

1-6

Adding and Subtracting Rational Numbers

What You'll Learn

To add and subtract rational numbers

CONTENT STANDARDS

7.NS.1, 7.NS.1.b, 7.NS.1.c,
7.NS.1.d, 7NS.3

Why Learn This?

You can add and subtract rational numbers to find differences in temperatures.

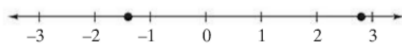
Temperatures in cold climates can change from being above zero to being below zero in a day. One day in 1939, the temperature in Rochester, Minnesota, dropped from 3.3°C to -30°C in less than 24 hours. To find the difference in temperatures, you can find the distance between the two temperatures on a number line.



KEY CONCEPTS Distance on a Number Line

The distance between two numbers on a number line is the absolute value of their difference.

Find the distance between -1.4 and 2.8 .



You can subtract -1.4 from 2.8 or you can subtract 2.8 from -1.4 before you find the absolute value of the difference.

Example $2.8 - (-1.4)$

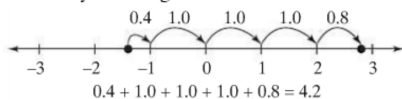
$$2.8 + (1.4) \quad \leftarrow \text{Add the opposite of } -\frac{1}{4}.$$

$$4.2 \quad \leftarrow \text{This is the difference.}$$

$$|4.2| = 4.2 \quad \leftarrow \text{Find the absolute value of the difference.}$$

The distance is 4.2 .

Check by counting the distance on the number line.



Whether you find the absolute value of the difference of the two points or you count on the number line, the distance is 4.2 .

Vocabulary Tip

Distance is a positive quantity. This is why you need to find the absolute value of the difference. The absolute value of all numbers, except zero, is positive.

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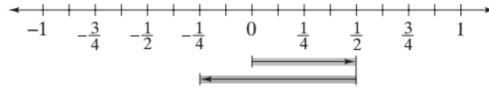
Activity Lab

Modeling Addition and Subtraction of Rational Numbers

You already know how to use a number line to add and subtract integers. You also know how to add positive decimals, fractions, and mixed numbers. You can use these skills to add and subtract any rational numbers on a number line.

ACTIVITY

1. The sum $\frac{1}{2} + \left(-\frac{3}{4}\right)$ can be represented on a horizontal number line diagram.



Copy the number line diagram and label the parts that represent $\frac{1}{2}$ and $\left(-\frac{3}{4}\right)$.

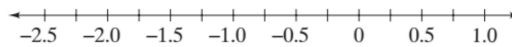
2. What is the sum of these two fractions?
 3. Can you use the same number line diagram to represent $\frac{1}{2} - \frac{3}{4}$?

4. Represent each sum or difference on a horizontal number line. Then find each sum or difference.

a. $-\frac{3}{4} + \frac{5}{8}$ c. $\frac{3}{4} + \left(-\frac{1}{2}\right)$

b. $\frac{1}{4} - \left(-\frac{3}{4}\right)$ d. $-\frac{1}{4} - \frac{5}{8}$

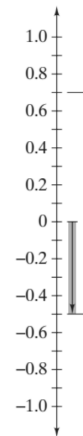
5. Use a horizontal number line like the one below to represent the sum of $-2.25 + 1.75$.



6. The vertical number line at the right represents $-0.5 - (-1.2)$.

- a. How else could you write this expression?
 b. What is the value of this expression?

7. Represent $-1\frac{1}{4} - 5\frac{1}{2}$ on a vertical number line diagram and find the difference.



You know how to add and subtract integers and you know how to add and subtract positive decimals, fractions, and mixed numbers. You can use these skills to add and subtract rational numbers.

EXAMPLE Adding Rational Numbers

1 Same Sign The sum of two positive rational numbers is positive. The sum of two negative rational numbers is negative.

a. $1\frac{3}{4} + 2\frac{1}{8}$ ← Both numbers are positive. The sum is $3\frac{7}{8}$.

b. $-3.5 + (-4.25)$ ← Both numbers are negative. The sum is -7.75 .

