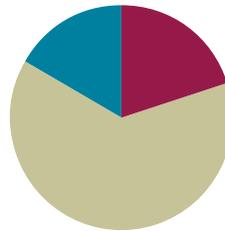


Lesson 4

Objective: Solve multiplicative comparison word problems.

Suggested Lesson Structure

■ Fluency Practice	(12 minutes)
■ Concept Development	(38 minutes)
■ Student Debrief	(10 minutes)
Total Time	(60 minutes)



Fluency Practice (12 minutes)

- Find the Unknown Factor **3.4J** (4 minutes)
- Multiplication Facts as Comparisons **3.5C** (4 minutes)
- Group Counting **3.4E** (4 minutes)

Find the Unknown Factor (4 minutes)

Materials: (S) Personal white board

Note: Finding the unknown factor allows students to practice division facts.

T: (Project $4 \times \underline{\quad} = 24$.) On your personal white board, write the unknown factor.

S: (Write 6.)

T: Say the multiplication sentence.

S: $4 \times 6 = 24$.

Repeat the process with the following possible sequence:

$$6 \times \underline{\quad} = 24; 5 \times \underline{\quad} = 30; 6 \times \underline{\quad} = 30; 6 \times \underline{\quad} = 42;$$

$$7 \times \underline{\quad} = 42.$$

Multiplication Facts as Comparisons (4 minutes)

Materials: (S) Personal white board

T: (Project 4×7 .)

T: Say the multiplication expression.

S: 4 times 7.



NOTES ON MULTIPLE MEANS OF ACTION AND EXPRESSION:

When students draw strip diagrams, the strips may be in a different order and the numbers may be in different places. Beyond that, for the same problem, the strip diagrams will generally look the same from student-to-student. However, the solution paths can vary significantly. When studying a strip diagram, a student can choose the most accessible path to solve. Some students may add, while others may multiply. When reviewing student solution paths, it is wise to start with the most accessible, and progress to more sophisticated solution paths, all while using the same strip diagram.

T: Another way to say this multiplication expression is 4 times as much as 7. Repeat that.

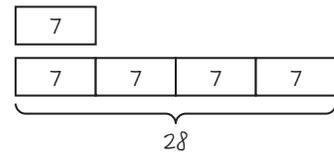
S: 4 times as much as 7.

T: On your personal white boards, draw that as a comparison.

T/S: (Draw.)

T: What is 4 times as much as 7?

S: 28.



Repeat the process with the following possible sequence: 5 times as much as 7; 6 times as much as 7; 8 times as much as 8; 5 times as much as 8 and 6 times as much as 8.

Group Counting (4 minutes)

Note: Group counting reviews interpreting multiplication as repeated addition. It reviews foundational strategies for multiplication from Module 1 and anticipates Module 3.

Direct students to count forward and backward, occasionally changing the direction of the count:

- Threes to 30
- Fours to 40
- Sixes to 60
- Sevens to 70
- Eights to 80
- Nines to 90

As students' fluency with skip-counting improves, help them make a connection to multiplication by tracking the number of groups they count using their fingers.



NOTES ON MULTIPLE MEANS OF ENGAGEMENT:

Multiplicative comparison problems are limited to whole numbers in Grade 3. In subsequent grades students will expand their use of comparisons to consider problems with half as much or 2 thirds as much. This foundational work in Grade 3, sets students up for success in later grades.

Concept Development (38 minutes)

Materials: (T/S) Problem Set

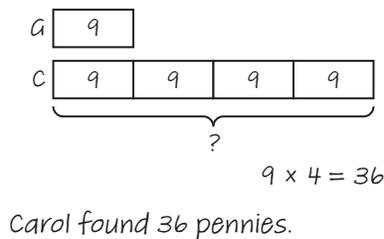
1. **Problem 1:** Two friends like to look for lost pennies on the sidewalk. In one day, George found 9 pennies and Carol found 4 times as many pennies as George. How many pennies did Carol find?

