

Example 2 Adding Rational Numbers

a. Find $-0.75 + (-1.5)$. **Estimate** $-1 + (-1.5) = -2.5$

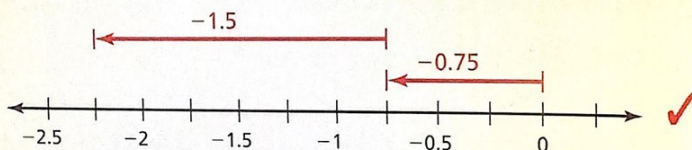
Because the signs are the same, add $|-0.75|$ and $|-1.5|$.

$$\begin{aligned} |-0.75| + |-1.5| &= 0.75 + 1.5 && \text{Find the absolute values.} \\ &= 2.25 && \text{Add.} \end{aligned}$$

Because -0.75 and -1.5 are both negative, use a negative sign in the sum.

► So, $-0.75 + (-1.5) = -2.25$. **Reasonable?** $-2.25 \approx -2.5$ ✓

Check



4 MTR COMPARE METHODS

Are the methods used to add in Examples 1 and 2 different? Explain your reasoning.

b. Find $-\frac{8}{3} + \frac{5}{6}$.

Estimate $-3 + 1 = -2$

Because the signs are different and $|\frac{8}{3}| > |\frac{5}{6}|$, subtract $|\frac{5}{6}|$ from $|\frac{8}{3}|$.

$$\left|-\frac{8}{3}\right| - \left|\frac{5}{6}\right| = \frac{8}{3} - \frac{5}{6}$$

$$= \frac{16}{6} - \frac{5}{6}$$

$$= \frac{16 - 5}{6}$$

$$= \frac{11}{6}, \text{ or } 1\frac{5}{6}$$

Find the absolute values.

Rewrite $\frac{8}{3}$ as $\frac{16}{6}$.

Write the difference of the numerators over the common denominator.

Simplify.

Because $|\frac{8}{3}| > |\frac{5}{6}|$, use the sign of $-\frac{8}{3}$.

► So, $-\frac{8}{3} + \frac{5}{6} = -1\frac{5}{6}$.

Reasonable? $-1\frac{5}{6} \approx -2$ ✓

same signs add and keep
different signs subtract take
sign of bigger #



Try It

Find the sum. Write fractions in simplest form.

4. $-3.3 + (-2.7)$

 -6

5. $-5.35 + 4$

 -1.35

6. $1.65 + (-0.9)$

 0.75

7. $-\frac{1}{2} + \left(-\frac{3}{2}\right)$

 -2

8. $-1\frac{3}{8} + \frac{3}{4}$

 $-\frac{5}{8}$

9. $4 + \left(-\frac{7}{2}\right)$

 $\frac{1}{2}$ **Example 3** Using Properties of AdditionEvaluate $-1\frac{1}{6} + \frac{2}{3} + \left(-\frac{1}{6}\right)$.

The Commutative and Associative Properties of Addition are true for all rational numbers.

Use properties of addition to group the mixed numbers that include fractions with the same denominator.

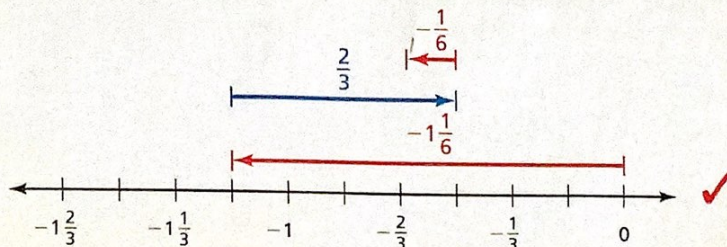
$$-1\frac{1}{6} + \frac{2}{3} + \left(-\frac{1}{6}\right) = -1\frac{1}{6} + \left(-\frac{1}{6}\right) + \frac{2}{3}$$

Commutative Property of Addition

$$= -1\frac{1}{3} + \frac{2}{3}$$

Add $-1\frac{1}{6}$ and $-\frac{1}{6}$.

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

Add $-1\frac{1}{3}$ and $\frac{2}{3}$.**Check**

GO DIGITAL



Try It

Evaluate the expression. Write fractions in simplest form.

10. $3\frac{3}{8} + \left(-\frac{1}{8} + 1\frac{1}{4}\right)$

$3\frac{3}{8} + 1\frac{1}{8}$

$4\frac{1}{2}$

11. $-0.7 + 2.9 + (-1.3)$

0.9

In-Class Practice**1** I don't understand yet.**2** I can do it with help.**3** I can do it on my own.**4** I can teach someone else.12. **WRITING** Explain how to use a number line to find the sum of two rational numbers.**ADDING RATIONAL NUMBERS** Find the sum.