Different Sign Find the absolute value of each addend. Subtract the lesser from the greater. The sum has the sign of the addend with the greater absolute value.

c. $1\frac{3}{4} + (-2\frac{1}{8})$ ← $|1\frac{3}{4}| = 1\frac{3}{4}$, $|-2\frac{1}{8}| = 2\frac{1}{8}$

$$2\frac{1}{8} - 1\frac{3}{4} = \frac{3}{8}$$

$$2\frac{1}{8} > 1\frac{3}{4}, \text{ so the sum is } -\frac{3}{8}.$$

d. $-3.5 + 4.25$ ← $|-3.5| = 3.5$, $|4.25| = 4.25$

$$4.25 - 3.5 = 0.75$$

$$4.25 > 3.5, \text{ so the sum is } 0.75.$$

Example

1 Adding Rational Numbers

Same Sign

The sum of two positive rational numbers is

The sum of two negative rational numbers is

$1\frac{1}{2} + 2\frac{1}{4}$ ← Both numbers are , so the sum is

$-2.2 + (-1.5)$ ← Both numbers are , so the sum is

Different Sign

Find the of each addend. Subtract the from the absolute value. The sum has the sign of the addend with the absolute value.

$-2.07 + 6.56$ ← $|-2.07| = \text{}$; $|6.56| = \text{}$

$>$, so the sum is $6.56 - 2.07 = \text{}$.

Quick Check

1. Find each sum.

a. $-6.25 + (-8.55)$

b. $4\frac{3}{5} + (-3\frac{2}{5})$

c. $-5.35 + 1.25$

EXAMPLE**Subtracting Rational Numbers**

2 To subtract a rational number, add its opposite.

a. Find $6\frac{2}{3} - (-3\frac{1}{3})$.

$$6\frac{2}{3} + (3\frac{1}{3}) \quad \leftarrow \text{Add the opposite of } -3\frac{1}{3}.$$

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Vocabulary Tip

The sum of a number and its opposite is zero.

b. Find $-4.68 - (-5.79)$.

$$-4.68 + (5.79) \quad \leftarrow \text{Add the opposite of } -5.79.$$

1.11

Example

2 **Subtracting Rational Numbers** To subtract a rational number, add its opposite.

a. Find $5\frac{5}{6} - (-2\frac{1}{6})$.

$$5\frac{5}{6} + (2\frac{1}{6})$$

So the difference is

\leftarrow Add the opposite of

b. Find $-1.65 - (-4.22)$.

$$-1.65 + 4.22$$

So the difference is

\leftarrow Add the opposite of

Quick Check

2. Find each difference.

a. $-3\frac{2}{5} - (-2\frac{4}{5})$

b. $4.35 - (-8.27)$

c. $-13.45 - 12.25$

You can subtract rational numbers to find temperature differences.

EXAMPLE Application: Temperature

- 3 The temperature was 3.5°C at noon and -2.7°C at 6:00 P.M. Find the change in the temperatures.

$$3.5 - (-2.7) \leftarrow \text{Subtract to find the difference.}$$

$$3.5 + 2.7 \leftarrow \text{Add the opposite of } -2.7.$$

6.2

The change in the temperatures is 6.2°C .

Example

- 3 Application: Temperature The temperature was -5.5°F at 2:00 A.M. and -8.0°F at 4:00 A.M. Find the change in temperature.

$$-5.5 - (-8.0) \leftarrow \text{[] to find the difference.}$$

$$-5.5 + 8.0 \leftarrow \text{Add the []}$$

The difference is [] $^{\circ}\text{F}$.

Quick Check

3. What is the temperature difference between -2.5°F and -6°F ?

You have an assignment - it is a checkpoint from lessons 1-4 through 1-6.

There are 10 questions. You can do all of your work on this page. If you chose to use scratch paper, please staple it to this paper.

Name: _____ Period: _____ September _____ 2013

Write each fraction as a decimal.

1. $\frac{4}{5}$ _____ 2. $\frac{4}{7}$ _____ 3. $\frac{4}{9}$ _____

Compare using <, > or =

4. $\frac{2}{3}$ _____ $-\frac{2}{3}$ 5. -5.56 _____ -3.36 6. $\frac{2}{5}$ _____ 0.4

Find each sum or difference

7. $-6\frac{3}{4} + 1\frac{2}{3} =$ _____

8. $-4.23 + 16.34 =$ _____

9. $-3\frac{5}{6} - (-3\frac{5}{6}) =$ _____

10. On a January morning in 1943, the temperature in Spearfish, South Dakota changed from -20 degrees Celsius to 22.8 degrees Celsius in two minutes. By how many degrees Celsius did the temperature change?