Note: Use Read, Draw, Write to model and solve this word problem. This problem is the easiest in the sequence. The unit is given, and the number of times the unit is repeated is given. When read in order, each sentence offers something to draw.

T: (Display the problem.) Let's read the problem together.

T/S: (Read.)

- T: Let's read the problem sentence by sentence and see if we can draw something.
- T: In one day, George found 9 pennies. What can we draw?
- S: We can draw one strip, and label it *G* for George.
- T: Draw that.
- T/S: (Draw.)
- T: What value does this one unit have?
- S: 9. → George found 9 pennies, so his strip should say 9.
- T: Label the one unit as 9.
- T/S: (Draw.)
- T: The problem says that Carol found 4 times as many pennies as George. Who found more, George or Carol?
- S: Carol found more than George. → She found 4 times as many.
- T: How can we draw that?
- S: Draw a strip for Carol that is 4 times longer than George's strip. → We need to make 4 units for Carol's bar. → Each unit is worth 9. → We need to draw 4 nines for Carol.
- T: Draw that.
- T/S: (Draw.)
- T: The last part of the problem asks how many pennies did Carol find. How can we show that on our strip diagrams?
- S: Put a question mark under Carol's strip.
- T/S: (Draw.)
- T: Use the information in your drawing to solve the problem. Compare your answer with your partner's.
- S: (Draw and compare.)
- T: How many pennies did Carol find? How do you know?
- S: Carol found 36 pennies. → 4 times as much as 9 is 36. → $9 \times 4 = 36$.



Problem 2: Bruce rode his bike on Monday and Friday. On Friday, he rode 6 times as far as he did on Monday. If he rode 30 miles on Friday, how far did he ride on Monday?

Note: Use Read, Draw, Write to model and solve this word problem. In this problem it's necessary to read to the second sentence in order to draw something. It is usually helpful to ask students which strip will be longer before they draw anything.

T: (Display the problem.) Let's read the problem together.

T/S: (Read.)

T: Let's read the problem sentence by sentence and see if we can draw something. Bruce rode his bike on Monday and Friday. What can we draw?

S: We can draw two strips and label them Monday and Friday. We won't know how long to draw either one of them. → I'm not sure how long to make the strips.

T: Let's read the next sentence. On Friday, he rode 6 times as far as he did on Monday. Is there something we can draw now?

S: We can draw 2 strips; one for Monday and one for Friday.

T: Which strip is longer?

S: The strip for Friday is longer. → Bruce rode his bike 6 times as much on Friday as he did on Monday.

T: Let's draw the longer strip.

T/S: (Draw.)

T: What do we need to do to the longer strip?

S: We need to show 6 units.

T: How long should our Monday strip be?

S: It should be just one unit.

T: What does the next sentence tell us?

S: That Bruce rode 30 miles on Friday.

T: Where can we show that on our strip diagram?

S: We can show that the total for Friday was 30.

T/S: (Draw.)

T: Where does the question mark go?

S: It goes on the Monday strip.

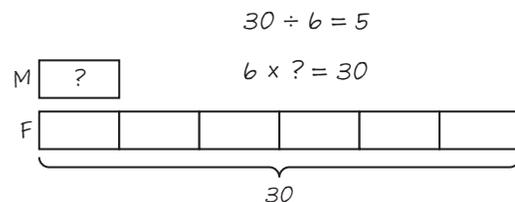
T/S: (Draw.)

T: Use your drawing to solve the problem. Compare your work with your partner's. What's the answer to the problem?

S: Bruce rode his bike for 5 miles on Monday.

T: How did you get that answer?

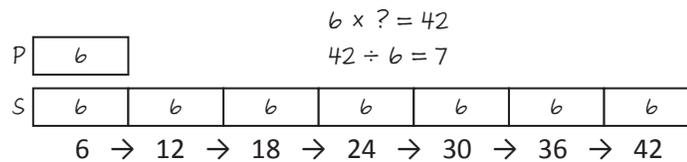
S: I divided 30 by 6 and got 5. → From the drawing, I saw 6 times as much as something would make 30. → 6 times something is 30. I knew that was 5.



