

Carowinds Comparisons

In this lesson, students explore how to draw models such as tape diagrams in order to solve multiplicative comparison problems.

NC Mathematics Standard:

Operations and Algebraic Thinking

NC.4.OA.1 Interpret a multiplication equation as a comparison. Multiply or divide to solve word problems involving multiplicative comparisons using models and equations with a symbol for the unknown number. Distinguish multiplicative comparison from additive comparison.

Standards for Mathematical Practice:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Student Outcomes:

- I can apply my knowledge of multiplication to solve multiplicative comparison problems.
- I can use multiplication or division to solve word problems involving multiplicative comparisons.
- I can use models and equations to solve multiplicative comparison problems.

Math Language:

- multiply
- divide
- compare
- times as much/times as many
- equation
- tape diagram

Materials:

- Carowinds commercial link - <https://www.youtube.com/watch?v=WdICVc7xeZM>
- Student Carowinds Planning Sheet (1 per student)
- extension for independent work/exit ticket sort (as needed)

Advance Preparation:

- Collect pictures of Carowinds to show students
- Pull up Carowinds commercial video ahead of time
- Make copies of the student Carowinds planning sheet
- If using the exit ticket sort, prepare sort ahead of time

Launch:

1. Introduce Problem (10 minutes)

Ask students if they have been to Carowinds or any type of theme park. Have students describe their favorite parts of the theme park. Students may mention different rides, shows, or food items. Then show the short video clip of a [Carowinds commercial](#) showing the Fury325 ride.

Present the problem to students:

You and your best friend have been working all year long to save up your money to go to Carowinds and ride the Fury325. This roller coaster can zoom 95 miles per hour and 325 feet in the air! It sounds like the best roller coaster EVER! If your parents permit you to go on this Carowinds trip, you must have it planned! First, you need to figure out how much money you will need for your trip. Then, you can plan out your day. When you start looking into the cost, you realize you will need to pay for parking, tickets, and you will need money for food.

- *Part 1: Parking costs \$16 a day. Tickets cost three times as much as parking. How much will your ticket cost? Solve this by drawing a tape diagram or model.*
- *Part 2: Your ticket costs t dollars. This is two times as much money as you want to plan to bring to spend on your lunch and snacks throughout the day. How much money are you planning on bringing for lunch and snacks? Solve this by drawing a tape diagram or model.*
- *Extension: How much money will you need for you and your best friend to go to Carowinds if you ride together?*

Explore:

2. Solving For Trip Cost (20 - 30 minutes)

Allow students time to work individually and then with partners in order to solve the given problem about how much money they will need for their trip. As students work, observe students to see how they are solving the task and how they are representing each task with their models.

Encourage students to connect their models with an equation. If students jump to an equation, have students go back and figure out a way to show the equation with a model. Remind students that today's task is about the models they can use to represent their thinking – not about just finding an answer. Encourage students to share their strategies with one another and describe how they are answering each question. Make sure students are also paying attention to the written portion of this lesson.

Observe:

- How are students organizing and representing their thinking between their numbers?
- How do students make sense of the numbers and the relationship between what is being compared?
- After students have drawn a model, ask students to make connections to an equation.
- How do students determine which operation to use when connecting to an equation?
- What vocabulary are students using as they solve the task?
- How are students accounting for the reasonableness of their answers?

Carefully select students to present to the class. Look for students who modeled the

problem correctly showing the relationship between each of the costs of the trip. Also look for students that have found a way to model the problem and show the relationship using an appropriate equation. It also may be helpful to pick out students that have good explanations about the reasonableness of their answer. Look for these students as well to help guide students to understanding that a multiplicative comparison doesn't always just mean using multiplication (i.e. the cost for lunch and snacks).

Discuss:

3. Discussion of Solutions (15 – 25 minutes)

Bring the group back together and have selected students share their strategies for solving the task. Relate the task to the commutative property and discuss how multiplication combinations can be reversed and still equal the same product. It is important that students take away that the phrase “times as many/times as much” can mean that students need to multiply or divide.

Possible points to address and questions to ask:

- Discuss and relate various modeling strategies (tape diagrams, tables, and/or manipulatives) to show the cost of the ticket and the cost of lunch.
- What equations can be used to find the cost of the ticket and the cost of lunch?
- How do these equations relate to the models shown?
- How are the models different for the tickets versus the cost of lunch?
- How do we know that these costs are reasonable?
- If the cost is not reasonable, what should that signal to us?

