

Example 1

During the first half of 2003, Cindy Lou lost 50 lbs. During the second half of 2003, Cindy Lou gained back 20 lbs.

- a. What was the net change in Cindy Lou's weight in 2003.

Cindy Lou lost 30 lb

- b. How can we use signed number *addition* to illustrate this net change in Cindy Lou's weight?

$$-50 + 20 = -30$$

Example 2

During the first half of 2003, Bobby Sue lost 25 lbs. During the second half of 2003, Bobby Sue gained back 35 lbs.

- a. What was the net change in Bobby Sue's weight in 2003.

Bobby Sue gained 10 lb

- b. How can we use signed number *addition* to illustrate this net change in Bobby Sue's weight?

$$-25 + 35 = 10$$

Example 3

During the first half of 2003, Baxter lost 14 lbs. During the second half of 2003, Baxter gained back 14 lbs.

- a. What was the net change in Baxter's weight in 2003.

0

- b. How can we use signed number *addition* to illustrate this net change in Baxter's weight?

$$-14 + 14 = 0$$

$$(2+7)^{-}$$

isn't

Mr. Simonds' MTH 60 class

When adding two numbers of opposite sign:

- If the numbers have equal absolute value, the numbers sum to 0. In this special case, the numbers are called **additive inverses**. This pair of numbers are also called **opposite numbers**.
- If the numbers don't have equal absolute value, begin by subtracting the lesser absolute value from the greater absolute value; the result is the absolute value of the sum. The sign on the sum agrees with the sign on the number in the sum that has the greater absolute value.

Example 4

Find the sum: $-4.3 + 9.07 =$ 4.77

Mental/scratch work:

$$\begin{array}{r} 9.07 \\ - 4.30 \\ \hline 4.77 \end{array}$$

Example 5

Find the sum: $\frac{57}{29} + \left(-\frac{86}{29}\right) =$ $-\frac{29}{29} = -1$

Mental/scratch work:

$$\begin{array}{r} 57 + (-86) \\ \hline 29 \end{array} \quad \begin{array}{r} 86 \\ - 57 \\ \hline 29 \end{array}$$

Example 6

Evaluate $-\frac{1}{6} + \frac{3}{4}$.

$$-\frac{1}{6} + \frac{3}{4} = \frac{7}{12}$$

Mental/scratch work:

$$\begin{aligned} -\frac{1}{6} + \frac{3}{4} &= \frac{-2}{12} + \frac{9}{12} \\ &= \frac{-2+9}{12} \end{aligned}$$

Example 7

Simplify $3x + (-9x)$

$$3x + (-9x) = -6x$$

Mental/scratch work:

$$\begin{aligned} 3x + (-9x) &= (3 + (-9))x \\ &= -6x \end{aligned}$$

$$\begin{aligned} -8x + 5x &= (-8 + 5)x \\ &= -3x \end{aligned}$$

Example 8

Evaluate $-8\pi + 5\pi$.

$$-8\pi + 5\pi = -3\pi$$

Example 9

Evaluate $\sqrt{17} + (-\sqrt{17})$.

additive inverses
(opposite numbers) sum to
the additive identity (zero)
 $\sqrt{17} + (-\sqrt{17}) = 0$

Example 10

During the first half of 2003, Ahmed gained 16 lbs. During the second half of 2003, Ahmed gained another 18 lbs.

- a. What was the net change in Ahmed's weight in 2003.

gained 34 lbs

- b. How can we use signed number *addition* to illustrate this net change in Ahmed's weight?

$$16 + 18 = 34$$

Example 11

During the first half of 2003, Carlotta lost 12 lbs. During the second half of 2003, Carlotta lost another 8 lbs.

- a. What was the net change in Carlotta's weight in 2003.

lost 20 lb

- b. How can we use signed number *addition* to illustrate this net change in Carlotta's weight?

$$-12 + (-8) = -20$$

When adding numbers of the same sign, begin by mentally adding the absolute values of the numbers in the sum – this is the absolute value of the sum. The sign on the sum is the same as the sign on the numbers in the sum.

Example 12

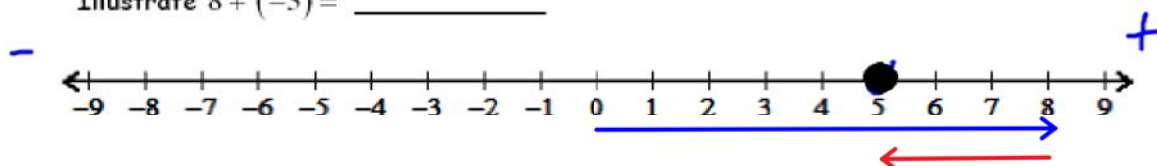
Find the sum: $(-3) + (-7) + (-2) + (-11) = \underline{-23}$