Bruce rode his bike 5 miles on Monday.

Problem 3: Peter made a collage using 6 different colorful leaves. His sister, Sue, used 42 colorful leaves in her collage. How many times more leaves did Sue use than Peter?

Note: Use Read, Draw, Write to model and solve this word problem. Students who fluently know the multiples of 6 may know to draw 7 units of 6 to make 42. Many Grade 3 students will keep adding on units of 6 to Sue's strip until 42 is reached. They will then count how many sixes they needed to make 42. Notice that the units are labeled with their value: 6. The multiples (or the running totals) are written below each unit of 6. Encourage students to tell that 7 times as much as 6 is 42. Also note that today's fluency, Group Counting, practices skip counting by 6 in anticipation of this problem.



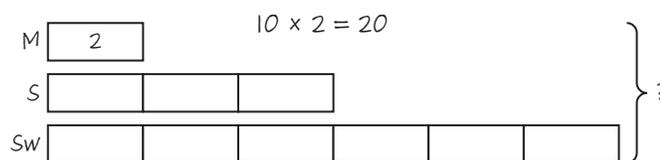
Sue used 7 times as many leaves as Peter.

Problem 4: A pair of mittens takes 2 skeins of yarn to knit. A shawl takes 3 times as much yarn as the mittens, and a sweater takes 6 times as much yarn as the mittens. If Grandma wants to knit all three garments, how many skeins of yarn does she need?

Note: Use Read, Draw, Write to model and solve this word problem. Having three quantities to compare adds to the complexity of this problem, although it is similar in structure to Problem 1. This problem can be solved in multiple steps by finding the quantity of yarn needed for each garment, and then adding to find the total. The final addition step could be pictured in a number bond or second strip diagram. The solution path shown here makes this a one-step problem. There are 10 units in all, and each unit has a value of 2. To find the total, multiply 10 times 2 or add 10 twos.

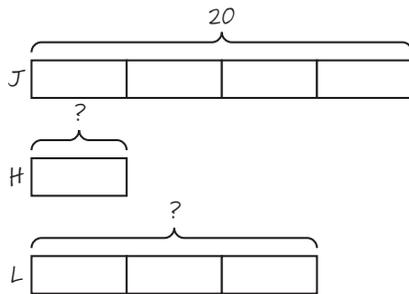
In this strip diagram, not all the units are labeled as 2. It's understood that each unit is the same, so labeling each becomes redundant. Depending on students' level of understanding, teachers may decide to label each unit with a 2 or not.

This scenario could generate many other questions. *How many more skeins of yarn does Grandma need to make a sweater than she needs to make a shawl?* *How many fewer skeins of yarn does Grandma need to make a pair of pair of mittens than a sweater?* After drawing the strip diagram, students could generate their own questions.



Grandma needs 20 skeins of yarn for all three garments.

Problem 5: Three friends joined a club that made birdhouses. Jake made 20 birdhouses. That was 4 times as many as the number of birdhouses that Henry made. Leah made 3 times as many birdhouses as Henry. How many birdhouses did Henry make? How many birdhouses did Leah make?



$$20 = 4 \text{ units}$$

$$1 \text{ unit} = 20 \div 4 = 5$$

Henry made 5 birdhouses.

$$3 \text{ units} = 3 \times 5 = 15$$

Leah made 15 birdhouses.

Note: Use Read, Draw, Write to model and solve this word problem. This problem is similar to Problem 2, because the larger quantity is given. The unknowns are the smaller amounts. Unlike Problem 2, this problem compares 3 amounts instead of 2. This problem can be differentiated by eliminating the information on Leah. Notice the solution path written for this problem. Each equation, in order, would guide the dialogue between teachers and students as they solve.

