MA.4.AR.2.1

Overarching Standard: ***MA.4.AR.2*** Demonstrate an understanding of equality and operations with whole numbers.

Benchmark of Focus

MA.4.AR.2.1: Determine and explain whether an equation involving any of the four operations with whole numbers is true or false.

> *Examples:* The equation 32 ÷ 8 = 32 − 8 − 8 − 8 − 8 can be determined to be false because the expression on the left side of the equal sign is not equivalent to the expression on the right side of the equal sign.

Benchmark Clarifications

Clarification 1: Multiplication is limited to whole number factors within 12 and related division facts.

Related Benchmark/Horizontal Alignment

- MA.4.NSO.2.1

Vertical Alignment

Previous Benchmarks	**Next Benchmarks**
MA.2.AR.2.2	MA.5.AR.2.3
MA.3.AR.2.2	

Terms from the K-12 Glossary

- Equation
- Expression

Purpose and Instructional Strategies

The purpose of this benchmark is to determine if students can connect their understanding of using the four operations fluently (MTR.3.1) to the concept of the meaning of the equal sign. This concept builds on the understanding of determining if addition and subtraction equations (MA.2.AR.2.2) and multiplication and division equations (MA.3.AR.2.2) are true and false.

- Students will determine if the expression on the left of the equal sign is equivalent to the expression to the right of the equal sign. If these expressions are equivalent, then the equation will be deemed true.
- Students may use comparative relational thinking or estimation, instead of solving, to determine if the equation is true or false.

Common Misconceptions or Errors

- Many students have difficulty understanding that the equal sign is a relational symbol.They believe that the equal sign makes the expression on the right side of the equationequal to the expression on the left side so that all equations would be true. Instead an equation with an equal sign can be true or false, depending on whether the expressionson each side of the equal sign are equal to each other or not.

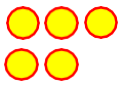
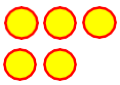
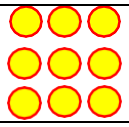
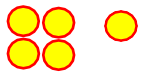
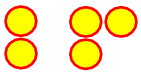
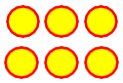
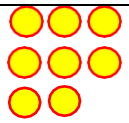
Strategies to Support Tiered Instruction

- Instruction includes opportunities to explore the meaning of the equal sign. The teacher provides clarification that the equal sign means "the same as" rather than "the answer is," providing multiple examples for students to evaluate equations as true or false using the four operations with the answers on both the left and right side of the equation. The teacher begins by using single numbers on either side of the equal sign to build understanding and uses the same equations written in different ways to reinforce the concept.
    - For example, the teacher shows the following equations. Students are asked if they are true or false statements and to explain why. This is repeated with additional true and false equations using the four operations.

Example	True/False	Sample Student Rationale
$5 = 5$	True	They are both the same number; five is the same as five.
$9 = 3$	False	Nine and three have different values; they are not the same.
$2 + 11 = 13$	True	When you add two and eleven, the total has a value of thirteen.
$13 = 2 + 11$	True	The value of thirteen is the same as the value of two and eleven combined.
$4 \div 2 = 42$	False	The quotient of four and two is two, not forty-two.
$25 - 5 = 20$	True	When you take five away from twenty-five, the difference is twenty.
$20 = 25 - 5$	True	The value of twenty is the same as the difference between twenty-five and five.
$20 = 25 + 5$	False	The value of twenty-five plus five is thirty, not twenty.
$4 + 1 = 2 + 3$	True	Four plus one has a value of five. Two plus three also has a value of five.
$2 \times 3 = 8 - 2$	True	Two times three has a value of six. Eight minus two also has a value of six.

- Teacher provides opportunities to explore the meaning of the equal sign using visual representations (e.g., counters, drawings, base-ten blocks) on a t-chart to represent the equations. The teacher provides clarification that the equal sign means "the same as" rather than "the answer is," and provides multiple examples for students to evaluate equations as true or false using the four operations with the answers on both the left and right side of the equation. The teacher begins by using single numbers on either side of the equal sign to build understanding, using the same equations written in different ways to reinforce the concept.

- For example, the teacher shows the following equations. Students use counters, drawings, or base-ten blocks on a t-chart to represent the equation. The teacher asks students if they are true or false statements and to explain why. This is repeated with additional true and false equations using the four operations

Example	True/False	Visual Representation		Sample Student Rationale
$5 = 5$	True			They are both the same number; the same amount is on both sides.
$9 = 3$	False			Nine and three have different values; there is a different number on each side.
$13 = 2 + 11$	True			The value of thirteen is the same as the value of two and eleven combined. Each side has the same amount.
$4 + 2 = 42$	False			The sum of four and two is six, not forty-two. The value on each side is different.
$4 + 1 = 2 + 3$	True			Four plus one has a value of five. Two plus three also has a value of five. Each side has the same number of counters.
$2 \times 3 = 8 - 2$	True			Two times three has a value of six. Eight minus two also has a value of six.

Questions to ask students:

- **Without adding 40 and 12, determine whether the equation 40 + 12 = 37 + 15 is true or false.**
- Sample answer that indicates understanding: The student identifies that 40 is 3 more than 37 and 12 is 3 less than 15, so the equation is correct.

- **Is the equation 3 x 5 = 15 ÷ 3 true?**
- Sample answer that indicates understanding: The equation is false because 3 groups of 5 is 15. 15 divided into 3 groups is 5.
- Sample answer that indicates misunderstanding: It is a true statement because 3 x 5 is 15.

Instructional Tasks

Instructional Task 1

Using the numbers below, create an equation that is true.

$$\_\_\_\_X\_\_\_ = \_\_\_X\_\_\_$$
$$3, 5, 6, 10$$

Instructional Items

Instructional Item 1

Determine whether the equation below is true or false.

$$86 + 58 = 144 \div 12$$

Achievement Level Descriptors

Benchmark	Context	Assessment Limits
MA.4.AR.2.1 Determine and explain whether an equation involving any of the four operations with whole numbers is true or false. Example: The equation 32 ÷ 8 = 32 − 8 − 8 − 8 − 8 can be determined to be false because the expression on the left side of the equal sign is not equivalent to the expression on the right side of the equal sign. Clarification 1: Multiplication is limited to whole number factors within 12 and related division facts.	Mathematical	Items must include at least two procedural steps on one side of the equation and at least one step on the other side of the equation. Items must use only one arithmetic operation on each side of the equation.

ALD 2	ALD 3	ALD 4	ALD 5
determines whether an equation of no more than two operands on either side, involving any of the four operations of whole numbers, is true or false.	determines whether an equation involving any of the four operations of whole numbers is true or false.	determines and explains whether an equation involving any of the four operations of whole numbers is true or false.	N/A

Additional Resources:

CPALMS Resources: https://www.cpalms.org/PreviewStandard/Preview/15364

CPALMS Lesson: Is my Equation True or False?
https://www.cpalms.org/Public/PreviewResourceLesson/Preview/73161

CPALMS Lesson: Is the Equation True and Finding the Missing Number:
https://www.cpalms.org/Public/PreviewResourceLesson/Preview/73176

Resources/Tasks to Support Your Child at Home:

- Write a variety of true and false equations. Have the child sort them into the correct true or false piles without solving and explain how they reasoned which pile the equation belongs.
- IXL: True or False with Mixed Operations: https://www.ixl.com/math/grade-5/equations-with-mixed-operations-true-or-false