

Name _____ Date _____

TASK 1

Clare's Packs of Crackers

Clare is packing 3 lunchboxes. She puts 2 packs of crackers in each lunchbox. Each pack of crackers has 6 crackers. How many crackers will there be in the lunchboxes?

Show a diagram of the packs of crackers, the lunchboxes, and the crackers. Write two different equations that show how you arrived at the total number of crackers.

Clare's Packs of Crackers

Suggested Duration for Lesson: 1 Period

Suggested Grouping for Lesson: Variable

Why this lesson now?

Students begin this lesson set by exploring multiplication with three factors by solving situations involving groups of groups of items. Students work to link their equations and the context to give meaning to the numbers. Since this is the first lesson in the set, students are unlikely to write three-factor multiplication equations on their own.

Through classroom mathematics discussion, students can be introduced to equations involving three factors and pressed to name the meaning of the factors. Establishing an understanding of groups of groups of items, which is multiplication with three factors, is the basis for developing an understanding of the associative property of multiplication.

Guiding Questions:

- What equations can we write to represent word problems involving groups of groups of items?
- What do the numbers mean in the equations we write to describe the situations?

Task 1: Clare's Packs of Crackers

Clare is packing 3 lunchboxes. She puts 2 packs of crackers in each lunchbox. Each...

See student task sheet for the complete task.

Mathematical Content Standards

* Greyed-out portions not addressed in task or lesson.

3.OA.A.1

Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5×7 .*

3.OA.B.5

Apply properties of operations as strategies to multiply and divide.² *Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property)*

Mathematical Practice Standards

MP1 Make sense of problems and persevere in solving them.
MP2 Reason abstractly and quantitatively.
MP4 Model with mathematics.
MP6 Attend to precision.
MP7 Look for and make use of structure.

² Students need not use formal terms for these properties.

Essential Understandings (EUs)	<p>Meaning of the Factors: In situations involving equal groups of items, one factor in the multiplication expression represents the quantity of items in each group (row or column), and the other factor(s) in the multiplication expression represents the number of groups (rows or columns).</p> <p>Associative Property of Multiplication: Because only two factors can be multiplied at a time, in multiplication expressions involving more than two factors, any two adjacent factors can be paired and multiplied without changing the product of the expression.</p>
Materials Needed	<ul style="list-style-type: none"> • Task Handouts (includes: Task, Application Task and Quick Write) • 40 connecting cubes or other manipulative per group • 8 mapping papers (1/4 pieces of construction paper) per group

▶ SET-UP PHASE

Suggested Duration: 3-5 minutes



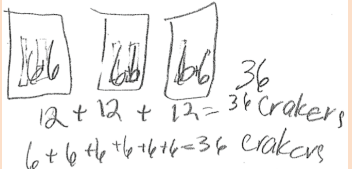
Suggested Grouping: Whole Group

Example of Set-Up Phase: *The example below shows one way to conduct the Set-Up Phase of the lesson. What is done during this phase will depend on the goals of the task, the context of the situation, and students' prior knowledge of both the mathematics and the context.*

- Listen as I read the task aloud. (Read the task.)
- What can you tell me about Clare's packs of crackers? (Take responses from 3-4 students. Take this time to teach any unknown vocabulary in the task.)
- Use the counters as crackers and the mapping papers as lunchboxes to show Clare's crackers and write equations to describe her crackers.
- You will have a few minutes to work on your own and then you will get a chance to share your thinking with your group. I'll be around to talk with you.

▶ EXPLORE PHASE

Suggested Duration: 15-17 minutes **Suggested Grouping:** Small Group

Possible Student Pathways	Assessing Questions	Advancing Questions
<ul style="list-style-type: none"> • Has trouble getting started. 	<p>Tell me what you know about Clare’s crackers.</p>	<p>Draw a picture of the packs of crackers.</p>
<ul style="list-style-type: none"> • Creates an incomplete equal groups diagram. • Represents only 1 of 3 lunchboxes. 	<p>Tell me about your diagram.</p> <p>What does the diagram show about the crackers?</p>	<p>Into how many lunchboxes does Clare put crackers? Change your picture to show all of the lunchboxes described in the word problem.</p>
<ul style="list-style-type: none"> • Creates an accurate <i>equal group</i> diagram. • Shows groups with groups of items inside. 	<p>Tell me how your diagram is showing Clare’s crackers.</p>	<p>Write an equation to describe the packs of crackers in each of the lunchboxes.</p>
<ul style="list-style-type: none"> • Creates an accurate diagram. • Writes two accurate equations. • Determines and labels an accurate final product. 	<p>Tell me about your work. How do the diagrams and equations describe the crackers?</p>	<p>Use what you know about repeated addition to write a multiplication equation to describe the crackers in the lunchboxes. Be sure to tell what each of the factors means in the equation.</p>

SHARE, DISCUSS, AND ANALYZE PHASE

LESSON
GUIDE
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Suggested Duration: 30 minutes

