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# Unit 6, Lesson 1: Relationships between Quantities

Let's try to solve some new kinds of problems.

## 1.1: Pricing Theater Popcorn

A movie theater sells popcorn in bags of different sizes. The table shows the volume of popcorn and the price of the bag.

Complete one column of the table with prices where popcorn is priced at a constant rate. That is, the amount of popcorn is proportional to the price of the bag. Then complete the other column with realistic example prices where the amount of popcorn and price of the bag are not in proportion.

volume of popcorn (ounces)	price of bag, proportional (\$)	price of bag, not proportional (\$)
10	6	6
20		
35		
48		

## 1.2: Entrance Fees

A state park charges an entrance fee based on the number of people in a vehicle. A car containing 2 people is charged \$14, a car containing 4 people is charged \$20, and a van containing 8 people is charged \$32.

1. How much do you think a bus containing 30 people would be charged?
2. If a bus is charged \$122, how many people do you think it contains?
3. What rule do you think the state park uses to decide the entrance fee for a vehicle?

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### 1.3: Making Toast

A toaster has 4 slots for bread. Once the toaster is warmed up, it takes 35 seconds to make 4 slices of toast, 70 seconds to make 8 slices, and 105 seconds to make 10 slices.

1. How long do you think it will take to make 20 slices?
2. If someone makes as many slices of toast as possible in 4 minutes and 40 seconds, how many slices do think they can make?

#### Are you ready for more?

What is the smallest number that has a remainder of 1, 2, and 3 when divided by 2, 3, and 4, respectively? Are there more numbers that have this property?

### Lesson 1 Summary

In much of our previous work that involved relationships between two quantities, we were often able to describe amounts as being so much more than another, or so many times as much as another. We wrote equations like  $x + 3 = 8$  and  $4x = 20$  and solved for unknown amounts.

In this unit, we will see situations where relationships between amounts involve more operations. For example, a pizza store might charge the amounts shown in the table for delivering pies.

number of pies	total cost in dollars
1	13
2	23
3	33
5	53

We can see that each additional pie adds \$10 to the total cost, and that each total includes a \$3 additional cost, maybe representing a delivery fee. In this situation, 8 pies will cost  $8 \cdot 10 + 3$  and a total cost of \$63 means 6 pies were ordered.

In this unit, we will see many situations like this one, and will learn how to use diagrams and equations to answer questions about unknown amounts.

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## Unit 6, Lesson 1: Relationships between Quantities

1. Lin and Tyler are drawing circles. Tyler's circle has twice the diameter of Lin's circle. Tyler thinks that his circle will have twice the area of Lin's circle as well. Do you agree with Tyler?

(from Unit 3, Lesson 7)

2. Jada and Priya are trying to solve the equation  $\frac{2}{3} + x = 4$ .

- Jada says, "I think we should multiply each side by  $\frac{3}{2}$  because that is the reciprocal of  $\frac{2}{3}$ ."
- Priya says, "I think we should add  $-\frac{2}{3}$  to each side because that is the opposite of  $\frac{2}{3}$ ."

a. Which person's strategy should they use? Why?

b. Write an equation that can be solved using the other person's strategy.

(from Unit 5, Lesson 15)

3. What are the missing operations?

a.  $48 ? (-8) = (-6)$

b.  $(-40) ? 8 = (-5)$

c.  $12 ? (-2) = 14$

d.  $18 ? (-12) = 6$

e.  $18 ? (-20) = -2$

f.  $22 ? (-0.5) = -11$

(from Unit 5, Lesson 13)

4. In football, the team that has the ball has four chances to gain at least ten yards. If they don't gain at

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least ten yards, the other team gets the ball. Positive numbers represent a gain and negative numbers represent a loss. Select **all** of the sequences of four plays that result in the team getting to keep the ball.

- A. 8, -3, 4, 21
- B. 30, -7, -8, -12
- C. 2, 16, -5, -3

(from Unit 5, Lesson 14)

5. A sandwich store charges \$20 to have 3 turkey subs delivered and \$26 to have 4 delivered.
- a. Is the relationship between number of turkey subs delivered and amount charged proportional? Explain how you know.
  - b. How much does the store charge for 1 additional turkey sub?
  - c. Describe a rule for determining how much the store charges based on the number of turkey subs delivered.
6. Which question cannot be answered by the solution to the equation  $3x = 27$ ?
- A. Elena read three times as many pages as Noah. She read 27 pages. How many pages did Noah read?
  - B. Lin has 27 stickers. She gives 3 stickers to each of her friends. With how many friends did Lin share her stickers?
  - C. Diego paid \$27 to have 3 pizzas delivered and \$35 to have 4 pizzas delivered. What is the price of one pizza?
  - D. The coach splits a team of 27 students into 3 groups to practice skills. How many students are in each group?