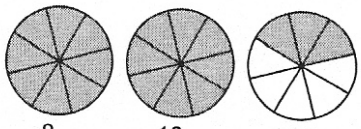
3.3 Skill Builder

Converting Mixed Numbers to Improper Fractions

Here are 2 ways to write $2\frac{3}{8}$ as an improper fraction.

- Make a diagram to show $2\frac{3}{8}$.

  Count individual parts.



  Think of the diagram above:

  2 × 8 + 3

  ↑ 2 whole circles shaded

  ↑ 8 pieces in each circle

  ↑ plus another 3 pieces

- Use calculation.

$$2\frac{3}{8} = \frac{2 \times 8 + 3}{8}$$

$$= \frac{19}{8}$$

$$2\frac{3}{8} = 2 + \frac{3}{8}$$

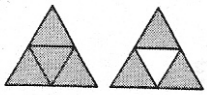
$$= \frac{16}{8} + \frac{3}{8}$$

$$= \frac{19}{8}$$

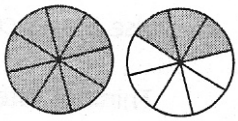
Check

1. Write a mixed number and an improper fraction to show each shaded quantity.

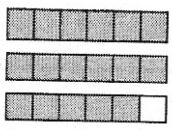
a) ___ or ___



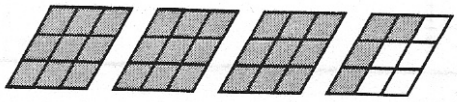
b) ___ or ___



c) ___ or ___



d) ___ or ___



2. Write each mixed number as an improper fraction.

a) $1\frac{2}{5} = \_\_\_ + \frac{2}{5}$

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

$= \frac{\_\_}{5}$

b) $2\frac{2}{3} = \_\_\_ + \_\_$

$= \frac{\_\_}{3} + \_\_$

$= \_\_$

c) $5\frac{3}{4} = \_\_\_ + \_\_$

$= \frac{\_\_}{4} + \_\_$

$= \_\_$

3.3 Subtracting Rational Numbers

FOCUS **Solve problems by subtracting rational numbers.**

To subtract an integer, we add its opposite.

- $-5 - 2$ is the same as $-5 + (-2)$.

  So, $-5 - 2 = -5 + (-2)$
  $= -7$

- $-5 - (-2)$ is the same as $-5 + (+2)$

  So, $-5 - (-2) = -5 + (+2)$
  $= -3$

We can use the same strategy to subtract rational numbers.

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

Example 1 Subtracting Rational Numbers in Fraction Form

Subtract: $\frac{1}{3} - \frac{5}{6}$

Solution

$\frac{1}{3} - \frac{5}{6}$	Add the opposite.
$= \frac{1}{3} + \left(-\frac{5}{6}\right)$	Use 6 as a common denominator.
$= \frac{2}{6} + \left(-\frac{5}{6}\right)$	Think of integer addition: $2 + (-5) = -3$
$= -\frac{3}{6}$	Write the answer in simplest form.
$= -\frac{1}{2}$	

Check

1. Subtract.

a) $-\frac{1}{2} - \frac{7}{8} = -\frac{1}{2} + \left(-\frac{7}{8}\right)$

$= \_\_\_ + \left(-\frac{7}{8}\right)$

$= \_\_\_$

$= \_\_\_$

b) $\frac{4}{5} - \left(-\frac{2}{3}\right) = \_\_\_ + \_\_\_$

$= \_\_\_ + \_\_\_$

$= \_\_\_$

$= \_\_\_$

Example 2 Subtracting Rational Numbers in Mixed Number Form

Subtract: $\frac{3}{4} - 2\frac{5}{8}$

Solution

$\frac{3}{4} - 2\frac{5}{8}$	Write $2\frac{5}{8}$ as an improper fraction.
$= \frac{3}{4} - \frac{21}{8}$	Use 8 as a common denominator.
$= \frac{6}{8} - \frac{21}{8}$	Add the opposite.
$= \frac{6}{8} + \left(-\frac{21}{8}\right)$	
$= -\frac{15}{8}$, or $-1\frac{7}{8}$	

Check

1. Find the difference.

a) $-\frac{13}{15} - 1\frac{1}{5}$ — Write $1\frac{1}{5}$ as an improper fraction.

$= -\frac{13}{15} - \_\_\_$ — Use ____ as a common denominator.

$= -\frac{13}{15} - \frac{\_\_}{15}$ — Add the opposite.

$= -\frac{13}{15} + \left(-\frac{\_\_}{15}\right)$

$= \frac{\_\_}{\_\_}$ — Write the answer as a mixed number.

