MA.5.AR.2.4

Overarching Standard: *MA.5.AR.2 Demonstrate an understanding of equality, the order of operations and equivalent numerical expressions.*

Benchmark of Focus

MA.5.AR.2.4: Given a mathematical or real-world context, write an equation involving any of the four operations to determine the unknown whole number with the unknown in any position.

Examples: The equation $250 - (5 \times s) = 15$ can be used to represent that 5 sheets of paper are given to s students from a pack of paper containing 250 sheets with 15 sheets left over.

Benchmark Clarifications

Clarification 1: Instruction extends the development of algebraic thinking where the unknown letter is recognized as a variable.

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

Related Benchmark/Horizontal Alignment

- MA.5.NSO.2.1
- MA.5.NSO.2.2
- MA.5.AR.1.1
- MA.5.AR.3.1

Vertical Alignment

Previous Benchmarks	**Next Benchmarks**
MA.4.AR.2.2	MA.6.AR.1.4 MA.6.AR.2.2/2.3/2.4

Terms from the K-12 Glossary

- Equal Sign
- Equation
- Expression
- Whole Number

Purpose and Instructional Strategies

The purpose of this benchmark is for students to write equations that determine unknown whole numbers from mathematical and real-world contexts. In Grade 4, students wrote equations from mathematical and real-world contexts to determine unknown whole numbers (represented by letter symbols) (MA.4.AR.2.2). The extension in Grade 5 is that factors are not limited to within 12 and equations may use parentheses, implying students may have to use the order of operations to solve. In Grade 6, students extend this work to include integers and positive fractions and decimals (MA.6.AR.2.2/2.3/2.4).

- Instruction should focus on helping students translate mathematical and real-world contexts to equations. Instructional emphasis should be placed on students' comprehension of the contexts to then translate to equations more easily. An instructional strategy that helps students translate from context to symbolic equations is to first present contexts with some or all their numerical information omitted. In a mathematical context,this may look like showing a data display with some numerical information covered. In areal-world context, this may look like a word problem with quantities covered. This allows students to comprehend what the problem trying to find and allows students to think deeper about what operations will be required to do so. It can also help students estimate reasonable solution ranges. Once students can predict an equation (or equations)to solve the problem, then the teacher can reveal all numerical information and allow students to solve (MTR.5.1).
- In each context, students may provide many examples of equations that can be used to solve. During instruction, teachers should have students compare their equations and evaluate whether they can be used to solve (MTR.4.1).
- During instruction, students should justify how their equations match the mathematical and real-world contexts through checking solutions. Students should substitute their solution for their letter symbol and use the order of operations to check that it makes the equation true.

Common Misconceptions or Errors

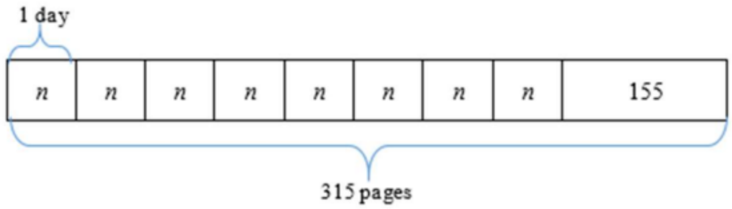
- When students have trouble comprehending contexts, they tend to just grab numbers from a given context and begin computing without justifying their arguments. Emphasis of instruction should be on the comprehension of problems through classroom discussion, sharing strategies, estimating reasonable solutions, and justifying equations and solutions.

Strategies to Support Tiered Instruction

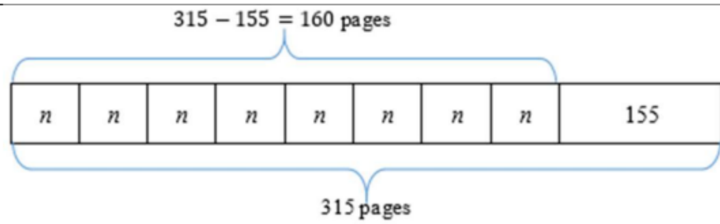
- Instruction focuses on the comprehension of problems through classroom discussion, sharing strategies, estimating reasonable solutions, and justifying equations and solutions.
- Instruction includes opportunities to connect real-world situations to write equations using any of the four operations to determine an unknown whole number with the unknown in any position. Students apply the order of operations to solve for the unknown. The teacher emphasizes the inverse relationships between addition and subtraction, and multiplication and division as applicable in order to help students solve for the unknown, while reinforcing conceptual understanding by having students use drawings, models and equations to solve real world problems.
    - For example, the teacher displays and reads the following problem aloud: "Renaldo read the same number of pages of his book each day for 8 days. He needs to read a total of 315 pages, and still needs to read 155 pages to meet his goal. How many pages did he read on each of the 8 days so far?" Students are provided manipulatives, such as counters or base-ten blocks, to model the problem or to use a drawing, such as a bar model, to solve and to write an equation. Through prompting and questioning, students explain their models,

justify their solutions, and check their solution, repeating with multiple examples of real-world problems.

