Subtracting Mixed Numbers by Renaming

Renaming When you subtract mixed numbers, as in Example 1, you may need to rename the first mixed number.

Example 1 Subtracting Mixed Numbers

Find the difference $2 \frac{1}{3} - 1 \frac{2}{3}$.

You can't subtract $\frac{2}{3}$ from $\frac{1}{3}$. Think of $2 \frac{1}{3}$ as $1 + \frac{3}{3} + \frac{1}{3}$.

\[
\begin{align*}
2 \frac{1}{3} & = 1 \frac{4}{3} & \text{Rename } 2 \frac{1}{3} \text{ as } 1 \frac{4}{3}. \\
- 1 \frac{2}{3} & = - 1 \frac{2}{3} \\
\hline \\
& = \frac{2}{3} & \text{Subtract.}
\end{align*}
\]

Your turn now

Find the difference. Simplify if possible.

1. $6 \frac{2}{7} - 4 \frac{3}{7}$
2. $3 \frac{1}{4} - 1 \frac{3}{4}$
3. $6 \frac{3}{8} - 3 \frac{7}{8}$
4. $2 \frac{3}{5} - \frac{4}{5}$
Renaming a Whole Number  Sometimes you need to rename a whole number as a mixed number. To do this, rename one whole part as a fraction equal to 1.

**Example 2  Subtracting from a Whole Number**

Find the difference $5 - 3\frac{1}{7}$.

Think of 5 as $4 + 1$, or $4 + \frac{7}{7}$.

\[
\begin{align*}
5 &= 4\frac{7}{7} \\
-3\frac{1}{7} &= -3\frac{1}{7} \\
\hline
1\frac{6}{7} &= \text{Subtract.}
\end{align*}
\]

**Example 3  Solving Subtraction Problems**

**Horses** The height of a horse is measured from its shoulders, as shown in the figure. How much taller is the Clydesdale than the Shetland?

**Solution**

You need to find the difference $5\frac{1}{3} - 3\frac{3}{4}$. Use the LCD, 12.

\[
\begin{align*}
5\frac{1}{3} &= 5\frac{4}{12} = \frac{64}{12} \\
-3\frac{3}{4} &= -3\frac{9}{12} = -\frac{45}{12} \\
\hline
1\frac{7}{12} &= \text{Subtract.}
\end{align*}
\]

**Answer** The Clydesdale is $1\frac{7}{12}$ feet taller than the Shetland.

**Your turn now** Find the difference. Simplify if possible.

5. $3 - 2\frac{1}{2}$  
6. $8 - 5\frac{3}{8}$  
7. $6\frac{1}{4} - 2\frac{3}{5}$  
8. $10\frac{2}{3} - 7\frac{5}{6}$

**Interactive Math**
6.5 Exercises
More Practice, p. 713

Getting Ready to Practice

Vocabulary Copy and complete the equivalent mixed number.

1. \(2 \frac{1}{6} = \frac{13}{6}\)
2. \(4 \frac{3}{5} = \frac{23}{5}\)
3. \(3 \frac{1}{5} = \frac{16}{5}\)
4. \(3 \frac{4}{7} = \frac{25}{7}\)

Find the difference. Simplify if possible.

5. \(4 \frac{1}{6} - 2 \frac{5}{6}\)
6. \(3 \frac{5}{8} - \frac{7}{8}\)
7. \(6 - 4 \frac{1}{4}\)
8. \(5 - \frac{2}{7}\)

9. Unicycles Members of a unicycle club are taking a two day trip. The trip is a total of 16 \(\frac{1}{4}\) miles. If they travel 6 \(\frac{1}{2}\) miles on the first day, how far will they travel on the second day?

Practice and Problem Solving

10. What renaming do the models represent?

\[
\begin{array}{c}
\text{\(\frac{3}{4}\)}&\text{\(\frac{1}{2}\)}&\text{\(\frac{3}{4}\)}
\end{array}
\rightarrow
\begin{array}{c}
\text{\(\frac{1}{2}\)}&\text{\(\frac{3}{4}\)}&\text{\(\frac{3}{4}\)}
\end{array}
\]

Find the difference.

11. \(\frac{5}{8} - \frac{7}{8}\)
12. \(\frac{6}{4} - \frac{3}{4}\)
13. \(\frac{5}{7} - \frac{6}{7}\)
14. \(\frac{9}{5} - \frac{7}{5}\)
15. \(4 - \frac{1}{2}\)
16. \(9 - \frac{3}{10}\)
17. \(10 - \frac{8}{15}\)
18. \(7 - \frac{5}{6}\)
19. \(\frac{3}{7} - \frac{1}{2}\)
20. \(\frac{4}{5} - \frac{3}{5}\)
21. \(\frac{1}{2} - \frac{3}{4}\)
22. \(\frac{8}{3} - \frac{7}{9}\)

23. Roads A road sign says that you are 1 \(\frac{3}{4}\) miles from Exit 1 and 3 \(\frac{1}{2}\) miles from Exit 2. How far is Exit 2 from Exit 1?

24. Pogo Sticks Your friend can jump 5 inches high on a pogo stick. You can jump \(\frac{2}{3}\) inches high. How much higher can your friend jump?

