MA.3.AR.1.1

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

Benchmark of Focus

MA.AR.1.1: Apply the distributive property to multiply a one-digit number and two-digit number. Apply properties of multiplication to find a product of one-digit whole numbers.

Examples: The product 4 × 72 can be found by rewriting the expression as 4 × (70 + 2) and then using the distributive property to obtain (4 × 70) + (4 × 2) which is equivalent to 288.

Benchmark Clarifications:

Clarification 1: Within this benchmark, the expectation is to apply the associative and commutative properties of multiplication, the distributive property and name the properties. Refer to K-12 Glossary(Appendix C).

Clarification 2: Within the benchmark, the expectation is to utilize parentheses.

Clarification 3: Multiplication for products of three or more numbers is limited to factors within 12. Refer to Properties of Operations, Equality and Inequality (Appendix D).

Related Benchmark/Horizontal Alignment

- MA.3.NSO.2.3
- MA.3.NSO.2.4

Vertical Alignment

Previous Benchmarks	Next Benchmarks
MA.2.NSO.1.2	MA.4.NSO.2.2 MA.4.NSO.2.3

Terms from the K-12 Glossary

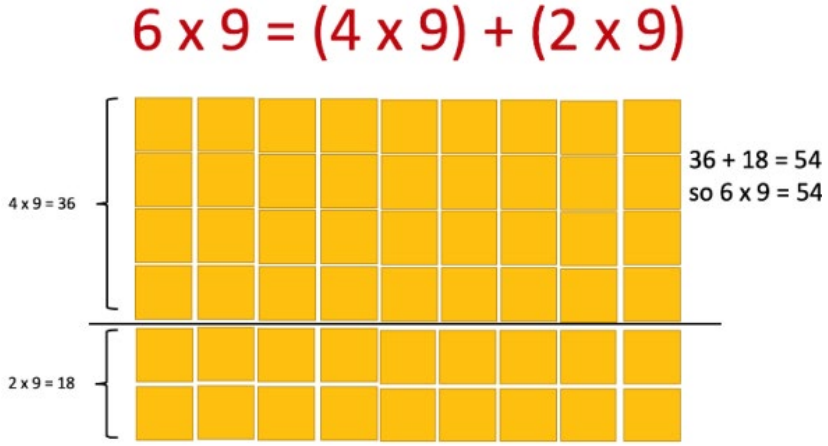
- expression
- equation
- distributive property
- factors

Purpose and Instructional Strategies

The purpose of this benchmark is for students to apply what they have learned about multiplication of one-digit numbers and multiples of ten to then multiply a one-digit number anda two-digit number (MA.3.NSO.2.3).

- Students are introduced to the distributive property of multiplication over addition as a strategy for using products that they know to solve products that they do not know. For example, if students are asked to find the product of 6 × 9, they might decompose 6 into 4 and 2 and then multiply 4 × 9 and 2 × 9 to arrive at 36 + 18, which equals 54. Because of the distributive property, students use parentheses to show how to decompose two-digit

numbers by the value of its tens and ones, and then multiply the one-digit number by both the values of the two-digit number's tens and ones values and find the sum of those products. The application of the commutative and associative properties of multiplication allow for two-digit numbers to be decomposed and multiplication expressions reorganized so that the distributive property can work (MTR.2.1).



- During instruction, teachers should model where the properties are applied while multiplying and expect students to explain how they work during explanations of their strategies and solutions. Splitting arrays can help students understand the distributive property. They can use a known fact to learn other facts that may cause difficulty (MTR.2.1, MTR.4.1).

- Building understanding of the distributive property in Grade 3 will help students decompose larger numbers as they continue to multiply multi-digit numbers with procedural reliability and procedural fluency in Grade 4. Splitting arrays can help students understand the distributive property. They can use a known fact to learn other facts that may cause difficulty.