Evaluation of Student Understanding:

Informal Evaluation:

- Observe and monitor students as they solve the problem. How are they making sense of the problem? Are they using only multiplication? Do they understand the difference in wording between the two comparisons?

Formal Evaluation/Exit Ticket:

- At the end of the lesson, give students the Carowinds Comparison sort. You can have students sort all of the problems or pick which problems you would like students to sort. Students must draw a model to prove why they are going to sort each question in a different way.

Meeting the Needs of the Range of Learners:

Interventions:

- Suggest that students use manipulatives or grid paper to help them make models to solve the task and visualize the comparison between the costs.
- Help students to think through the reasonableness of their answer. A common misconception in this task may be that students find \$84 as the amount of money needed for lunch. This would be due to the fact that they think that times as much means to only use multiplication. Ask students if this sounds like a reasonable amount of money for lunch and snacks? Then redirect them back to the wording of the question.

Extensions:

- Ask students to create their own comparison problem.
- Extension problem: How much money will you need for you and your best friend to go to Carowinds if you ride together?

- Use exit ticket Carowinds Comparison Sort as independent classwork or as an exit ticket.

Possible Misconceptions/Suggestions:

Possible Misconceptions	Suggestions
<ul style="list-style-type: none"> • Students do not understand how to draw a model. • Students do not understand the different meanings “times as many” or “times as much” can have. • Students do not make connections between models and the equations. 	<ul style="list-style-type: none"> • Get out manipulatives and have students use those to help make a hands on model. • Help students to focus on wording of the problem – what is the problem saying is the larger amount? • Discuss as a class, asking questions to encourage students to be able to draw models correctly. • Help students to see the connections using their basic multiplication facts (or connect to using repeated addition or repeated subtraction).

Special Notes:

- You can use the Carowinds Comparison Sort as an independent activity or shorten to use as an exit ticket.

Possible Solutions:

- **Part 1:** Parking costs \$16 a day. Tickets cost three times as much as parking. How much will your ticket cost? Solve this by drawing a tape diagram or model.

Parking - \$16 Tickets - ?

Parking:

16

Tickets:

16	16	16
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Ticket Equation: $16 \times 3 = \$48$ is the cost of a ticket (Students can add 16 three times and get the same answer. The problem says times as much – help student connect this to multiplication.)

Write two sentences explaining if the cost of your ticket is reasonable.

Students should have some explanation about why the cost of the ticket is reasonable at \$48. Usually the cost of a ticket to a theme park is expensive. Students can explain why this does make sense and why they think this is reasonable. Student answers will vary.

- **Part 2:** Your ticket cost, t dollars (**students should use the answer from part one**). This is two times as much money as you want to plan to bring to spend on your lunch and snacks throughout the day. How much money are you planning on bringing for lunch and snacks? Solve this by drawing a tape diagram or model.

Tickets: t (Answer from Part 1: \$48) Lunch Cost - ?

Tickets: \$48

24	24
----	----

 = 48 divided by two is 24

Lunch:

?

 = 24

Ticket Equation: $\$48 \div 2 = \24 is the cost of lunch (Students need to recognize that even though it says *times as much*, the ticket cost (not the lunch) is two times as much. The ticket cost is two times more than the cost of the lunch.)

Write two sentences explaining if the amount of money you plan to spend on lunch and snacks is reasonable.

Students should have some explanation about how the amount of money they have planned for lunch, \$24, is a reasonable amount, because this should give more than enough money for lunch, with money left over for a snack or drink at some point later. This question should help to highlight student errors. If students get \$84 as the cost of lunch, they should realize this is not a reasonable amount and that they have made an error in their calculations. Student answers will vary.

- **Extension:** How much money will you need for you and your best friend to go to Carowinds?

Parking: \$16 – You only have to buy one parking pass since you can ride together.
Tickets: \$96 – You need a ticket for you and your best friend - $\$48 + \$48 = \$96$.
Lunch: \$48 – You both need money for lunch and snacks - $\$24 + \$24 = \$48$.
Total Cost: $\$16 + \$96 + \$48 = \160

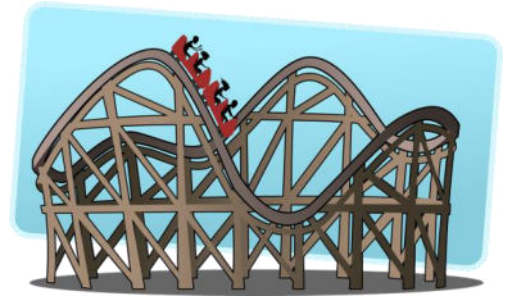
Write at least two sentences explaining if you think this is a reasonable amount of money to spend for a day full of fun and for a chance to ride the Fury325.