25. Find the Error Describe and correct the error in the solution.

\[
\frac{4}{5} - \frac{14}{5} = \frac{7}{5} - \frac{14}{5} = \frac{3}{5}
\]
**Number Sense** Tell whether you need to rename the whole part and the fraction in the first mixed number to subtract. Explain.

26. \(6\frac{1}{4} - 3\frac{1}{2}\)  
27. \(7\frac{1}{2} - 2\frac{5}{6}\)  
28. \(8\frac{7}{10} - 3\frac{1}{10}\)  
29. \(8\frac{4}{7} - 3\frac{5}{7}\)  
30. \(5 - 2\frac{1}{3}\)  
31. \(4\frac{2}{5} - 3\)  
32. \(7\frac{5}{8} - 6\frac{1}{6}\)  
33. \(9\frac{2}{3} - 4\frac{3}{4}\)

34. **Blue Crabs** A fisherman catches a blue crab that is \(2\frac{1}{3}\) inches wide.

Blue crabs that are less than 5 inches wide are returned to the water. How much wider must the crab be before it will be 5 inches wide?

35. Mental Math Find the difference using mental math.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>35.</td>
<td>(6 - 5\frac{3}{4})</td>
</tr>
<tr>
<td>36.</td>
<td>(8 - 7\frac{2}{3})</td>
</tr>
<tr>
<td>37.</td>
<td>(4 - 3\frac{7}{8})</td>
</tr>
<tr>
<td>38.</td>
<td>(3 - 2\frac{5}{7})</td>
</tr>
</tbody>
</table>

39. **Hockey** A professional ice hockey goal is 4 feet tall. You buy a hockey goal that is \(3\frac{2}{3}\) feet tall. How much taller is the professional goal?

40. **Critical Thinking** When subtracting mixed numbers, how do you know whether you need to rename?

41. \(5\frac{1}{6} - x\)  
42. \(x - 1\frac{7}{8}\)  
43. \(8\frac{1}{5} - y\)  
44. \(y - 2\frac{3}{4}\)  
45. \(8 - x\)  
46. \(4 - x\)  
47. \(7 - y\)  
48. \(10 - y\)

49. **Snakes** In Exercises 49–51, use the table at the right. It shows the lengths of four snakes at a zoo exhibit.

<table>
<thead>
<tr>
<th>Snake</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>green water snake</td>
<td>35(\frac{3}{8}) in.</td>
</tr>
<tr>
<td>northern brown snake</td>
<td>11(\frac{5}{6}) in.</td>
</tr>
<tr>
<td>southern ringneck snake</td>
<td>13(\frac{7}{8}) in.</td>
</tr>
<tr>
<td>checkered garter snake</td>
<td>20 in.</td>
</tr>
</tbody>
</table>

49. How much longer is the green water snake than the southern ringneck snake?

50. How much longer is the checkered garter snake than the northern brown snake?

51. The glossy crayfish snake is one half inch shorter than the checkered garter snake. How long is the glossy crayfish snake?

52. **Writing** You are subtracting a mixed number from a whole number. Describe how to find the fraction you should use when you rename the whole number.
**Challenge** Some of the tallest trees in Massachusetts can be found in the Mohawk Trail State Forest.

53. A White Pine is $47\frac{3}{10}$ feet taller than an American Basswood, which is $7\frac{7}{10}$ feet shorter than a Northern Red Oak. If the Northern Red Oak is 119 feet tall, how tall is the White Pine?

54. Explain A White Ash is $13\frac{4}{5}$ feet shorter than the White Pine in Exercise 53. Is it taller or shorter than the Northern Red Oak in Exercise 53? How much taller or shorter? Explain your method.

**Mixed Review**

Find the sum. *(Lesson 6.4)*

55. $3\frac{7}{9} + 1\frac{1}{3}$

56. $4\frac{2}{5} + 4\frac{7}{10}$

57. $1\frac{7}{12} + 2\frac{1}{6}$

58. $7\frac{5}{6} + 5\frac{1}{2}$

Choose a Strategy Use a strategy from the list to solve the following problem. Explain your choice of strategy.

59. The perimeter of a triangle is 9.8 meters. One side of the triangle is 3.2 meters. The other two sides have the same length. Find the length of the other two sides.

**Basic Skills** Copy and complete the statement.

60. 8 minutes = ? seconds

61. 290 min = ? hours ? min

62. 343 sec = ? min ? sec

63. 11 hours = ? minutes

**Test-Taking Practice**

64. **Multiple Choice** What is the value of the expression $6\frac{2}{3} - 5\frac{7}{4}$?

   A. $\frac{1}{12}$
   B. $\frac{11}{12}$
   C. $1\frac{1}{12}$
   D. $1\frac{11}{12}$

65. **Multiple Choice** A jar contains $2\frac{1}{2}$ cups of honey. You pour $1\frac{3}{5}$ cups into a bowl. How many cups of honey are left in the jar?

   F. $\frac{1}{10}$ cup
   G. $\frac{2}{3}$ cup
   H. $\frac{3}{5}$ cup
   I. $\frac{9}{10}$ cup