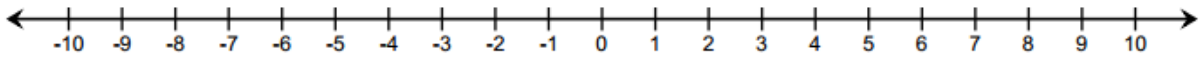
Lesson 4: Efficiently Adding Integers and Other Rational Numbers

Classwork

Example 1: Rule for Adding Integers with Same Signs

a. Represent the sum of $3 + 5$ using arrows on the number line.



i. How long is the arrow that represents $\mathbf{3}$?

ii. What direction does it point?

iii. How long is the arrow that represents $\mathbf{5}$?

iv. What direction does it point?

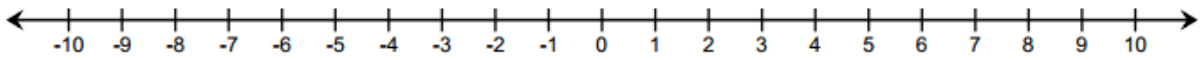
v. What is the sum?

vi. If you were to represent the sum using an arrow, how long would the arrow be and what direction would it point?

vii. What is the relationship between the arrow representing the number on the number line and the absolute value of the number?

viii. Do you think that adding two positive numbers will always give you a greater positive number? Why?

b. Represent the sum of $-3 + (-5)$ using arrows that represent -3 and -5 on the number line. From part (a), use the same questions to elicit feedback. In the Integer Game, I would combine -3 and -5 to give me -8.



i. How long is the arrow that represents $-\mathbf{3}$?

ii. What direction does it point?

iii. How long is the arrow that represents $-\mathbf{5}$?

iv. What direction does it point?

v. What is the sum?

vi. If you were to represent the sum using an arrow, how long would the arrow be and what direction would it point?

vii. Do you think that adding two negative numbers will always give you a smaller negative number? Why?

c. What do both examples have in common?

RULE: Add integers with the same sign by adding the absolute values and using the common sign.

Exercise 2

a. Decide whether the sum will be positive or negative without actually calculating the sum.

i. $-4 + (-2)$ _____

ii. $5 + 9$ _____

iii. $-6 + (-3)$ _____

iv. $-1 + (-11)$ _____

v. $3 + 5 + 7$ _____

vi. $-20 + (-15)$ _____

b. Find the following sums:

i. $15 + 7$

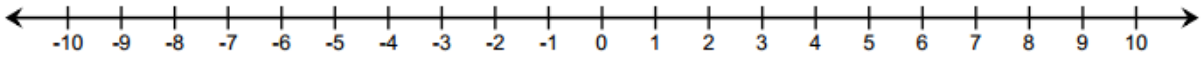
ii. $-4 + (-16)$

iii. $-18 + (-64)$

iv. $-205 + (-123)$

Example 2: Rule for Adding Opposite Signs

a. Represent the $5 + (-3)$ using arrows on the number line.



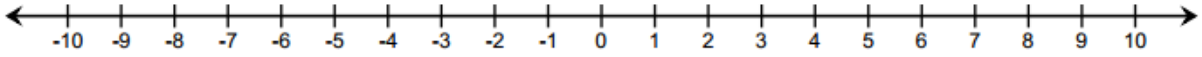
i. How long is the arrow that represents -3?

ii. What direction does it point?

iii. Which arrow is longer?

iv. What is the sum? If you were to represent the sum using an arrow, how long would the arrow be and what direction would it point?

b. Represent the $4 + (-7)$ using arrows on the number line.



i. In the two examples above, what is the relationship between length of the arrow representing the sum and the lengths of the arrows representing the p-value and q-value?

ii. What is the relationship between the direction of the arrow representing the sum and the direction of arrows representing the p-value and q-value?

iii. Write a rule that will give the length and direction of the arrow representing the sum of two values that have opposite signs.

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RULE: Add integers with opposite signs by subtracting the absolute values and using the sign of the integer with the greater absolute value.

