

Problem Solving with Multiplication & Division Equations – Grade 3, Level 1

Lesson Overview

In this lesson, students use multiplication and related division problems, and apply their knowledge to find and solve equations (including unknowns) relating to problem situations.

Alignment

Standard/Indicator Addressed

Math (3.ATO.3) Solve real-world problems involving equal groups, area/array, and number line models using basic multiplication and related division facts. Represent the problem situation using an equation with a symbol for the unknown.

Standards for Mathematical Practice (as appropriate)

1. Make sense of problems and persevere in solving them.
 - c. Analyze what is given, what is not given, what is being asked, and what strategies are needed, and make an initial attempt to solve a problem.
2. Connect mathematical ideas and real-world situations through modeling.
 - a. Identify relevant quantities and develop a model to describe their relationships.
 - b. Interpret mathematical models in the context of the situation.
 - d. Evaluate the reasonableness of a model and refine if necessary.
6. Identify and utilize structure and patterns.
 - a. Look for structures to interpret meaning and develop solution strategies.

Lesson Plan

Time Required – One 60 Minute Class Period

Disciplinary Vocabulary – factors , product, quotient, divisor, dividend, equation, symbol, unknown

Materials Needed: Chart for students in the “Explain” section

Teacher Notes: This lesson builds upon 3.ATO.1 and 3.ATO.2 where students use concrete objects, drawings and symbols to represent multiplication and division relationships. 3.ATO.3 is focused on problem solving and writing equations with an unknown. It is the application which employs problem solving strategies.

Formative Assessment Strategies: observation, student dialogue, partner problems/chart to be turned in

Engage

- Explain to students the unknown in a problem situations is the solution you are seeking; the answer to the problem.
- Show students the following examples and explain the unknown symbol. Allow students to explore the unknown being the first part of the equation. Ask students what they might think the problem situation is representing. Have them create problem situations which would be modeled by the equations. Write these on a board or chart to revisit later.
- The possibilities should include these examples: $24 \div 6 = x$; $24 \div x = 6$; $x \div 6 = 4$

Explore

Teacher NOTE: Have students work in pairs to solve the problems with manipulatives. Ask: What strategy did you use to solve the problem? How do you know it is correct? What other way might you solve this problem? Have the students share their strategies. Encourage them to ask questions about the strategies if they don't understand. Keep a "Strategies" poster of all the strategies that work. Encourage them to try other strategies if they understand them.

- Instructions: For each of the following, write multiplication equation(s) with an unknown and/or division equation(s) with an unknown. Discuss how problems differ with where the unknown may be located (factor, product, quotient, etc.) NOTE: Sample equations are listed below the problem situations.

Equal grouping problems:

- Debbie has 3 boxes of crayons with 9 crayons in each box. How many crayons does Debbie have?
 - $3 \times 9 = c$
- Brock has 24 cookies. He wants to put 8 in each bag. How many bags will he need?
 - $24 \div 8 = c$
 - $8 \times c = 24$

- I gave each of my 4 brothers and sisters \$8 each and I have none left. How much money did I start out with?
 - $4 \times 8 = m$
- Brock has some cookies. He wants to share between himself and 5 of his friends. How many cookies does he start with if everyone receives 4 cookies?
 - $C = 6 \times 4$
 - $C \div 6 = 4$

Comparison Problems:

- Matt picked 8 apples. Sara picked 3 times as many. How many apples did Sara pick?
 - $8 \times 3 = S$
- Sara picked 24 apples. She picked 3 times as many as Matt. How many apples did Matt pick?
 - $3 \times M = 24$
 - $24 \div 3 = M$
 - Teacher NOTE: Students may have a difficult time determining what 3 times as many actually means. For example: For every 1 apple Matt picked, Sara picked 3. (3 times as many). Perhaps, modeling 1 yellow counter paired with 3 red counters or asking students to act this out would help students.

Explain

- Part 1: Revisit the problem situations written on the board earlier in the lesson based on the equations in the “explore” section. Do students wish to make any adaptations? Could they add any equations which could be used to solve the problems other than the ones given?
- Part 2: Complete the following chart with a partner. Discuss as a class.

Problem Situation	Possible Equations (circle the one(s) that apply as paths to solving the problem)	Create ONE Representation for each problem (Array, Number Line, Skip Counting, Equal Groups, etc.) However, you must use at least 2 different types of representations in this section of the table.	Solve for the Unknown Variable	Explain Your Thinking
Sam has 24 boxes of candy to sell for a fundraiser. He sells the same number of boxes to 12 different people. How many boxes did each person receive?	$24 \times 12 = n$ $24 \div 12 = n$ $12 \times n = 24$ $12 \div 24 = n$			
Sam has 24 boxes of candy to sell for a fundraiser. If each person he sells to gets 3 boxes, how many people did he sell to?	$24 \div 3 = c$ $24 \div c = 3$ $3 \times c = 24$ $24 \times 3 = c$			
I have a pack of pencils. I give 4 friends 8 pencils each and I have none left. How many pencils are in my original pack?	$8 \div 4 = p$ $4 \times p = 8$ $4 \times 8 = p$ $p \div 4 = 8$			
I have a pack of donuts I want to share	$d \div 4 = 3$			

<p>equally between myself and 3 friends. How many donuts do I have each each person (including me) receives 3 donuts?</p>	$d \div 3 = 3$ $4 \times 3 = d$ $3 \times 3 = d$			
<p>I started the day with \$20. I let 4 friends each borrow money. They each borrowed the same amount. How much did each friend borrow?</p>	$5 \times m = 20$ $20 \div 4 = m$ $4 \times m = 20$ $20 \div 5 = m$			
<p>I planted flowers in my garden. There were 6 rows and 3 flowers in each row. How many flowers did I plant?</p>	$f \div 6 = 3$ $6 \div 3 = f$ $6 \times 3 = f$ $f \div 3 = 6$			

Have students turn in the chart to assess their understanding.

Other information on this indicator(s) can be found in the support documents/resources on the SC State Department website.

www.ed.sc.gov (Instruction → Standards and Learning → Mathematics or Science → Support Documents and Resources)

Content Area (Disciplinary) Literacy strategies and descriptions can be found on the S2TEM Centers SC website:

s2temsc.org (Resources → Disciplinary Literacy Virtual Library → Strategy Warehouse)

Computational Thinking Reference:

<https://csta.acm.org/Curriculum/sub/CurrFiles/CompThinkingFlyer.pdf>

<https://csta.acm.org/Curriculum/sub/CompThinking.html>

Additional Information

Level 1 lessons contain a realignment to the 2014 Science and/or the 2015 Mathematics Standards.

Level 2 lessons contain Level 1 information and Content Area Literacy and Disciplinary Literacy Strategies.

Level 3 lessons contain Level 1 and 2 information and Computational Thinking Connections.

Level 4 lessons contain Level 1, 2, and 3 and integration of at least 2 content areas.