



NAME

DATE

PERIOD

Unit 5, Lesson 14

## Solving Problems with Rational Numbers

Let's use all four operations with signed numbers to solve problems.

### 14.1 Which One Doesn't Belong: Equations

Which equation doesn't belong?

$$\frac{1}{2}x = -50$$

$$x + 90 = -100$$

$$-60t = 30$$

$$-0.01 = -0.001x$$



NAME \_\_\_\_\_

DATE \_\_\_\_\_

PERIOD \_\_\_\_\_

## 14.2 Draining and Filling a Tank

A tank of water is being drained. Due to a problem, the sensor does not start working until some time into the draining process. The sensor starts its recording at time zero when there are 770 liters in the tank.

- Given that the drain empties the tank at a constant rate of 14 liters per minute, complete the table:

<b>time after sensor starts (minutes)</b>	<b>change in water (liters)</b>	<b>expression</b>	<b>water in the tank (liters)</b>
0	0	$770 + (0)(-14)$	770
1	-14	$770 + (1)(-14)$	756
5	-70		
10			



NAME \_\_\_\_\_

DATE \_\_\_\_\_

PERIOD \_\_\_\_\_

2. Later, someone wants to use the data to find out how long the tank had been draining before the sensor started. Complete this table:

time after sensor starts (minutes)	change in water (liters)	expression	water in the tank (liters)
1	-14	$770 + (1)(-14)$	756
0	0	$770 + (0)(-14)$	770
-1	14	$770 + (-1)(-14)$	784
-2	28		
-3			
-4			
-5			

3. If the sensor started working 15 minutes into the tank draining, how much was in the tank to begin with?

## 14.3 Buying and Selling Power

A utility company charges \$0.12 per kilowatt-hour for energy a customer uses. They give a credit of \$0.025 for every kilowatt-hour of electricity a customer with a solar panel generates that they don't use themselves.

A customer has a charge of \$82.04 and a credit of -\$4.10 on this month's bill.



NAME

DATE

PERIOD

1. What is the amount due this month?
2. How many kilowatt-hours did they use?
3. How many kilowatt-hours did they generate that they didn't use themselves?

### Are you ready for more?

1. Find the value of the expression without a calculator.  
 $(2)(-30) + (-3)(-20) + (-6)(-10) - (2)(3)(10)$
2. Write an expression that uses addition, subtraction, multiplication, and division and only negative numbers that has the same value.

---

## Lesson 14 Summary

We can apply the rules for arithmetic with rational numbers to solve problems

In general:

$$a - b = a + (-b)$$

If  $a - b = x$ , then  $x + b = a$ . We can add  $-b$  to both sides of this second equation to get that  $x = a + (-b)$

Remember: the *distance* between two numbers is independent of the order, but the *difference* depends on the order.

And when multiplying or dividing:



---

NAME

DATE

PERIOD

- The sign of a positive number multiplied or divided by a negative number is always negative.
- The sign of a negative number multiplied or divided by a positive number is always negative.
- The sign of a negative number multiplied or divided by a negative number is always positive.