NAME   DATE   PERIOD
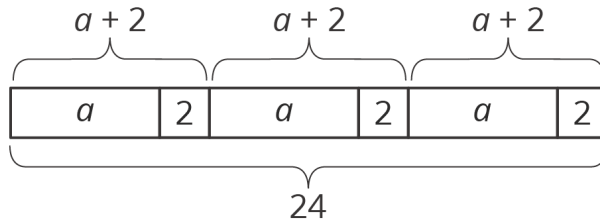
Unit 6, Lesson 11: Using Equations to Solve Problems

Let's use tape diagrams, equations, and reasoning to solve problems.

## 11.1: Remember Tape Diagrams

1. Write a story that could be represented by this tape diagram.

2. Write an equation that could be represented by this tape diagram.

11.2: At the Fair

1. Tyler is making invitations to the fair. He has already made some of the invitations, and he wants to finish the rest of them within a week. He is trying to spread out the remaining work, to make the same number of invitations each day. Tyler draws a diagram to represent the situation.
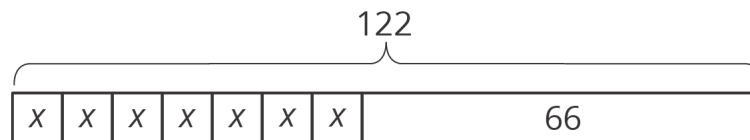
   a. Explain how each part of the situation is represented in Tyler's diagram:

   How many total invitations Tyler is trying to make.

   How many invitations he has made already.

   How many days he has to finish the invitations.

b. How many invitations should Tyler make each day to finish his goal within a week? Explain or show your reasoning.

c. Use Tyler's diagram to write an equation that represents the situation. Explain how each part of the situation is represented in your equation.

d. Show how to solve your equation.

2. Noah and his sister are making prize bags for a game at the fair. Noah is putting 7 pencil erasers in each bag. His sister is putting in some number of stickers. After filling 3 of the bags, they have used a total of 57 items.

$$57$$

| x | 7 | x | 7 | x | 7 |
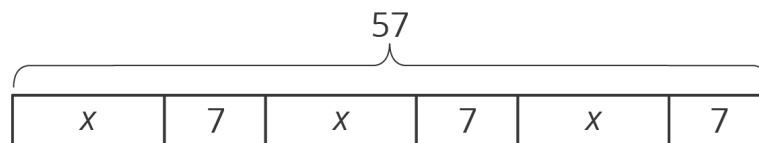
a. Explain how the diagram represents the situation.

b. Noah writes the equation $3(x + 7) = 57$ to represent the situation. Do you agree with him? Explain your reasoning.

c. How many stickers is Noah's sister putting in each prize bag? Explain or show your reasoning.

3. A family of 6 is going to the fair. They have a coupon for $1.50 off each ticket. If they pay $46.50 for all their tickets, how much does a ticket cost without the coupon? Explain or show your reasoning. If you get stuck, consider drawing a diagram or writing an equation.

11.3: Running Around

Priya, Han, and Elena, are members of the running club at school.

1. Priya was busy studying this week and ran 7 fewer miles than last week. She ran 9 times as far as Elena ran this week. Elena only had time to run 4 miles this week.

a. How many miles did Priya run last week?

b. Elena wrote the equation $\frac{1}{9}(x - 7) = 4$ to describe the situation. She solved the equation by multiplying each side by 9 and then adding 7 to each side. How does her solution compare to the way you found Priya's miles?

2. One day last week, 6 teachers joined $\frac{5}{7}$ of the members of the running club in an after-school run. Priya counted a total of 31 people running that day. How many members does the running club have?

3. Priya and Han plan a fundraiser for the running club. They begin with a balance of -80 because of expenses. In the first hour of the fundraiser they collect equal donations from 9 parents, which brings their balance to -44. How much did each parent give?

4. The running club uses the money they raised to pay for a trip to a canyon. At one point during a run in the canyon, the students are at an elevation of 128 feet. After descending at a rate of 50 feet per minute, they reach an elevation of -472 feet. How long did the descent take?

Are you ready for more?

A musician performed at three local fairs. At the first he doubled his money and spent $30. At the second he tripled his money and spent $54. At the third, he quadrupled his money and spent $72. In the end he had $48 left. How much did he have before performing at the fairs?