$= \frac{\_\_}{\_\_}$

b) $-2\frac{3}{8} - 3\frac{1}{2}$ — Rewrite $-2\frac{3}{8}$ and $3\frac{1}{2}$ as improper fractions.

$= \frac{\_\_}{\_\_} - \frac{\_\_}{\_\_}$ — Use ___ as a common denominator.

$= \frac{\_\_}{\_\_} - \frac{\_\_}{\_\_}$ — Add the opposite.

$= \frac{\_\_}{\_\_} + \frac{\_\_}{\_\_}$

$= \frac{\_\_}{\_\_}$ — Write the answer as a mixed number.

$= \frac{\_\_}{\_\_}$

Example 3 Solving a Problem by Subtracting Rational Numbers

In Alberta:

- The lowest temperature ever recorded was −61.1°C at Fort Vermilion in 1911.
- The highest temperature was 43.3°C at Bassano Dams in 1931.

What is the difference between these temperatures?

Solution

Subtract to find the difference between the temperatures.

$43.3 - (-61.1)$ Add the opposite.

$= 43.3 + (61.1)$

$= 104.4$

The difference between the temperatures is 104.4°C.

Use mental math to check.
40 + 60 = 100
3.3 + 1.1 = 4.4
100 + 4.4 = 104.4

Check

1. The lowest temperature ever recorded on Earth was −89.2°C in Antarctica.
The highest temperature ever recorded is 57.8°C in Libya.
What is the difference between these temperatures?

_____ − (_____) = _____ + (_____)

= _____

The difference between the temperatures is _____°C.

Practice

1. Subtract.

a) $1.6 - 3.9 =$ _____ **b)** $1.6 - (-3.9) =$ _____

c) $-2.4 - 4.5 =$ _____ **d)** $2.4 - (-4.5) =$ _____

2. Draw lines to join matching subtraction sentences, addition sentences, and answers.

Subtraction sentence	Addition sentence	Answer
$2.7 - 9.7$	$2.7 + 9.7$	-12.4
$-2.7 - 9.7$	$2.7 + (-9.7)$	-7
$-2.7 - (-9.7)$	$-2.7 + (-9.7)$	7
$2.7 - (-9.7)$	$-2.7 + 9.7$	12.4

3. Find each difference.

a) $7.1 - 4.7 =$ _____

b) $-3.2 - 1.9 =$ _____

c) $26.2 - (-8.4) =$ _____

d) $(-8.6) - (-7.2) =$ _____

Estimate to check if your answers are reasonable.

4. Subtract.

a) i) $6 - 3 =$ ____ **ii)** $6.3 - 3.1 =$ ____ **iii)** $\frac{6}{7} - \frac{3}{7} =$ ____

b) i) $-6 - 3 =$ ____ **ii)** $-6.3 - 3.1 =$ ____ **iii)** $-\frac{6}{7} - \frac{3}{7} =$ ____

c) i) $6 - (-3) =$ ____ **ii)** $6.3 - (-3.1) =$ ____ **iii)** $\frac{6}{7} - \left(-\frac{3}{7}\right) =$ ____

d) i) $-6 - (-3) =$ ____ **ii)** $-6.3 - (-3.1) =$ ____ **iii)** $-\frac{6}{7} - \left(-\frac{3}{7}\right) =$ ____

5. Determine each difference.

a) $\frac{3}{5} - \left(-\frac{1}{3}\right) = \frac{3}{5} + \frac{1}{3}$

$= \frac{\quad}{\quad} + \frac{\quad}{\quad}$

$= \frac{\quad}{\quad}$

b) $-\frac{17}{20} - \frac{3}{2} = -\frac{17}{20} + \left(-\frac{3}{2}\right)$

$= -\frac{17}{20} + \frac{\quad}{\quad}$

$= \frac{\quad}{\quad}$

c) $\frac{9}{5} - \frac{7}{4} =$ ____

$= \frac{\quad}{\quad} + \frac{\quad}{\quad}$

$= \frac{\quad}{\quad}$

6. Calculate.

a) $2\frac{1}{6} - 1\frac{1}{3} = \frac{\quad}{6} - \frac{\quad}{3}$

$= \frac{\quad}{6} + \left(-\frac{\quad}{3}\right)$

$= \frac{\quad}{\quad} + \frac{\quad}{\quad}$

$= \frac{\quad}{\quad}$

b) $1\frac{1}{2} - \left(-2\frac{1}{3}\right) = \frac{\quad}{2} - \left(-\frac{\quad}{3}\right)$

$= \frac{\quad}{2} + \frac{\quad}{3}$

$= \frac{\quad}{\quad} + \frac{\quad}{\quad}$

$= \frac{\quad}{\quad}$

7. Jenny has a gift card with $24.50 left on it. She makes purchases totaling $42.35. What amount does Jenny still owe the cashier after using the gift card?

