

MA.4.AR.2.2

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

Benchmark of Focus

MA.4.AR.2.2: Given a mathematical or real-world context, write an equation involving multiplication or division to determine the unknown whole number with the unknown in any position.

Examples: The equation $96 = 8 \times t$ can be used to determine the cost of each movie ticket at the movie theatre if a total of \$96 was spent on 8 equally priced tickets. Then each ticket costs \$12.

Benchmark Clarifications

Clarification 1: Instruction extends the development of algebraic thinking skills where the symbolic representation of the unknown uses 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.

Related Benchmark/Horizontal Alignment

- MA.4.NSO.2.1
-

Vertical Alignment

Previous Benchmarks	Next Benchmarks
MA.3.AR.2.3	MA.5.AR.2.1 MA.5.AR.2.4

Terms from the K-12 Glossary

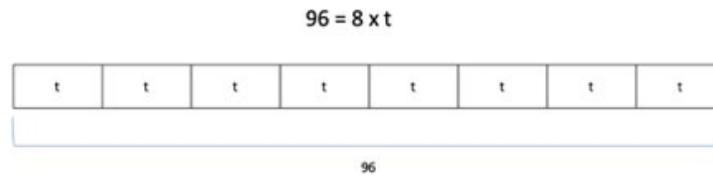
- Equation
-

Purpose and Instructional Strategies

The purpose of this benchmark is for students to continue connecting real world situations to multiplication and division by writing equations to represent these situations and using the relationship between multiplication and division to solve problems. This connects the work from Grade 3 of determining the value of the unknown number in multiplication and division equations that are given (MA.3.AR.2.3).

- Instruction of this benchmark should emphasize helping students to see the relationship between multiplication and division (MA.4.NSO.2.1) when solving for an unknown in any position in an equation.
- Success with this benchmark will facilitate automaticity with multiplication and division facts (MA.4.NSO.2.1).

- Within this benchmark, students may use multiplicative comparison ($50 = 5$ times as many as 10).
- Using a bar or tape diagram can be helpful for students to model the real-world situations presented (see example below).

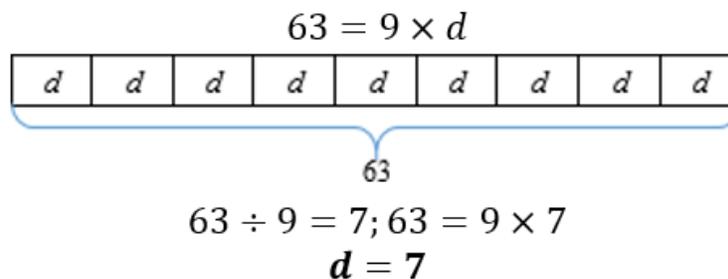


Common Misconceptions or Errors

- Even though many students know their multiplication and related division facts with automaticity, students without a firm conceptual understanding of multiplication and division may have difficulty problem solving with multiplication and division and writing equations to model situations. Provide opportunities for students to explain their models and justify solutions.

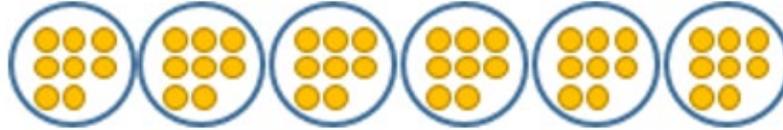
Strategies to Support Tiered Instruction

- Instruction includes opportunities to connect real world situations to multiplication and division by writing equations to represent these situations and using the relationship between multiplication and division to solve problems. The teacher emphasizes the inverse relationship between multiplication and division, reinforcing conceptual understanding of multiplication and division by having students use drawings, models, and equations to solve real world problems.
 - For example, the teacher displays and reads the following problem aloud: “Enrique has 63 baseball cards, which is 9 times as many as Damion. How many baseball cards does Damion have?” The teacher guides students to use a drawing, such as a bar model, to solve and to write an equation. Through prompting and questioning, students explain their models and justify their solutions. This is repeated with multiple examples of real-world problems.



- The teacher provides opportunities to connect real-world examples to multiplication and division using the relationship between multiplication and division to solve problems using hands-on models and manipulatives. The teacher emphasizes the inverse relationship between multiplication and division, reinforcing conceptual understanding of multiplication and division by having students use manipulatives and equations to solve real world problems. Through prompting and questioning, students explain their models and justify their solutions.