Lesson 11 Summary

Many problems can be solved by writing and solving an equation. Here is an example:

Clare ran 4 miles on Monday. Then for the next six days, she ran the same distance each day. She ran a total of 22 miles during the week. How many miles did she run on each of the 6 days?

One way to solve the problem is to represent the situation with an equation, $4 + 6x = 22$, where x represents the distance, in miles, she ran on each of the 6 days. Solving the equation gives the solution to this problem.

$$4 + 6x = 22$$
$$6x = 18$$
$$x = 3$$

Unit 6, Lesson 11: Using Equations to Solve Problems

1. Find the value of each variable.

 a. $a \cdot 3 = -30$
 b. $-9 \cdot b = 45$
 c. $-89 \cdot 12 = c$
 d. $d \cdot 88 = -88{,}000$

(from Unit 5, Lesson 9)

2. Match each equation to its solution and to the story it describes.

Equations: Solutions:

 A. $5x - 7 = 3$ 1. -4

 B. $7 = 3(5 + x)$ 2. $\frac{-8}{3}$

 C. $3x + 5 = -7$ 3. 2

 D. $\frac{1}{3}(x + 7) = 5$ 4. 8

Stories:

 ◦ The temperature is -7. Since midnight the temperature tripled and then rose 5 degrees. What was temperature at midnight?

 ◦ Jada has 7 pink roses and some white roses. She gives all of them away: 5 roses to each of her 3 favorite teachers. How many white roses did she give away?

 ◦ A musical instrument company reduced the time it takes for a worker to build a guitar. Before the reduction it took 5 hours. Now in 7 hours they can build 3 guitars. By how much did they reduce the time it takes to build each guitar?

 ◦ A club puts its members into 5 groups for an activity. After 7 students have to leave early, there are only 3 students left to finish the activity. How many students were in each group?

3. The baby giraffe weighed 132 pounds at birth. He gained weight at a steady rate for the first 7 months until his weight reached 538 pounds. How much did he gain each month?
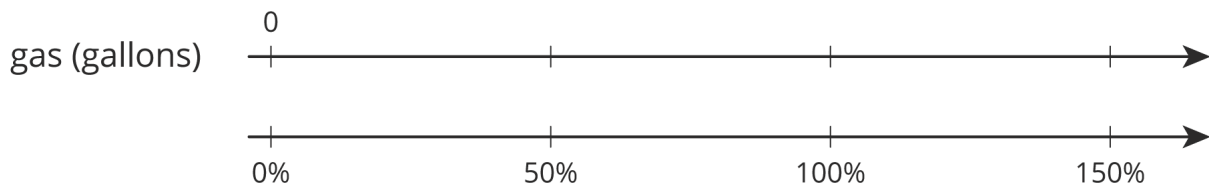
4. Six teams are out on the field playing soccer. The teams all have the same number of players. The head coach asks for 2 players from each team to come help him move some equipment. Now there are 78 players on the field. Write and solve an equation whose solution is the number of players on each team.

5. A small town had a population of 960 people last year. The population grew to 1200 people this year. By what percentage did the population grow?

number of people

| 0 | 120 | 240 | 360 | 480 | 600 | 720 | 840 | 960 | 1080 | 1200 |

0%
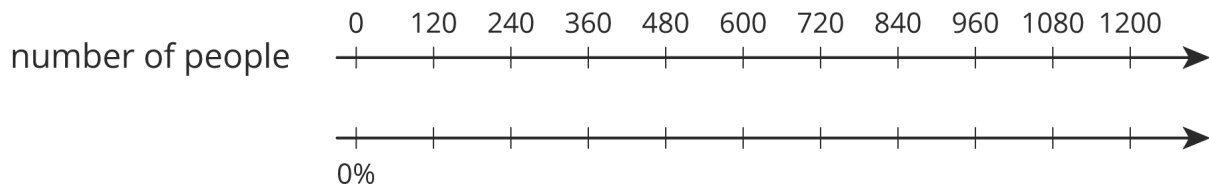
(from Unit 4, Lesson 7)

6. The gas tank of a truck holds 30 gallons. The gas tank of a passenger car holds 50% less. How many gallons does it hold?

gas (gallons)

0

0%   50%   100%   150%

(from Unit 4, Lesson 7)