Lesson 8: Applying the Properties of Operations to Add and Subtract Rational Numbers

Classwork

Example 1: The Opposite of a Sum is the Sum of its Opposites

Explain the meaning of “The opposite of a sum is the sum of its opposites.”Use a specific math example.

|  |  |  |  |
| --- | --- | --- | --- |
| **Rational Number** | **Rational Number** | **Sum** | **Opposite of the Sum** |
|   |  |  |  |

|  |  |  |
| --- | --- | --- |
| **Opposite Rational Number** | **Opposite Rational Number** | **Sum** |
|   |  |  |

Exercise 1

Represent the following expression with a single rational number. Simplify by using each operation to get one single rational number.

$$-2\frac{2}{5} + 3\frac{1}{4} - \frac{3}{5}$$

Example 2: A Mixed Number Is a Sum

Use the number line model shown below to explain and write the opposite of $2\frac{2}{5}$ as a sum of two rational numbers.

$$\frac{2}{5}$$

$$2$$

$$2+\frac{2}{5}$$

$$2$$

$$0$$

$$-2$$

$$-\left(2+\frac{2}{5}\right)$$

The opposite of a sum (top single arrow pointing left) and the sum of the opposites correspond to the same point on the number line.

Exercise 2

Rewrite each mixed number as the sum of two signed numbers.

|  |  |  |
| --- | --- | --- |
| * 1. $-9\frac{5}{8}$
 | * 1. $-2\frac{1}{2}$
 | * 1. $8\frac{11}{12}$
 |

Exercise 3

Represent each sum as a mixed number.

|  |  |  |
| --- | --- | --- |
| * 1. $-1+\left(-\frac{5}{12}\right)$
 | * 1. $30+\frac{1}{8}$
 | * 1. $-17+\left(-\frac{1}{9}\right)$
 |

Exercise 4

Mr. Mitchell lost $10$ pounds over the summer by jogging each week. By winter, he had gained $5\frac{1}{8}$ pounds. Represent this situation with an expression involving signed numbers. What is the overall change in Mr. Mitchell’s weight?

Exercise 5

Jamal is completing a math problem and represents the expression $-5\frac{5}{7}+8-3\frac{2}{7}$with a single rational number as shown in the steps below. Justify each of Jamal’s steps. Then, show another way to solve the problem.

$$=-5\frac{5}{7}+8+\left(-3\frac{2}{7}\right)$$

$$=-5\frac{5}{7}+\left(-3\frac{2}{7}\right)+8$$

$$=-5+\left(-\frac{5}{7}\right)+\left(-3\right)+\left(-\frac{2}{7}\right)+8$$

$$=-5+\left(-\frac{5}{7}\right)+\left(-\frac{2}{7}\right)+\left(-3\right)+8$$

$$=-5+\left(-1\right)+\left(-3\right)+8$$

$$=-6+\left(-3\right)+8$$

$$=\left(-9\right)+8$$

$$=-1$$