

3.3 - Subtracting Rational Numbers

Recall that when adding and subtracting fractions:

- 1) convert any mixed numbers to improper fractions $\frac{1}{2} \rightarrow \frac{3}{2}$
- 2) make the fractions compatible by creating Common denominators
- 3) add the numerators and keep the same denominator
- 4) if the answer is an improper fraction, convert it into a mixed number

To subtract fractions, you can "add the opposite" just like we did for subtracting negative integers. You may find it helpful to visualize what is happening by using a number line.

Ex 1: Find the difference between each pair of fractions.

(a) $\frac{3}{4} - \frac{1}{4} = \frac{1}{2}$

$= \frac{2}{4} = \boxed{\frac{1}{2}}$

(b) $\frac{1}{4} - \frac{3}{4} = -\frac{1}{2}$

$= \frac{-2}{4} = \boxed{-\frac{1}{2}}$

A number line from -5/4 to 5/4 with tick marks every 1/4. Points are labeled: -5/4, -4/4, -3/4, -2/4, -1/4, 0, 1/4, 2/4, 3/4, 4/4, 5/4. Below the line, points are labeled: -1 1/4, -1, -1/2, 1/2, 1, 1 1/4. A red dot is at 3/4 and a purple dot is at 1/4. A red arrow points from 3/4 to 1/4. A purple arrow points from 3/4 to -1/4. A purple box is drawn around -1/4.

(c) $\frac{4}{3} - \frac{5}{6} = \frac{1}{2}$

$= \frac{8}{6} - \frac{5}{6} = \frac{3}{6} = \boxed{\frac{1}{2}}$

(d) $\frac{1}{6} - (-\frac{4}{3}) = \frac{5}{6}$

$= \frac{1}{6} + (\frac{4}{3}) = \boxed{\frac{5}{6}}$

A number line from -4/3 to 5/3 with tick marks every 1/3. Points are labeled: -4/3, -3/3, -2/3, -1/3, 0, 1/3, 2/3, 3/3, 4/3, 5/3. Below the line, points are labeled: -1 1/3, -1, -2/3, 1/3, 2/3, 1, 1 1/3, 1 2/3. A green dot is at 1/6 and a purple dot is at 4/3. A green arrow points from 1/6 to 4/3. A purple arrow points from 4/3 to 1/6. A purple box is drawn around 1/2.

$$\begin{aligned}
 & \text{(e) } 4\frac{3}{8} - 2\frac{1}{2} \\
 & \quad \times 4 \\
 & = \frac{35}{8} - \frac{5 \times 4}{2 \times 4} \\
 & = \frac{35}{8} - \frac{20}{8} \\
 & = \frac{15}{8} = \boxed{\frac{17}{8}}
 \end{aligned}$$

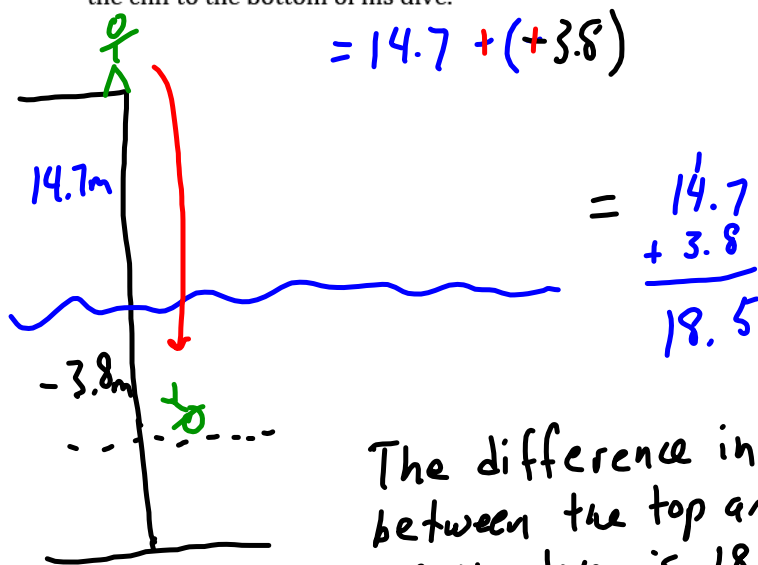
$$\begin{aligned}
 & \text{(f) } \left(-\frac{5}{4}\right) - \left(-3\frac{1}{5}\right) \\
 & \quad \times 20 \qquad \times 20 \\
 & = \left(-\frac{5}{4}\right) \times 20 - \left(-\frac{16}{5}\right) \times 20 \\
 & = \left(\frac{-25}{20}\right) + \left(+\frac{64}{20}\right) \\
 & = \frac{39}{20} = \boxed{1\frac{19}{20}}
 \end{aligned}$$

4, 8, 12, 16, 20
5, 10, 15, 20

Use what you know about subtracting integers to subtract rational numbers in decimal form.

Ex. 2: A diver jumps off a cliff that is 14.7 m above sea level. After hitting the water, he plunges 3.8 m below the surface of the water.

Use a drawing and rational numbers to represent the difference in heights from the top of the cliff to the bottom of his dive.



The difference in height between the top and bottom of the dive is 18.5m.

Assignment: Blue 3.3 practice