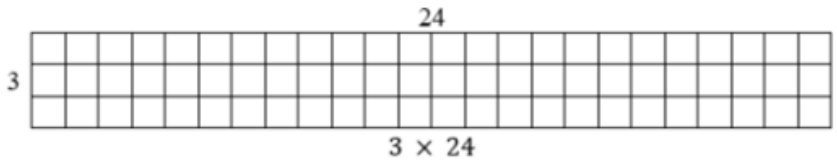
Common Misconceptions or Errors

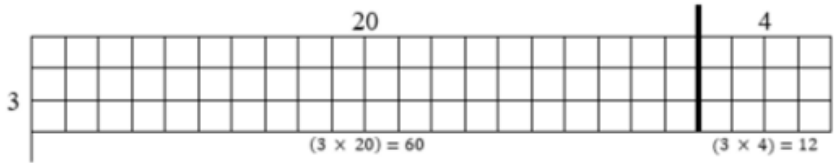
- Students can be confused about how to write expressions using the distributive property. One common mistake that students make is writing an expression 4×72 as $(4 \times 70) \times (4 \times 2)$ or $(4 \times 7) + (4 \times 2)$ instead of $(4 \times 70) + (4 \times 2)$. Instruction should show concrete models (e.g., base ten drawings) along with equations so students can understand the relationship between multiplication and addition while applying the property and writingexpressions.

Strategies to Support Tiered Instruction

- Instruction includes opportunities to use concrete models and drawings along with equations to increase understanding of the relationship between multiplication and addition when applying the distributive property and writing equations. The teacher begins by modeling a one-digit number multiplied by a one-digit number, guiding students to decompose one of the factors and use models or drawings to demonstrate the reorganization of the multiplication expression using parentheses. Next, the teacher models multiplication of a one-digit number by a two-digit number, guiding students to decompose the two-digit number into the value of the tens and the ones using models or drawings. The teacher clarifies that the decomposed factor can be represented in expanded form by adding the tens and the ones, repeating with additional one-digit by two-digit multiplication equations.

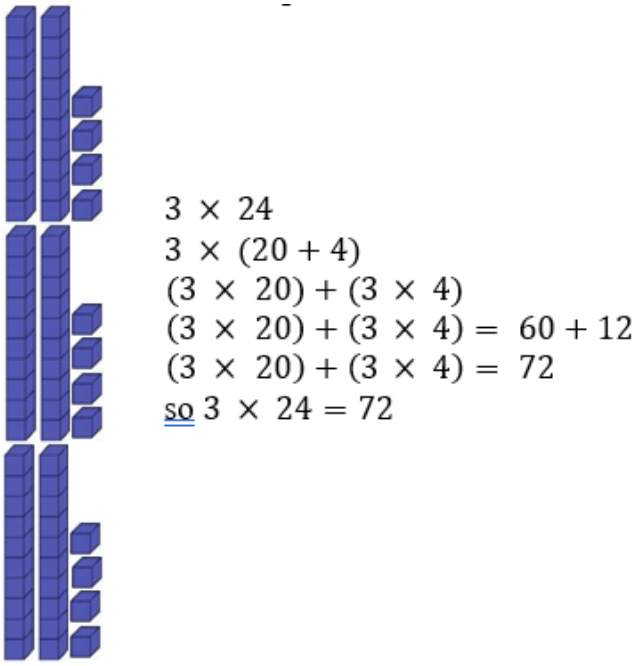
- For example, the teacher uses a model or drawing to use the distributive property to solve 3 x 24.





$3 \times (20 + 4)$
$(3 \times 20) + (3 \times 4)$
$(3 \times 20) + (3 \times 4) = 60 + 12$
$(3 \times 20) + (3 \times 4) = 72$
so $3 \times 24 = 72$

- Teacher provides opportunities to apply the distributive property to solve one-digit by two-digit multiplication equations using base-ten blocks or place value disks. The teacher provides the equation and guides students to decompose the two-digit number into the value of the tens and the ones using manipulatives. If needed, the teacher prompts students to count by 10s and 1s using the base-ten blocks or place value disks.
  - For example, the teacher uses base-ten blocks to solve 3 × 24 while asking guiding questions such as “How many tens are in 24?” “How many ones are in 24?” “How would we write 24 in expanded form?”



3×24
$3 \times (20 + 4)$
$(3 \times 20) + (3 \times 4)$
$(3 \times 20) + (3 \times 4) = 60 + 12$
$(3 \times 20) + (3 \times 4) = 72$
so $3 \times 24 = 72$

$(3 \times 4) = 12$

Questions to ask students:

Ask students if the order of the factors in a multiplication equation effects the product and to prove why or why not.