Student answers will vary, but students should be able to explain how they feel about the value of this trip.

Carowinds Student Planning Sheet

You and your best friend have been working all year long to save up your money to go to Carowinds and ride the Fury325. This roller coaster can zoom 95 miles per hour and 325 feet in the air. It sounds like the best roller coaster EVER!

If your parents are going to permit this Carowinds trip, you must have it planned! First you need to figure out how much money you will need for your trip. Then you can plan out your day. When you start looking into the cost, you realize you will need to pay for parking, tickets, and you will need money for food.



Part 1: Parking costs \$16 a day. Tickets cost three times as much as parking. How much will your ticket cost? Solve this by drawing a tape diagram or model.

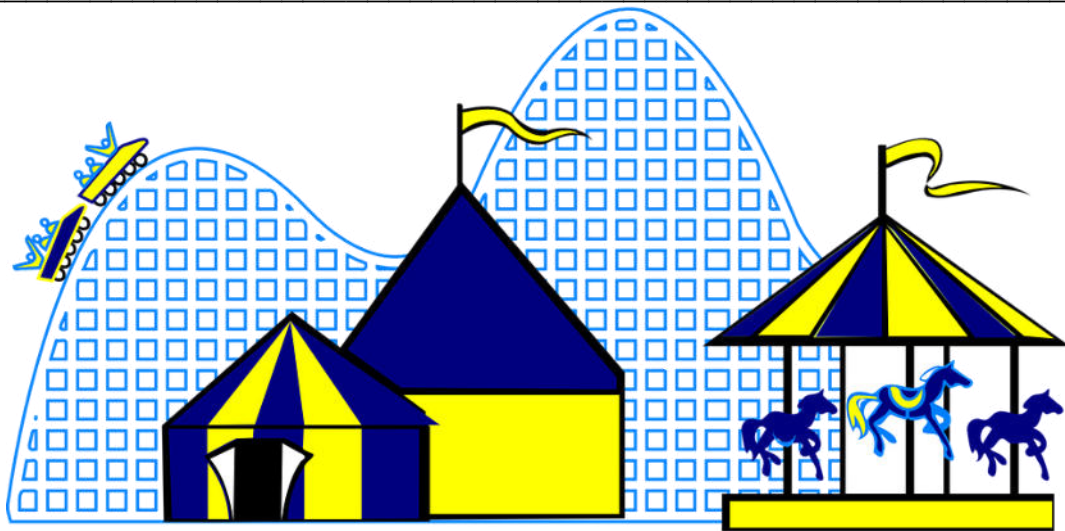
Write two sentences explaining if the cost of your ticket is reasonable.

Part 2: Your ticket cost, t dollars. This is two times as much money as you want to plan to bring to spend on your lunch and snacks throughout the day. How much money are you planning on bringing for lunch and snacks? Solve this by drawing a tape diagram or model.

Write two sentences explaining if the amount of money you plan to spend on lunch and snacks is reasonable.

Extension: How much money will you need for you and your best friend to go to Carowinds if you ride together? Label the cost of each item and show how you found the total.

Write at least two sentences explaining if you think this is a reasonable amount of money to spend for a day full of fun and for a chance to ride the Fury325.



Carowinds Comparison Sort

The following task cards can be used to follow the Carowinds Comparison lesson. Students can use the category headers to sort their multiplicative comparison problems into multiplicative comparisons using multiplication or division. Be sure students have a way to justify why they sorted each problem.

Multiplicative Comparisons Using Division

It is lunch time and you and your best friend head over to Chick-Fil-A to get some food. You both order some chicken nuggets and french fries. You eat twelve chicken nuggets. This is three times as many chicken nuggets as your best friend ate. How many chicken nuggets was your best friend able to eat?

Prove your answer by drawing a tape diagram or model.



Multiplicative Comparisons Using Multiplication

You and your best friend decide to buy souvenirs from the Carowinds gift shop! You pick out a tie-dye shirt and a pair of sunglasses that altogether costs four times as much as your friend's souvenirs.

Your shirt and sunglasses cost \$32 altogether. How much did your friend spend in the gift shop?

Prove your answer by drawing a tape diagram or model.



