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Unit 5, Lesson 13: Expressions with Rational Numbers

Let's develop our signed number sense.

13.1: True or False: Rational Numbers

Decide if each statement is true or false. Be prepared to explain your reasoning.

1. $(-38.76)(-15.6)$ is negative

2. $10,000 - 99,999 < 0$

3. $\left(\frac{3}{4}\right)\left(-\frac{4}{3}\right) = 0$

4. $(30)(-80) - 50 = 50 - (30)(-80)$

13.2: Card Sort: The Same But Different

Your teacher will give you a set of cards. Group them into pairs of expressions that have the same value.

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13.3: Near and Far From Zero

a	b	$-a$	$-4b$	$-a + b$	$a \div -b$	a^2	b^3
$-\frac{1}{2}$	6						
$\frac{1}{2}$	-6						
-6	$-\frac{1}{2}$						

1. For each set of values for a and b, evaluate the given expressions and record your answers in the table.

2. When $a = -\frac{1}{2}$ and $b = 6$, which expression:

   has the largest value? has the smallest value? is the closest to zero?

3. When $a = \frac{1}{2}$ and $b = -6$, which expression:

   has the largest value? has the smallest value? is the closest to zero?

4. When $a = -6$ and $b = -\frac{1}{2}$, which expression:

   has the largest value? has the smallest value? is the closest to zero?

Are you ready for more?

Are there any values could you use for a and b that would make all of these expressions have the same value? Explain your reasoning.

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13.4: Seagulls and Sharks Again

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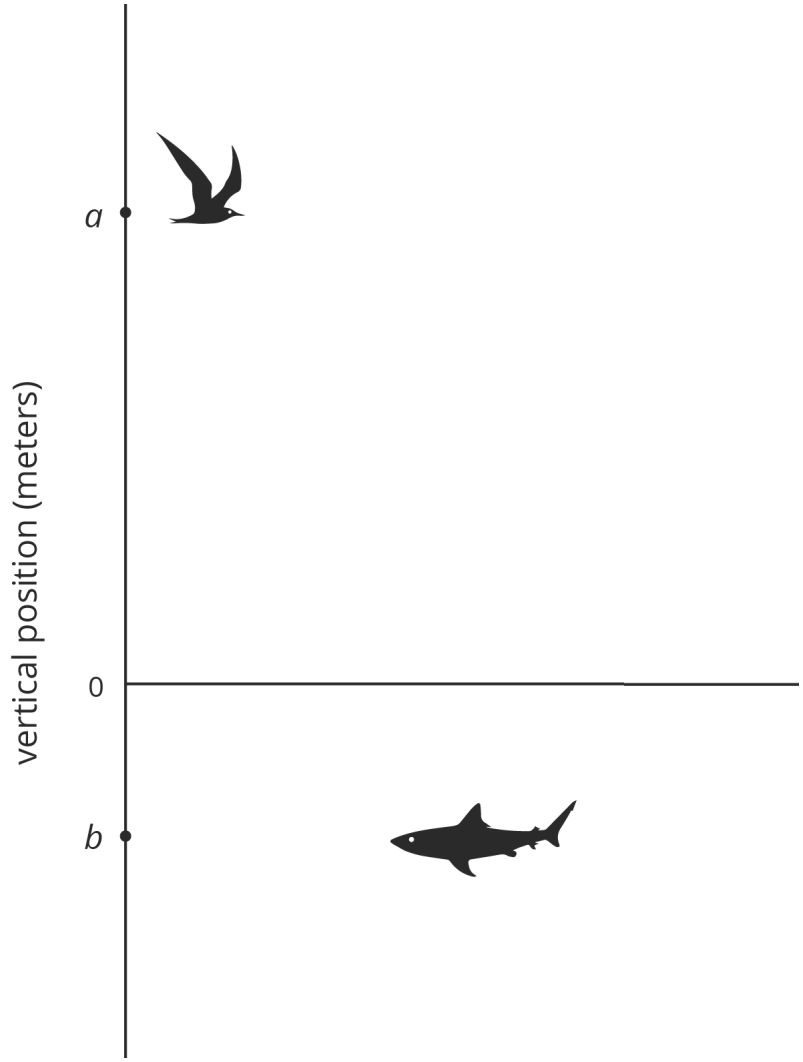

A seagull has a vertical position a, and a shark has a vertical position b. Draw and label a point on the vertical axis to show the vertical position of each new animal.

