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Unit 5, Lesson 11: Dividing Rational Numbers

Let's divide signed numbers.

11.1: Tell Me Your Sign

Consider the equation: $-27x = -35$

Without computing:

1. Is the solution to this equation positive or negative?
2. Are either of these two numbers solutions to the equation?

$$\frac{35}{27}$$

$$-\frac{35}{27}$$

11.2: Multiplication and Division

1. Find the missing values in the equations
 - a. $-3 \cdot 4 = ?$
 - b. $-3 \cdot ? = 12$
 - c. $3 \cdot ? = 12$
 - d. $? \cdot -4 = 12$
 - e. $? \cdot 4 = -12$
2. Rewrite the unknown factor problems as division problems.

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3. Complete the sentences. Be prepared to explain your reasoning.

- a. The sign of a positive number divided by a positive number is always:
- b. The sign of a positive number divided by a negative number is always:
- c. The sign of a negative number divided by a positive number is always:
- d. The sign of a negative number divided by a negative number is always:

4. Han and Clare walk towards each other at a constant rate, meet up, and then continue past each other in opposite directions. We will call the position where they meet up 0 feet and the time when they meet up 0 seconds.

- Han's velocity is 4 feet per second.
- Clare's velocity is -5 feet per second.

a. Where is each person 10 seconds before they meet up?

b. When is each person at the position -10 feet from the meeting place?

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Are you ready for more?

It is possible to make a new number system using *only* the numbers 0, 1, 2, and 3. We will write the symbols for multiplying in this system like this: $1 \otimes 2 = 2$. The table shows some of the products.

\otimes	0	1	2	3
0	0	0	0	0
1		1	2	3
2			0	2
3				

1. In this system, $1 \otimes 3 = 3$ and $2 \otimes 3 = 2$. How can you see that in the table?
2. What do you think $2 \otimes 1$ is?
3. What about $3 \otimes 3$?
4. What do you think the solution to $3 \otimes n = 2$ is?
5. What about $2 \otimes n = 3$?

11.3: Drilling Down

A water well drilling rig has dug to a height of -60 feet after one full day of continuous use.

1. Assuming the rig drilled at a constant rate, what was the height of the drill after 15 hours?
2. If the rig has been running constantly and is currently at a height of -147.5 feet, for how long has the rig been running?

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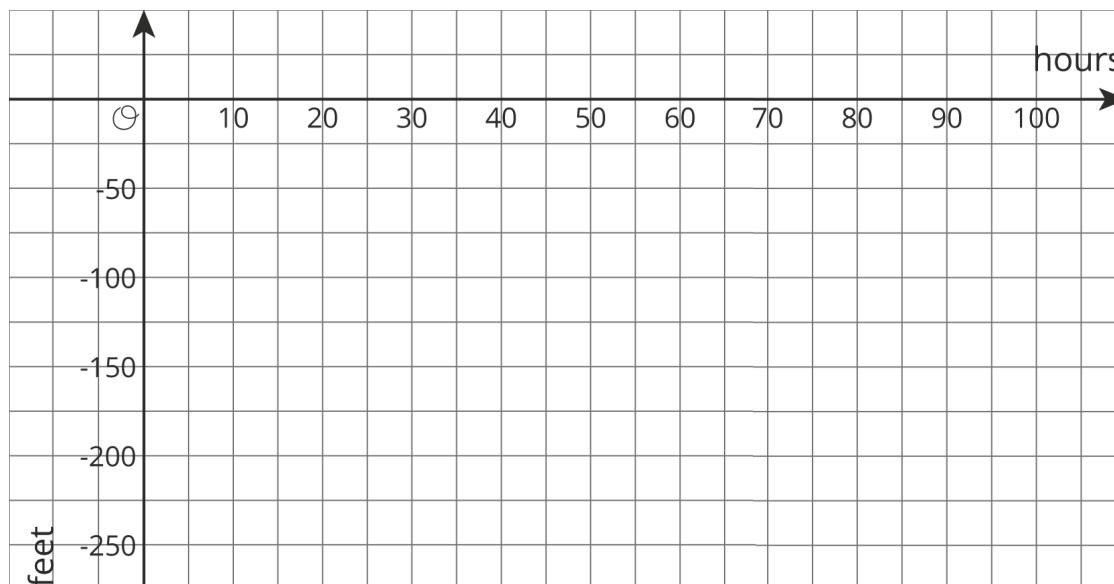


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3. Use the coordinate grid to show the drill's progress.



4. At this rate, how many hours will it take until the drill reaches -250 feet?

Lesson 11 Summary

Any division problem is actually a multiplication problem:

- $6 \div 2 = 3$ because $2 \cdot 3 = 6$
- $6 \div -2 = -3$ because $-2 \cdot -3 = 6$
- $-6 \div 2 = -3$ because $2 \cdot -3 = -6$
- $-6 \div -2 = 3$ because $-2 \cdot 3 = -6$

Because we know how to multiply signed numbers, that means we know how to divide them.

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

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1. Find the quotients:

$24 \div -6$

$-15 \div 0.3$

$-4 \div -20$

2. Find the quotients.

a. $\frac{2}{5} \div \frac{3}{4}$

b. $\frac{9}{4} \div \frac{-3}{4}$

c. $\frac{-5}{7} \div \frac{-1}{3}$

d. $\frac{-5}{3} \div \frac{1}{6}$

3. Is the solution positive or negative?

a. $2 \cdot x = 6$

b. $-2 \cdot x = 6.1$

c. $2.9 \cdot x = -6.04$

d. $-2.473 \cdot x = -6.859$

4. Find the solution mentally.

a. $3 \cdot (-4) = a$

b. $b \cdot (-3) = -12$

c. $(-12) \cdot c = 12$

d. $d \cdot 24 = -12$

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5. In order to make a specific shade of green paint, a painter mixes $1\frac{1}{2}$ quarts of blue paint, 2 cups of green paint, and $\frac{1}{2}$ gallon of white paint. How much of each color is needed to make 100 cups of this shade of green paint?

(from Unit 4, Lesson 2)

6. Here is a list of the highest and lowest elevation on each continent.

	highest point (m)	lowest point (m)
Europe	4,810	-28
Asia	8,848	-427
Africa	5,895	-155
Australia	4,884	-15
North America	6,198	-86
South America	6,960	-105
Antarctica	4,892	-50

a. Which continent has the largest difference in elevation? The smallest?

b. Make a display (dot plot, box plot, or histogram) of the data set and explain why you chose that type of display to represent this data set.

(from Unit 5, Lesson 3)