You have extra money left over for snacks. You decide to buy a frozen Coke slushy. There are three different sizes. The small is 8 ounces. The medium is half the size of the large. The large size slushy is three times as large as a small slushy. How many ounces is a large size slushy?

Prove your answer by drawing a tape diagram or model.



Before the park closes, you decide to ride the Fury325 one more time. While standing in line you start talking to the kid in front of you. You tell him you've ridden twelve rides today. He says that is three times as many rides as him. How many rides has your new friend been able to ride? Prove your answer by drawing a tape diagram or model.



You stood in line to ride the Fury325 seven times as long as you did for the Scrambler. You stood in line for the Fury325 for sixty-three minutes. How long did you stand in line to ride the Scrambler? Prove your answer by drawing a tape diagram or model.



In the first hour the park is open, they sell only eleven fast passes. When the Park Manager looks at their totals at the end of the day he realizes that in total they sold ten times as many as they had in the first hour. How many fast passes did they sell today? Prove your answer by drawing a tape diagram or model.



At the end of the day you start to think about everything you've been able to ride. Some of the lines were long but you were able to ride twelve rides, including the Fury325, during your day at the park. Your best friend says they were able to ride four times as many rides as you. How many rides was your best friend able to ride? Prove your answer by drawing a tape diagram or model.



It is lunch time and you and your best friend head over to Chick-Fil-A to get some food. You both order some chicken nuggets and french fries. You eat twelve french fries. Your best friend ate three times as many french fries. How many french fries was your best friend able to eat? Prove your answer by drawing a tape diagram or model.



While at Carowinds, you and your best friend both run into people that you know. You run into 9 times as many people as your best friend. You ran into twenty seven different people throughout the day. How many people did your best friend run into? Prove your answer by drawing a tape diagram or model.



Your mom packed you and your best friend a bag of Goldfish to share as a snack on the way home. You are starving and before you realize it you've eaten five times as many as your best friend. You ate 45 Goldfish before you even got on the highway. How many did your best friend eat? Prove your answer by drawing a tape diagram or model.



Carowinds Comparison Sort ANSWER KEY

Multiplicative Comparisons Using Multiplication

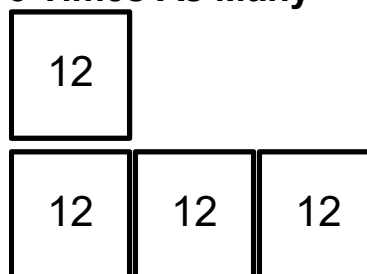
It is lunch time and you and your best friend head over to Chick-Fil-A to get some food. You both order some chicken nuggets and french fries. You eat twelve french fries. Your best friend ate three times as many french fries. How many french fries was your best friend able to eat? Prove your answer by drawing a tape diagram or model.



SAMPLE PROOF

Your French Fries – 12
Best Friend – 3 Times As Many

You:



Best Friend:

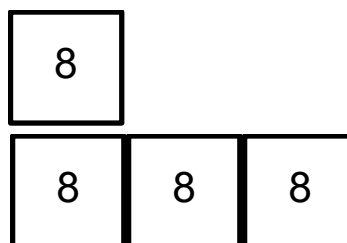
You have extra money left over for snacks. You decide to buy a frozen Coke slushy. There are three different sizes. The small is 8 ounces. The medium is half the size of the large. The large size slushy is three times as large as a small slushy. How many ounces is a large size slushy? Prove your answer by drawing a tape diagram or model.



SAMPLE PROOF

Small – 8 Ounces
Large – 3 Times as Large as Small

Small:



Large:

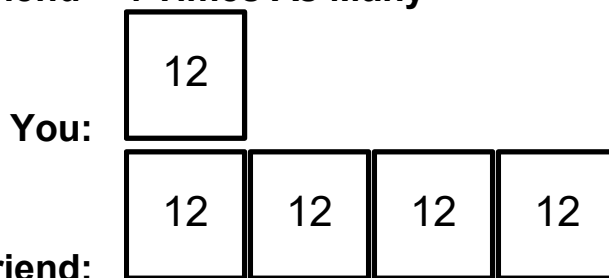
Multiplicative Comparisons Using Multiplication

At the end of the day you start to think about everything you've been able to ride. Some of the lines were long but you were able to ride twelve rides, including the Fury325, during your day at the park. Your best friend says they were able to ride four times as many rides as you. How many rides was your best friend able to ride? Prove your answer by drawing a tape diagram or model.