- For example, the teacher displays and reads the following problem aloud: “Sabrina hiked 48 miles in the month of May. Andre hiked 8 miles in the same month. How many times more miles did Sabrina hike than Andre?” The teacher guides students to use manipulatives, such as counters or base-ten blocks, to model the problem by showing equal groups, reminding students that multiplication and division are inverse operations. Through prompting and questioning, students explain their models and justify their solutions and write an equation. This is repeated with multiple examples of real-world problems.



$$48 = 8 \times a$$

$$48 \div 8 = 6; 48 = 8 \times 6$$

$$a = 6$$

Questions to ask students:

- **(Sample problems: Jeremy has 8 puppies. This is 4 times as many as Beth. How many puppies does Beth have?) How could you record this problem as an equation?**
- Sample answer that indicates understanding: Student responds with an equation that uses multiplication or division and recognizes that there is an unknown amount that needs to be represented in the equation: Example equations: $4 \times ___ = 8$ or $4 \times P = 8$ or $8 \div 4 = B$
- **Why can you use multiplication or division to represent and solve this problem?**
- Sample answer that indicates understanding: Both multiplication and division deal with equal groups, but multiplication is when I know the number of groups and number in each group, but not the total. Division is when I know the total and either the number of groups OR how many in each group. This thinking helps me write the equation and then I can use inverse relationship to solve if needed.
- **Follow-up question: How does the equation relate to the problem? What do each of the numbers represent from the problem?**
- Sample answer that indicates understanding: Student responds that the missing amount represents the number of puppies that Beth has. The 8 represents the total number of puppies that Jeremy has. The 4 represents how many times as many puppies Jeremy has than Beth.

Instructional Tasks

Instructional Task 1

A typical Dalmatian weighs 54 pounds and a typical Yorkshire terrier weighs 9 pounds. Write an equation to model this situation. Use your equation to determine how many more times does the typical Dalmatian weigh than the typical Yorkshire terrier?

Instructional Items

Instructional Item 1

Shernice has 84 comic books which is 12 times as many as Cindy. Which equation below represents how many comic books, c , Cindy has?

- a. $84 = 12 + c$
- b. $84 = 12 \times c$
- c. $c = 12 + 84$
- d. $c = 12 \times 84$

Achievement Level Descriptors

Benchmark		Context	Assessment Limits
MA.4.AR.2.2 Given a mathematical or real-world context, write an equation involving multiplication or division to determine the unknown whole number with the unknown in any position. Example: The equation $96 = 8 \times t$ can be used to determine the cost of each movie ticket at the movie theatre if a total of \$96 was spent on 8 equally priced tickets. Then each ticket costs \$12. Clarification 1: Instruction extends the development of algebraic thinking skills where the symbolic representation of the unknown uses 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.		Both	Equations in items must be solved in one procedural step.
ALD 2	ALD 3	ALD 4	ALD 5
matches a mathematical or real-world problem to an equation involving multiplication or division to determine the whole number with the result unknown.	solves a mathematical or real-world context with an equation provided involving multiplication or division to determine the unknown whole number with the unknown in any position.	given a mathematical or real-world context, writes and solves an equation involving multiplication or division to determine the unknown whole number with the unknown in any position.	N/A

Additional Resources:

CPALMS Resources: <https://www.cpalms.org/PreviewStandard/Preview/15365>

Khan Academy: Comparing with Multiplication Basics: <https://goo.gl/78hja4>

Khan Academy: Comparing with Multiplication, Money: <https://goo.gl/xRmmYq>

Resources/Tasks to Support Your Child at Home:

- Discuss and draw bar models of real-world examples of multiplicative comparison problems. Compare how many times more one child has than the other with candy or cereal.
- Use the previous real-world examples of multiplicative comparison problems and extend to have your child record equations.
- Compare how many times more one child has than the other with candy or cereal. One child has 2 pieces, the other has 6. $2 \times ? = 6$ or $6 \div 2 = ?$ o Use it to help your child budget: If they have \$5 and want to purchase an item that is \$40, how many times greater is the cost of the item than what you have? $5 \times ? = 40$ or $40 \div 5 = ?$
- Khan Academy: Comparing with Multiplication, Magic: <https://goo.gl/yCXmMi>
- Khan Academy: Comparing with Multiplication, Age: <https://goo.gl/QvwD6G>