Subtraction sentence: _____ − _____ = _____

Jenny still owes the cashier $_____.

CHECKPOINT

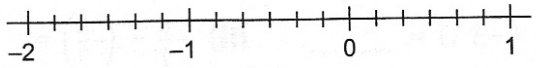
Can you ...

- Compare and order rational numbers?
- Add and subtract rational numbers?
- Solve problems by adding and subtracting rational numbers?

3.1 **1.** Find 2 rational numbers between each pair of numbers.

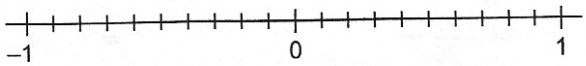
a) $-1\frac{1}{3}$ and $\frac{1}{6}$

Plot each number on the number line.



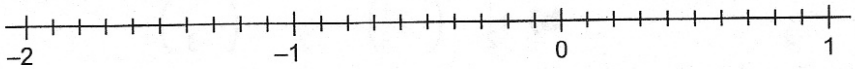
From the number line, 2 values between $-1\frac{1}{3}$ and $\frac{1}{6}$ are: ____ and ____

b) -0.4 and 0.2



From the number line, 2 values between -0.4 and 0.2 are: _____ and _____

2. Use the number line to order the fractions from least to greatest: $-1\frac{2}{3}$, $\frac{7}{10}$, $-\frac{4}{5}$



For least to greatest, read the points from _____ to _____: _____

3. a) Write each number as a decimal.

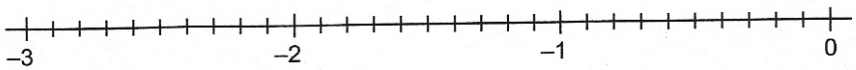
$-\frac{2}{5} =$ _____ $-1\frac{1}{2} =$ _____

$-\frac{5}{3} =$ _____ $-\frac{5}{2} =$ _____

$-\frac{2}{5}$ means $-(2 \div 5)$.

b) Order the decimals in part a from least to greatest.

Use the number line to help you.



From least to greatest: _____

3.2 **4.** Find each sum.

a) $6.5 + (-4.2) =$ _____

b) $-13.6 + (-7.9) =$ _____

5. Find each sum. Use equivalent fractions.

a) $-\frac{3}{8} + \frac{1}{4} = -\frac{3}{8} +$ ____

$=$ _____

b) $\frac{3}{8} + \frac{1}{4} =$ ____ $+$ ____

$=$ _____

c) $-\frac{3}{8} + \left(-\frac{1}{4}\right) =$ _____

$=$ _____

d) $\frac{3}{8} + \left(-\frac{1}{4}\right) =$ _____

$=$ _____

6. Add.

a) $\frac{2}{3} + \left(-1\frac{4}{11}\right) = \frac{2}{3} + \left(-\frac{15}{11}\right)$

$=$ ____ $+$ ____

$=$ ____

b) $-1\frac{5}{6} + 3\frac{7}{8} =$ (___ + ___) + (___ + ___)

$=$ ___ + (___ + ___)

$=$ ____

3.3 **7.** Find each difference.

a) $7.6 - 4.2 =$ ____

b) $-3.4 - 5.7 =$ ____

c) $1.7 - (-9.3) =$ ____

d) $-2.3 - (-5.6) =$ ____

Estimate to check if your answers are reasonable.

8. Subtract.

a) $-\frac{5}{12} - \frac{1}{6} = -\frac{5}{12} +$ ____

$= -\frac{5}{12} +$ ____

$=$ ____

b) $-2\frac{4}{7} - \left(-3\frac{1}{3}\right) = -2\frac{4}{7} +$ ____

$= -\frac{\quad}{7} + \frac{\quad}{3}$

$=$ ____ $+$ ____

$=$ ____

9. The table shows Lesley's temperature readings at different times one day.

Time	Temperature (°C)
9:00 A.M.	−5.4
12:00 P.M.	1.3
3:00 P.M.	2.7
9:00 P.M.	−4.2

Find the change in temperature between each pair of given times.
Did the temperature rise or fall each time?

a) 9:00 A.M. and 12:00 P.M.

Change in temperature: $1.3 - (-5.4)$

$= \_\_\_\_ + \_\_\_\_$

$= \_\_\_\_$

The temperature _____ by ____°C.

b) 3:00 P.M. and 9:00 P.M.

Change in temperature: _____ − _____

= _____ + _____

= _____

The temperature _____ by ____°C.

c) 9:00 A.M. and 9:00 P.M.

Change in temperature: _____

_____

_____

_____