SAMPLE PROOF

Your Rides – 12
Best Friend – 4 Times As Many

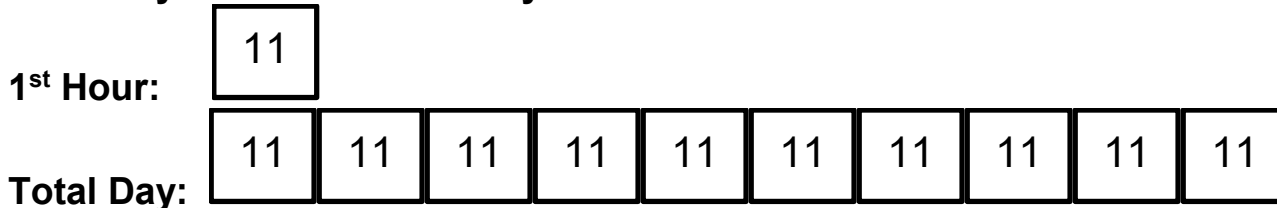


In the first hour the park is open, they sell only eleven fast passes. When the Park Manager looks at their totals at the end of the day, he realizes that in total they sold ten times as many as they had in the first hour. How many fast passes did they sell today? Prove your answer by drawing a tape diagram or model.



SAMPLE PROOF

1st Hour – 11
Total Day – 10 Times As Many



Multiplicative Comparisons Using Division

It is lunch time and you and your best friend head over to Chick-Fil-A to get some food. You both order some chicken nuggets and french fries. You eat twelve chicken nuggets. This is three times as many chicken nuggets as your best friend ate. How many chicken nuggets was your best friend able to eat?

Prove your answer by drawing a tape diagram or model.



SAMPLE PROOF

Your Nuggets – 12 (3 Times As Many)
Best Friend –?

You: $12 =$

?	?	?
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 $12 \div 3$

Best Friend:

?

 = 4 nuggets

You and your best friend decide to get souvenirs from the Carowinds' gift shop! You pick out a tie-dye shirt and pair of sunglasses that altogether costs four times as much as your friend's souvenirs. Your shirt and sunglasses cost \$32 altogether. How much did your friend spend in the gift shop? Prove your answer by drawing a tape diagram or model.



SAMPLE PROOF

Your Souvenirs – \$32 (4 Times As Many)
Your Best Friend –?

You: $32 =$

?	?	?	?
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 $\$32 \div 4$

Your Best Friend:

?

 = \$8.00

Before the park closes, you decide to ride the Fury325 one more time. While standing in line, you start talking to the kid in front of you. You tell him you've ridden twelve rides today. He says that is three times as many rides as him. How many rides has your new friend been able to ride? Prove your answer by drawing a tape diagram or model.



SAMPLE PROOF

Your Rides – 12 (3 Times As Many)
Your New Friend –?

You: $12 =$

?	?	?
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 $12 \div 3$

Your New Friend:

?

 = 4 Rides

Multiplicative Comparisons Using Division

You stood in line to ride the Fury325 seven times as long as you did for the Scrambler. You stood in line for the Fury325 for sixty three minutes. How long did you stand in line to ride the Scrambler? Prove your answer by drawing a tape diagram or model



SAMPLE PROOF

Fury325 – 63 minutes (7 Times As Long)
Scrambler –?

Fury325: $63 =$

?	?	?	?	?	?
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 $63 \div 7$

Scrambler:

?

 = 9 minutes

While at Carowinds, you and your best friend both run into people that you know. You run into 9 times as many people as your best friend. You ran into twenty seven different people throughout the day. How many people did your best friend run into? Prove your answer by drawing a tape diagram or model.



SAMPLE PROOF

You – 27 (9 Times As Many)
Your Best Friend –?

You: $27 =$

?	?	?	?	?	?	?	?	?
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 $27 \div 3$

Best Friend:

?

 = 9 people

Multiplicative Comparisons Using Division

Your mom packed you and your best friend a bag of Goldfish to share as a snack on the way home. You are starving and before you realize it, you've eaten five times as many as your best friend. You ate 45 Goldfish before you even got on the highway. How many did your best friend eat? Prove your answer by drawing a tape diagram or model.



SAMPLE PROOF

You – 45 (5 Times As Many)

Your Best Friend – ?

You: 45 =

?	?	?	?	?
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 45 ÷ 5

Best Friend:

?

 = 9 goldfish