- Sample answer/s that indicate understanding: *"The order of the factors does not change the product. I can make a 3 × 2 array, which is 6. Then I can turn that array so that it is a 2 × 3 array, and I still have a product of 6."*
- Sample answer/s that indicates partial understanding or a misconception: *"It depends on what the factors are."*

Ask students why it is helpful to know that the grouping of factors will not change the product when they are trying to find the product of 3 or more factors.

- Sample answer/s that indicate understanding: *"I can decide which numbers I want to multiply first, so that I can use the facts I know. If I was trying to solve 5 × 7 × 2, I could multiply the 5 × 2 to get 10, because that is easy to multiply by 7 and get the product of 70."*
- Sample answer/s that indicates partial understanding or a misconception: *"You have to multiply the factors in order."* Or *"You can't find the product of more than 2 factors."*

Ask students to explain how breaking apart a factor can be used to find a product.

- Sample answer/s that indicate understanding: *"If I have a problem I don't know, like 6 × 7, I can break apart one of the factors and use facts I do know. I could break apart the 7 into 2 and 5, and then just find 6 × 2 and 6 × 5 and add the products together."*
- Sample answer/s that indicates partial understanding or a misconception: *"If I am trying to find a product, like 6 × 7, I know that 3 × 2 is 6, so I can find 3 × 7 and 3 × 2 and add those products back together."*

Instructional Tasks

Instructional Task 1

In each equation, find the missing value, n.

Part A. $4 \times 52 = (4 \times 50) + (4 \times n)$

Part B. $n \times 3 = (20 \times 3) + (9 \times 3)$

Part C. $8 \times 36 = (n \times 30) + (n \times 6)$

Part D. $48 \times 6 = n$

Instructional Task 2

Tory tried to use the associative and commutative properties to create the following equations. Using pictures and/or words, explain why Tory is incorrect.

$4 \times (11 + 6) = (4 \times 11) + 6$

$4 \times (11 + 6) = 11 \times (4 + 6)$

Instructional Items

Instructional Item 1

Which of the following correctly uses the distributive property to multiply 8×39 ?

a. $(8 \times 30) \times (8 \times 9) = 24 + 72 = 96$

b. $(8 \times 30) + (8 \times 9) = 240 + 56 = 296$

c. $(8 \times 30) + (8 \times 9) = 38 + 17 = 45$

d. $(8 \times 30) + (8 \times 9) = 240 + 72 = 312$

Benchmark	Context	Assessment Limits
MA.3.AR.1.1 Apply the distributive property to multiply a one-digit number and two-digit number. Apply properties of multiplication to find a product of one-digit whole numbers. Example: The product 4 × 72 can be found by rewriting the expression as 4 × (70 + 2) and then using the distributive property to obtain (4 × 70) + (4 × 2) which is equivalent to 288. Clarification 1: Within this benchmark, the expectation is to apply the associative and commutative properties of multiplication, the distributive property and name the properties. Refer to K-12 Glossary (Appendix C). Clarification 2: Within the benchmark, the expectation is to utilize parentheses. Clarification 3: Multiplication for products of three or more numbers is limited to factors within 12. Refer to Properties of Operations, Equality and Inequality (Appendix D).	Mathematical	N/A

ALD 2	ALD 3	ALD 4	ALD 5
applies commutative property of multiplication to find the product of one-digit whole numbers.	applies commutative and associative properties of multiplication to find a product of three or more whole numbers limited to factors within 12.	applies the distributive property to multiply a one-digit number and two-digit number; applies properties of multiplication to find a product of one-digit whole numbers.	identifies an error in the application of the distributive property when multiplying a one-digit number and a two-digit number.

Additional Resources:

CPALMS Resources

Khan Academy Distributive Property

Khan Academy Associative Property

Resources/Tasks to Support Your Child at Home:

Use everyday items (cereal, toys, pennies, etc.) to make equal groups of arrays, and have your child write an expression that matches the model. Then, have them change the way the objects are grouped and find other expressions that would have the same product.

Ask, "How are 5 bags of 4 apples in each bag is similar to and different from 4 bags of 5 apples each?"

Learnzillion: Solve Multiplication Problems Using the Associative Property

Learnzillion: Solve Multiplication Problems Using the Distributive Property

Learnzillion: Use an array to solve a 1-digit by a 2-digit multiplication problem