷ c = 9?

- Sample answer that demonstrates student understanding: I know that I can use multiplication to help me solve division, so I can rewrite the equation as 9 x c = 63 and I know that 9 x 7 = 63 OR I can rewrite the equation as 63 ÷ 9 = c. When I solve it I get 7, so c is 7.

Instructional Tasks

Instructional Task 1

Sam is having trouble deciding whether the value of n that makes the equation below true is 4 or 36. Which number is correct? Show your thinking using an equation or array.

$$3 = n \div 12$$

Instructional Items

Instructional Item 1

What value of n makes the equation below true?

$$n \div 6 = 5$$

Instructional Item 2

What is the value of the unknown number in the equation $7 \times n = 56$?

Achievement Level Descriptors:

Benchmark	Context	Assessment Limits
MA.3.AR.2.3 Determine the unknown whole number in a multiplication or division equation, relating three whole numbers, with the unknown in any position Clarification 1: Instruction extends the development of algebraic thinking skills where the symbolic representation of the unknown uses any symbol or a letter. Clarification 2: Problems include the unknown on either side of the equal sign. Clarification 3: Multiplication is limited to factors within 12 and related division facts. Refer to Situations Involving Operations with Numbers (Appendix A). **Also Assesses** MA.3.AR.2.1 Restate a division problem as a missing factor problem using the relationship between multiplication and division. Example: The equation 56 ÷ 7 =? can be restated as 7 ×? = 56 to determine the quotient is 8. Clarification 1: Multiplication is limited to factors within 12 and related division facts. Clarification 2: Within this benchmark, the symbolic representation of the missing factor uses any symbol or a letter	Mathematical	N/A

ALD 2	ALD 3	ALD 4	ALD 5
restates multiplication equations to solve division problems with unknown factors where one of the factors is 1, 2, or 5. determines the unknown whole number in a multiplication or division equation when the unknown number is the product or quotient (where one of the factors is 1, 2, or 5).	restates a division problem as a missing factor problem using the relationship between multiplication and division where the factors are less than or equal to 10. determines the unknown whole number in a multiplication or division equation when the unknown number is the multiplier or divisor.	restates a division problem as a missing factor problem using the relationship between multiplication and division. determines the unknown whole number in a multiplication or division equation, relating three whole numbers, with the unknown in any position.	N/A

Additional Resources:

CPALMS Resources

Learn Zillion Video: Represent Unknown Numbers Using Symbols or Letters

Khan Academy Unknowns with multiplication and division

Unknown whole numbers part one (video)

Resources/Tasks to Support Your Child at Home:

As your child is becoming more fluent with their basic facts, begin to ask them unknown values in a variety of positions. For example, instead of only posing 7 x 5 = ?, also ask 7 x ? = 35, ? x 5 = 35.

Learn Zillion Video: Represent Unknown Numbers Using Symbols or Letters

Math Playground Video: Multiplication and Division

Origo One Video: Related Multiplication and Division Facts