Expressions with Rational Numbers

Let's develop our signed number sense.

18.1 Math Talk: Rational Numbers

Decide mentally whether each statement is true.

- $(-38.76)(-15.6)$ is negative.
- $10{,}000 - 99{,}999 < 0$
- $\left(\frac{3}{4}\right)\left(-\frac{4}{3}\right) = 0$
- $(30)(-80) - 50 = 50 - (30)(-80)$

18.2 Card Sort: The Same but Different

Your teacher will give you a set of cards. Take turns with your partner to match two expressions with the same value.

1. For each match that you find, explain to your partner how you know it's a match.
2. For each match that your partner finds, listen carefully to their explanation. If you disagree, discuss your thinking and work to reach an agreement.

18.3 Near and Far from Zero

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

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

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

   has the largest value? has the smallest value? is the closest to 0?

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

   has the largest value? has the smallest value? is the closest to 0?

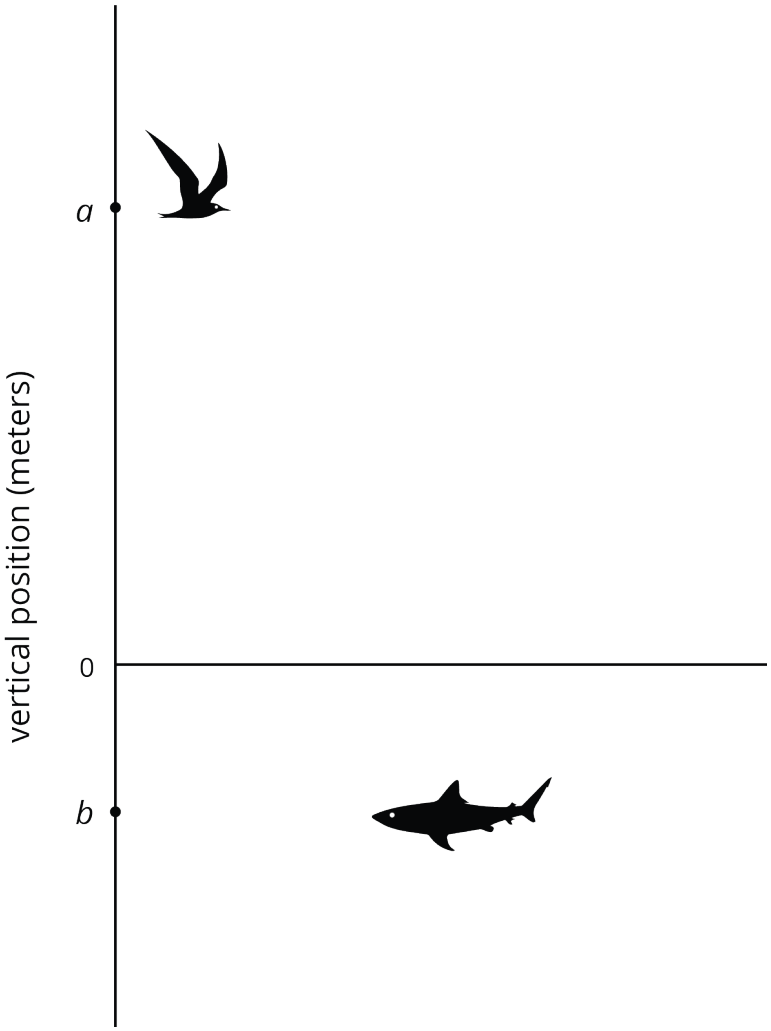
4. When $a = -6$ and $b = -\frac{1}{2}$, which expression:

   has the largest value? has the smallest value? is the closest to 0?

Are you ready for more?

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

18.4 Seagulls and Sharks Again



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 $g = a - b$

Lesson 18 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:
$\frac{1}{2} + \text{-}9$	$\frac{1}{2} - \text{-}9$	$(\frac{1}{2})(\text{-}9)$	$\frac{1}{2} \div \text{-}9$
$\text{-}8.5 + x$	$\text{-}8.5 - x$	$\text{-}8.5x$	$\frac{\text{-}8.5}{x}$

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

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

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

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

When we have an algebraic expression like $\frac{\text{-}8.5}{x}$ 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 $\text{-}8.5 \div 2 = \text{-}4.25$.