13. $-2 + (-12)$

14. $-2.6 + 4.3$

15. $-\frac{3}{4} + \left(-\frac{1}{3}\right) + 1\frac{3}{4}$

4
MTR16. **DIFFERENT WORDS, SAME QUESTION** Which is different? Find "both" answers.Add -4.5 and 3.5 .What is the distance between -4.5 and 3.5 ?What is -4.5 increased by 3.5 ?Find the sum of -4.5 and 3.5 .

Example 4 B.E.S.T. Test Prep: Modeling Real Life

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MTR

The table shows the annual profits (in millions of dollars) of an online gaming company from 2017 to 2021. Positive numbers represent *gains*, and negative numbers represent *losses*. Which statement describes the profit over the five-year period?

Year	Profit (millions of dollars)
2017	-1.7
2018	-4.75
2019	1.7
2020	0.8
2021	3.2

$$-1.7 - 4.75 + 1.7 + 0.8 + 3.2$$

-0.75 million
which is
\$750,000

- (A) gain of \$0.75 million (C) loss of \$75,000
 (B) gain of \$75,000 (D) loss of \$750,000

To determine the amount of the gain or loss, find the sum of the profits.

$$\begin{aligned}
 \text{five-year profit} &= -1.7 + (-4.75) + 1.7 + 0.8 + 3.2 && \text{Write the sum.} \\
 &= -1.7 + 1.7 + (-4.75) + 0.8 + 3.2 && \text{Comm. Prop. of Add.} \\
 &= 0 + (-4.75) + 0.8 + 3.2 && \text{Additive Inv. Prop.} \\
 &= -4.75 + 0.8 + 3.2 && \text{Add. Prop. of Zero} \\
 &= -4.75 + (0.8 + 3.2) && \text{Assoc. Prop. of Add.} \\
 &= -4.75 + 4 && \text{Add 0.8 and 3.2.} \\
 &= -0.75 && \text{Add -4.75 and 4.}
 \end{aligned}$$

The five-year profit is $-\$0.75$ million. So, the company has a five-year loss of $\$0.75$ million, or $\$750,000$.

► The correct answer is (D).



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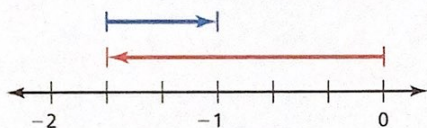
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MTR

28. **YOU BE THE TEACHER** Your friend finds the sum. Is your friend correct? Explain your reasoning.

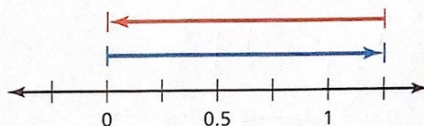
$$\begin{aligned} -3.7 + (-0.25) &= |-3.7| + |-0.25| \\ &= 3.7 + 0.25 \\ &= 3.95 \end{aligned}$$

OPEN-ENDED Describe a real-life situation that can be represented by the addition expression modeled on the number line.

29.



30.



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31. **MODELING REAL LIFE** You eat $\frac{3}{10}$ of a coconut. Your friend eats $\frac{1}{5}$ of the coconut. What fraction of the coconut do you and your friend eat?



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32. **MODELING REAL LIFE** Your bank account balance is $-\$20.85$. You deposit $\$15.50$. What is your new balance?

Do together *deposit means put \$ in account*

$-20.85 + 15.50$

$\$-5.35$

Withdrawal - take \$ out *amount of \$ in account*

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USING PROPERTIES Evaluate the expression. Write fractions in simplest form. (See Example 3.)

33. $17 + 22 + (-7)$

34. $30 + (-20 + 13)$

▶ 35. $4.5 + (-6.21) + (-4.5)$

36. $8\frac{1}{2} + \left[4\frac{1}{10} + \left(-8\frac{1}{2}\right)\right]$

$8\frac{1}{2} + -4\frac{2}{5}$

$4\frac{1}{10}$

37. $\frac{1}{3} + \left(\frac{2}{3} + \frac{5}{8}\right)$

38. $[5.6 + (-7.2)] + (-2.6)$

$-1.6 + -2.6$

-4.2

ADDING RATIONAL NUMBERS Find the sum. Explain each step.

39. $6 + 4\frac{3}{4} + (-2.5)$

40. $-4.3 + \frac{4}{5} + 12$

41. $5\frac{1}{3} + 7.5 + \left(-3\frac{1}{6}\right)$

42. **NUMBER SENSE** When is the sum of two negative mixed numbers an integer?

43. **WRITING** You are adding two rational numbers with different signs. How can you tell if the sum will be *positive*, *negative*, or *zero*?