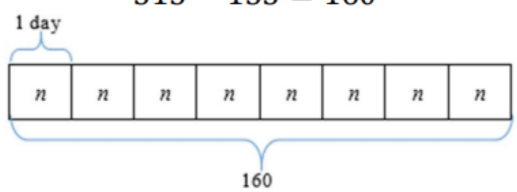
$$(8 \times n) + 155 = 315$$



$$(8 \times n) = 315 - 155$$



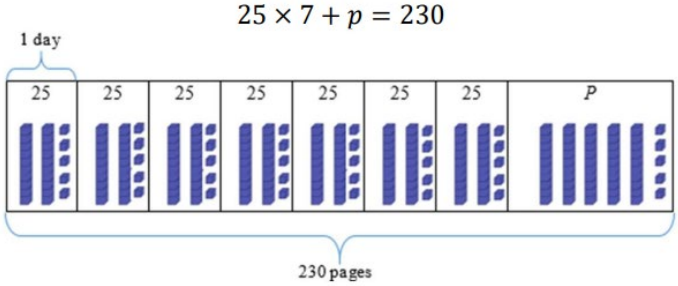
$$315 - 155 = 160$$



$$8 \times n = 160$$
$$160 \div 8 = n$$
$$160 \div 8 = 20$$
$$n = 20$$

- For example, Elijah reads 25 pages of a novel per day for 7 days. The entire novel is 230 pages, how many pages does he have left to read? Students are provided manipulatives, such as counters or base-ten blocks, to model the problem or to use a drawing, such as a bar model, to solve and to write an equation. Through prompting and questioning, students explain their models, justify their solutions, and check their solution, repeating with multiple examples of real-world problems.

$$25 \times 7 + p = 230$$



$$25 \times 7 + p = 230$$
$$175 + p = 230$$
$$230 - 175 = p$$
$$230 - 175 = 55$$
$$p = 55$$

Questions to ask students:

How do you know if your equation matches the context of the problem?

- Sample answer that indicates understanding: Students should have an understanding of checking their work in order to determine if their equation correctly models the context of the problem. For example, they should know to substitute their solution for their letter symbol and then use order of operations to check that their solution makes the equation true.

How can estimation help you to understand and determine reasonable solutions?

- Sample answer that indicates understanding: Estimation can help to determine if a given equation or solution is reasonable or not. For example, a student may be able to determine his equation is not a reasonable fit for the context of the real world problem through the use of estimation.

Ask students: At ELP last week, Simmons Elementary had 500 snacks for students after school. After 2 days of ELP, there were 50 snacks left over. What equation(s) could be used to solve for *s*, or the number of snacks eaten each day?

- Sample answer that indicates understanding: Equation: $500 - (2 \times s) = 50$

Instructional Tasks

Instructional Task 1

To celebrate reaching their monthly reading goal, Dr. Ocasio's class has a cookie party. Dr. Ocasio buys a box of 96 cookies. She plans to give the same number to each of the 21 students in her class. She wants 12 cookies remaining to bring home for her children. What is the greatest number of cookies each of Dr. Ocasio's students can receive?

Part A. Write an equation that can be used to solve. Use a letter to represent the unknown number.

Part B. What is the greatest number of cookies each of Dr. Ocasio's students can receive?

Part C. Prove that your answer is correct by showing how your equation is true.

Instructional Items

Instructional Item 1

Which of the equations can be used to solve the problem below?

To celebrate reaching their monthly reading goal, Dr. Ocasio's class has a cookie party. Dr. Ocasio buys a box of 96 cookies. She plans to give the same number to each of the 21 students in her class. She wants 12 remaining to bring home for her children. What is the greatest number of cookies each of Dr. Ocasio's students can receive?

a. $96 - 21 - 12 = c$

b. $96 - (21 \times c) = 12$

c. $12 + c = 96 - 21$

d. $21 \times c + 12 = 96$

Achievement Level Descriptors

Benchmark	Context	Assessment Limits
MA.5.AR.2.4 Given a mathematical or real-world context, write an equation involving any of the four operations to determine the unknown whole number with the unknown in any position. Example: The equation $250 - (5 \times ss) = 15$ can be used to represent that 5 sheets of paper are given to ss students from a pack of paper containing 250 sheets with 15 sheets left over. Clarification 1: Instruction extends the development of algebraic thinking where the unknown letter is recognized as a variable. Clarification 2: Problems include the unknown and different operations on either side of the equal sign	Both	Items including one procedural step involving multiplication or division will not include factors within 12 and related division facts. Items must not use coefficients to represent multiplication. Items may require the student to only determine the equation or to determine the equation and solve for the unknown whole number.

ALD 2	ALD 3	ALD 4	ALD 5
Given a mathematical context, recognizes an equation involving any of the four operations to determine the unknown whole number with the unknown standing alone on one side of the equation.	Given a mathematical context, identifies an equation involving any of the four operations to determine the unknown whole number with the unknown in any position.	Given a mathematical or real-world context, determines an equation involving any of the four operations to determine the unknown whole number with the unknown in any position.	N/A

Additional Resources:
CPALMS Resources

Resources/Tasks to Support Your Child at Home:

iXL: Represent Multi-Step Problems using Equations