Problem Set (10 minutes)

Students should do their personal best to complete the Problem Set within the allotted 10 minutes. For some classes, it may be appropriate to modify the assignment by specifying which problems they work on first. Some problems do not specify a method for solving. Students should solve these problems using the RDW approach used for Application Problems.

Student Debrief (10 minutes)

Lesson Objective: Solve multiplicative comparison word problems.

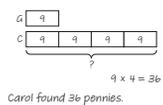
The Student Debrief is intended to invite reflection and active processing of the total lesson experience.

Invite students to review their solutions for the Problem Set. They should check work by comparing answers with a partner. Look for misconceptions or misunderstandings that can be addressed in the Student Debrief. Guide students in a conversation to debrief the Problem Set and process the lesson.

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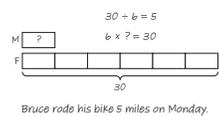
Solve. Show your work by drawing strip diagrams.

1. Two friends like to look for lost pennies on the sidewalk. In one day, George found 9 pennies and Carol found 4 times as many pennies as George. How many pennies did Carol find?



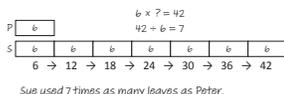
Carol found 36 pennies.

2. Bruce rode his bike on Monday and Friday. On Friday, he rode 6 times as far as he did on Monday. If he rode 30 miles on Friday, how far did he ride on Monday?



Bruce rode his bike 5 miles on Monday.

3. Peter made a collage using 6 different colorful leaves. His sister, Sue, used 42 colorful leaves in her collage. How many times more leaves did Sue use than Peter?



Sue used 7 times as many leaves as Peter.

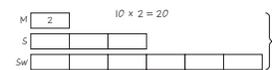
Any combination of the questions below may be used to lead the discussion.

- Compare Problem 1 and Problem 2. How are they alike? How are they different?
- How did knowing the multiples of 6 help you in solving Problem 3? (How did not knowing the multiples of 6 hinder you in Problem 3?)
- Create another question using the information from Problem 4. Switch with a partner.
- What would be an efficient way to find the total number of birdhouses made in Problem 5?
- How do strip diagrams help solve these problems?

Exit Ticket (3 minutes)

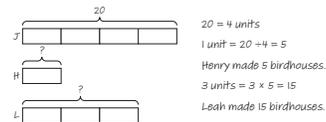
After the Student Debrief, instruct students to complete the Exit Ticket. A review of their work will help with assessing students' understanding of the concepts that were presented in today's lesson and planning more effectively for future lessons. The questions may be read aloud to the students.

4. A pair of mittens takes 2 skeins of yarn to knit. A shawl takes 3 times as much yarn as the mittens, and a sweater takes 6 times as much yarn as the mittens. If Grandma wants to knit all three garments, how many skeins of yarn does she need?



Grandma needs 20 skeins of yarn for all three garments.

5. Three friends joined a club that made birdhouses. Jake made 20 birdhouses. That was 4 times as many the number of birdhouses that Henry made. Leah made 3 times as many birdhouses as Henry. How many birdhouses did Henry make? How many birdhouses did Leah make?



4. A pair of mittens takes 2 skeins of yarn to knit. A shawl takes 3 times as much yarn as the mittens, and a sweater takes 6 times as much yarn as the mittens. If Grandma wants to knit all three garments, how many skeins of yarn does she need?
5. Three friends joined a club that made birdhouses. Jake made 20 birdhouses. That was 4 times as many the number of birdhouses that Henry made. Leah made 3 times as many birdhouses as Henry. How many birdhouses did Henry make? How many birdhouses did Leah make?

4. Mr. Peterson will need 2 gallons of paint to paint his kitchen. He will need 2 times that amount to paint his bedroom, and 5 times that amount to paint his livingroom. If he wants to paint all three rooms, how many gallons of paint does Mr. Peterson need?
5. The average life span of a parrott is 80 years. That is 8 times as much as the average life span of a green frog. The average life span of a horse is 4 times that of a green frog. What is the average life span of a green frog? What is the average life span of a horse?