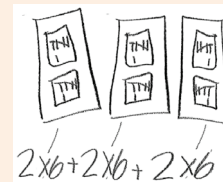
Suggested Grouping: Whole Group

EU: Meaning of the Factors

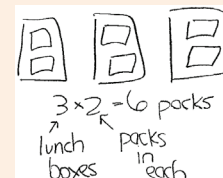
- Show us your diagram and tell us how you thought about the crackers in the packs and the lunchboxes. (*I did 6 crackers in 2 packs the lunchbox has 12 crackers.*)



- What equations can we write to tell about this diagram of Clare's crackers?
($2 \times 6 = 12$, $6 + 6 = 12$)
- What do the factors in 2×6 mean? What does the 12 mean? (*The 2 tells us how many packs of crackers there are and the 6 tells us how many crackers are in each pack. There are 12 crackers in the lunchbox.*)
- Does 12 crackers tell us about all of the crackers? (*12 is how many crackers are in one lunchbox, but there are three lunchboxes. There are 36 crackers in all of the lunchboxes.*)
- Stop and jot. Write an equation that tells about all of the lunchboxes and the crackers in each lunchbox. (*I wrote 2×6 three times, so it is $2 \times 6 + 2 \times 6 + 2 \times 6$.*)
- Someone else explain $(2 \times 6) + (2 \times 6) + (2 \times 6)$ and point to the diagram of the crackers when you give the explanation.
(*This lunchbox is 2×6 and this one is 2×6 and this one is 2×6 . There are three lunchboxes with crackers. Then I added them all together.*)



- (Record $3 \times 2 \times 6$ on the board.) Look at the expression $3 \times 2 \times 6$. How does this expression describe the lunchboxes and crackers or the expression $(2 \times 6) + (2 \times 6) + (2 \times 6)$? (*The 3 is the lunchboxes, and the 2 is the packs of crackers, and the 6 is how many crackers are in each pack of crackers. There are three packs because I see 2×6 three times.*)
- Lunchboxes and packs are both words that mean groups. The crackers are the items. That means we have groups of groups of items. **(Marking)**
- Someone show us the groups of groups of items with your manipulatives. (*There 3 lunchboxes and those are the bigger groups, and there are 2 packs of crackers that are smaller groups in each lunchbox, and then there are 6 items in each pack.*)
- When we multiply three factors, two of the factors tell us about groups and one of the factors tells us the items in each group. We can say there are groups of groups of items. **(Marking)**



**LESSON
GUIDE
1**
EU: Associative Property of Multiplication

- There are 6 packs and each pack has six crackers.
We did $(3 \times 2) \times 3$ or 6×6 . What do we need to do next?
- We solved $3 \times (2 \times 6)$ and then we did $(3 \times 2) \times 6$.
Why doesn't it matter we if start by multiply 2×6 and then multiply the 3 or if we start by multiplying 3×2 and then multiply the 6? *(We still get 36. We still have the same number of lunchboxes and packs of crackers and there are still 6 crackers in each pack.)*
- Are we saying that we can pair and multiply the factors in different ways and we'll get the same answer? Who agrees, who disagrees? Why?
- Can we write $3 \times (2 \times 6) = (3 \times 2) \times 6$? Explain.
- We are going to keep thinking about this mathematical idea of being able to pair and multiply three factors in different ways.

A handwritten diagram illustrating the associative property of multiplication. At the top, there are six small boxes, each containing the number 6, representing six packs. Below this, the equation $6 \times 6 = 36$ is written. The first 6 is labeled '6 packs' and the second 6 is labeled '6 crackers in each'. The result 36 is labeled '36 crackers'.

Summary

When we have two factors, we have groups of items; but, when we have three factors, we have groups of groups of items. Two of the factors tell groups, a bigger group and a smaller group, and one factor tells us how many items are in the smaller group.

▶ APPLICATION

LESSON
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Suggested Duration: 10 minutes

Suggested Grouping: Individual

The following word problem involves groups of groups of items.

Solve the word problem. Create a diagram and write a multiplication equation to show the word problem.

There are 5 lunchboxes. There are 3 packs of crackers in each lunchbox. Each pack of crackers has 6 crackers. How many crackers will there be in all of the lunchboxes?

▶ QUICK WRITE

Suggested Duration: 5 minutes

Suggested Grouping: Individual

Reread the word problem from the Task 1 Application.

There are 5 lunchboxes. There are 3 packs of crackers in each lunchbox. Each pack of crackers has 6 crackers. How many crackers will there be in all of the lunchboxes?

The expression $(3 \times 6) \times 5$ tells about Clare's packs of crackers. Write about the meaning of each of the factors in the equation using information from the situation.

English Learner Support:

1. Describe and show available manipulatives in the Set-Up Phase of the lesson. In this lesson that includes connecting cubes or counters and mapping papers.
2. Link the phrase "groups of groups of items" to the image of the lunchboxes with packs of crackers inside of them.
3. Identify explicitly the lunchboxes as groups and the packs as groups.