Exercise 3

1. Circle the integer with the greater absolute value. Decide whether the sum will be positive or negative without actually calculating the sum.
   a. $-1 + 2$

   b. $5 + (-9)$

   c. $-6 + 3$

   d. $-11 + 1$

2. Find the following sums:
   a. $-10 + 7$

   b. $8 + (-16)$

   c. $-12 + (65)$

   d. $105 + (-126)$

Example 3: Applying Integer Addition Rules to Rational Numbers

Find the sum of $6 + \left(-2\frac{1}{4}\right)$. The addition of rational numbers follows the same rules of addition for integers.

a. Find the absolute values of the numbers.

b. Subtract the absolute values.

c. The answer will take the sign of the number that has the greater absolute value.

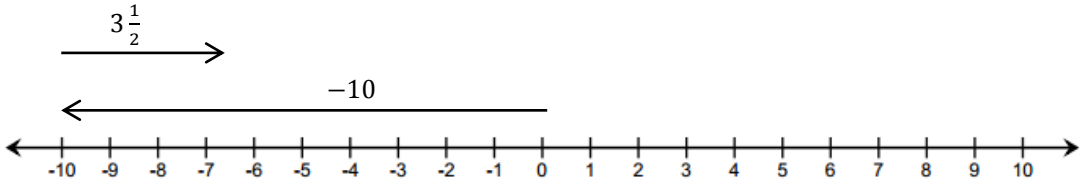
Exercise 4

Solve the following problems. Show your work.

a. Find the sum of $-18 + 7$.

b. If the temperature outside was 73 degrees at 5:00 p.m., but it fell 19 degrees by 10:00 p.m., what is the temperature at 10:00 p.m.? Write an equation and solve.

c. Write an addition sentence, and find the sum using the diagram below.



Lesson Summary

- Add integers with the same sign by adding the absolute values and using the common sign.
- Steps to adding numbers with opposite signs:
  1. Find the absolute values of the numbers.
  2. Subtract the absolute values.
  3. The answer will take the sign of the integer that has the greater absolute value.
- To add rational numbers, follow the same rules used to add integers.

Problem Set

1. Find the sums. Show your work to justify your answer.
   a. $4 + 17$
   b. $-6 + (-12)$
   c. $2.2 + (-3.7)$
   d. $-3 + (-5) + 8$
   e. $\frac{1}{3} + (-2\frac{1}{4})$

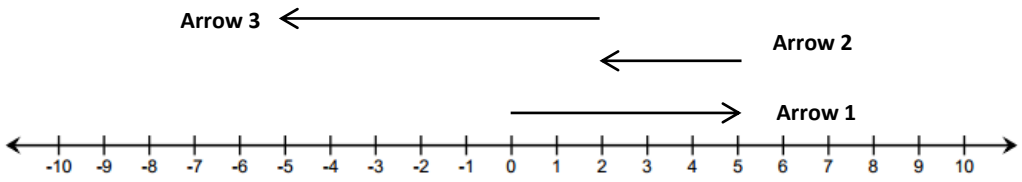
2. Which of these story problems describes the sum $19 + (-12)$? Check all that apply. Show your work to justify your answer.

   _____ Jared's dad paid him $\$19$ for raking the leaves from the yard on Wednesday. Jared spent $\$12$ at the movie theater on Friday. How much money does Jared have left?

   _____ Jared owed his brother $\$19$ for raking the leaves while Jared was sick. Jared's dad gave him $\$12$ for doing his chores for the week. How much money does Jared have now?

   _____ Jared's grandmother gave him $\$19$ for his birthday. He bought $\$8$ worth of candy and spent another $\$4$ on a new comic book. How much money does Jared have left over?

3. Use the diagram below to complete each part.



a. Label each arrow with the number the arrow represents.

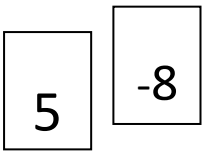
b. How long is each arrow? What direction does each arrow point?

Arrow	Length	Direction
1		
2		
3		

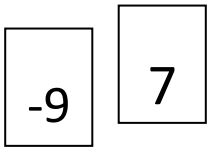
c. Write an equation that represents the sum of the numbers. Find the sum.

4. Jennifer and Katie were playing the Integer Game in class. Their hands are represented below.

Jennifer's Hand



Katie's Hand



a. What is the value of each of their hands? Show your work to support your answer.

b. If Jennifer drew two more cards, is it possible for the value of her hand not to change? Explain why or why not.

c. If Katie wanted to win the game by getting a score of 0, what card would she need? Explain.

d. If Jennifer drew a -1 and a -2, what would be her new score? Show your work to support your answer.