1. A dragonfly at d, where $d = -b$

2. A jellyfish at j, where $j = 2b$

3. An eagle at e, where $e = \frac{1}{4}a$.

4. A clownfish at c, where $c = -\frac{a}{2}$

5. A vulture at v, where $v = a + b$

6. A goose at g, where $g = a - b$

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Lesson 13 Summary

We can represent sums, differences, products, and quotients of rational numbers, and combinations of these, with numerical and algebraic expressions.

Sums:	Differences:	Products:	Quotients:
$\frac{1}{2} + (-9)$	$\frac{1}{2} - (-9)$	$(\frac{1}{2})(-9)$	$(\frac{1}{2}) \div (-9)$
$-8.5 + x$	$-8.5 - x$	$-8.5x$	$\frac{-8.5}{x}$

We can write the product of two numbers in different ways.

- By putting a little dot between the factors, like this: $-8.5 \cdot x$.
- By putting the factors next to each other without any symbol between them at all, like this: $-8.5x$.

We can write the quotient of two numbers in different ways as well.

- By writing the division symbol between the numbers, like this: $-8.5 \div x$.
- By writing a fraction bar between the numbers like this: $\frac{-8.5}{x}$.

When we have an algebraic expression like $\frac{-8.5}{x}$ and are given a value for the variable, we can find the value of the expression. For example, if x is 2, then the value of the expression is -4.25, because $-8.5 \div 2 = -4.25$.

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1. a. A coffee maker's directions say to use 2 tablespoons of ground coffee for every 6 ounces of water. How much coffee should you use for 33 ounces of water?

   b. A runner is running a 10 km race. It takes her 17.5 minutes to reach the 2.5 km mark. At that rate, how long will it take her to run the whole race?

(from Unit 4, Lesson 3)

2. The price of an ice cream cone is $3.25, but it costs $3.51 with tax. What is the sales tax rate?

(from Unit 4, Lesson 10)

3. Find the value of each expression.

   a. $-22 + 5$

   b. $-22 - (-5)$

   c. $(-22)(-5)$

   d. $(-22) \div 5$

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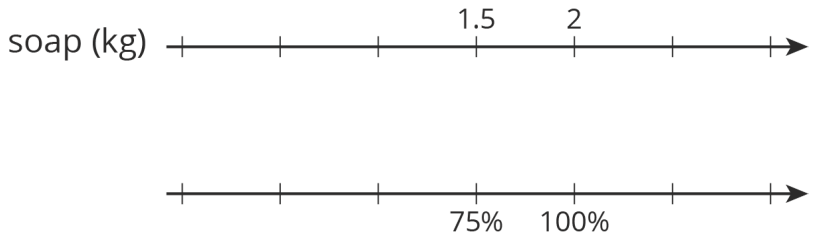
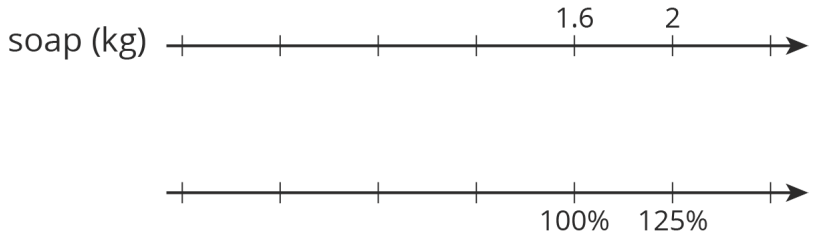
4. Two students are both working on the same problem: A box of laundry soap has 25% more soap in its new box. The new box holds 2 kg. How much soap did the old box hold?

   - Here is how Jada set up her double number line.



   - Here is how Lin set up her double number line.



   Do you agree with either of them? Explain or show your reasoning.

   (from Unit 4, Lesson 7)

5. The value of x is $\frac{-1}{4}$. Order these expressions from least to greatest:

   x $1 - x$ $x - 1$ $-1 \div x$

6. Here are four expressions that have the value $\frac{-1}{2}$:

   $\frac{-1}{4} + (\frac{-1}{4})$ $\frac{1}{2} - 1$ $-2 \cdot \frac{1}{4}$ $-1 \div 2$

   Write five expressions: a sum, a difference, a product, a quotient, and one that involves at least two operations that have the value $\frac{-3}{4}$.