

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?

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

$$x + 90 = -100$$

$$-60t = 30$$

$$-0.01 = -0.001x$$

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:

time after sensor starts (minutes)	change in water (liters)	expression	water in the tank (liters)
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?

NAME

DATE

PERIOD

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:

- 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.

NAME _____

DATE _____

PERIOD _____

Unit 5, Lesson 14: Solving Problems with Rational Numbers

1. A furniture store pays a wholesale price for a mattress. Then, the store marks up the retail price to 150% of the wholesale price. Later, they put the mattress on sale for 50% off of the retail price. A customer just bought the mattress on sale and paid \$1,200.

a. What was the retail price of the mattress, before the discount?

b. What was the wholesale price, before the markup?

(from Unit 4, Lesson 11)

2. The table shows transactions in a checking account.

January	February	March	April
-38.50	250.00	-14.00	-86.80
126.30	-135.20	99.90	-570.00
429.40	35.50	-82.70	100.00
-265.00	-62.30	-1.50	-280.10

a. Find the total of the transactions for each month.

b. Find the mean total for the four months.

3. A bank charges a service fee of \$7.50 per month for a checking account.

A bank account has \$85.00. If no money is deposited or withdrawn except the service charge, how many months until the account balance is negative?

NAME

DATE

PERIOD

4. A large aquarium of water is being filled with a hose. Due to a problem, the sensor does not start working until some time into the filling process. The sensor starts its recording at the time zero minutes. The sensor initially detects the tank has 225 liters of water in it.
- The hose fills the aquarium at a constant rate of 15 liters per minute. What will the sensor read at the time 5 minutes?
 - Later, someone wants to use the data to find the amount of water at times before the sensor started. What should the sensor have read at the time -7 minutes?
5. a. A restaurant bill is \$21. You leave a 15% tip. How much do you pay including the tip?
- b. Which of the following represents the amount a customer pays including the tip of 15% if the bill was b dollars? Select **all** that apply.
- $0.15b$
 - $15b$
 - $b + 0.15b$
 - $1.15b$
 - $1.015b$
 - $b + \frac{15}{100}b$
 - $b + 0.15$

(from Unit 4, Lesson 10)