Mental/scratch work: $3 + 7 + 2 + 11 = 23$

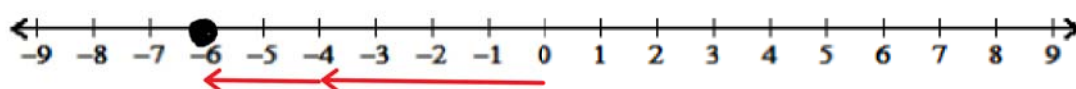
Example 13

Illustrate each sum on the provided number line

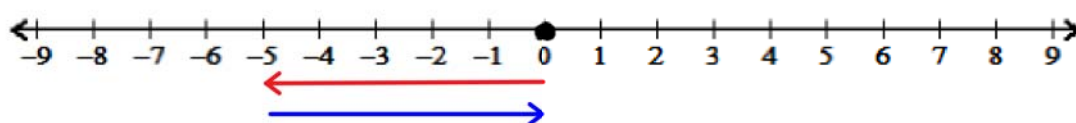
Illustrate $8 + (-3) = \underline{5}$



Illustrate $-4 + (-2) = \underline{-6}$



Illustrate $-5 + 5 = \underline{0}$



Subtraction of signed numbers – a model for why it works the way it works**Example 14**

Complete Table 1

Table 1

Subtraction	Value	Equivalent Addition
$4 - 3$	1	$4 + (-3)$
$4 - 2$	2	$4 + (-2)$
$4 - 1$	3	$4 + (-1)$
$4 - 0$	4	$4 + 0$
$4 - (-1)$	5	$4 + 1$
$4 - (-2)$	6	$4 + 2$
$4 - (-3)$	7	$4 + 3$

a minus b is the same as a plus the opposite of b .

Example 15Find $4 - (-16.8)$ after first rewriting the difference as a sum.

$$\begin{aligned}
 4 - (-16.8) &= 4 + 16.8 \\
 &= 20.8
 \end{aligned}$$

Example 16

Find $-22 - (-22)$ after first rewriting the difference as a sum.

$$\begin{aligned} -22 - (-22) &= -22 + 22 \\ &= 0 \end{aligned}$$

Example 17

Find $-22 - 22$ after first rewriting the difference as a sum.

$$\begin{aligned} -22 - 22 &= -22 + (-22) \\ &= -44 \end{aligned}$$

Example 18

Subtract 82.2 from -17.8 after first rewriting the difference as a sum.

$$\begin{aligned} -17.8 - 82.2 &= -100 \\ &= -100 \end{aligned}$$

Mental/scratch work:

$$\begin{array}{r} 17.8 \\ 82.2 \\ \hline 100.0 \end{array}$$

Example 19

Find $\frac{7}{10} - \frac{8}{45}$ after first rewriting the difference as a sum.

$$\begin{aligned} \frac{7}{10} - \frac{8}{45} &= \frac{7}{10} + \left(-\frac{8}{45}\right) \\ &= \frac{63 + (-16)}{90} \\ &= \frac{47}{90} \end{aligned}$$

Mental/scratch work:

$$\begin{aligned} \frac{7}{10} &= \frac{63}{90} \\ \frac{8}{45} &= \frac{16}{90} \end{aligned}$$

Example 20Evaluate $x + y - z - w$ when $x = -1$, $y = 5$, $z = -6$, and $w = -11$.

$$\text{When } x = -1, y = 5, z = -6, \text{ and } w = -11$$

$$\begin{aligned} x + y - z - w &= -1 + 5 - (-6) - (-11) \\ &= -1 + 5 + 6 + 11 \\ &= 21 \end{aligned}$$

Example 21

Simplify each expression.

a. $15 - (-8x) + (-7) - 18x$

$$\begin{aligned} 15 - (-8x) + (-7) - 18x &= 15 + \underline{8}x + (-7) + (\underline{-18}x) \\ &= (15 + (-7)) + (\underline{8} + \underline{-18})x \\ &= 8 + (-10x) \\ &= 8 - 10x \end{aligned}$$

b. $4(6w - 2) - (19 - 24w)$

$$48w - 27$$

Group work problems: *Work these problems on your own paper.*

Problem set 1

Find each sum. Make sure that you write complete equations to express your sum. e.g., for problem (a), write $2 + (-7) = -5$.

a. Find $2 + (-7)$

b. Find $-2 + (-7)$

c. Find $-2 + 7$

d. Find $-\frac{7}{3} + 12$

e. Find $-\frac{8}{9} + \left(-\frac{5}{12}\right)$

f. Find $\frac{7}{27} + \left(-\frac{11}{6}\right)$

g. Find $7 + (-8) + (-12) + 2 + 6 + (-1)$

h. Find $|2 + (-3)| + |-2 + 3|$

Problem set 2

Find each difference *after first rewriting the difference as a sum*. Make sure that you "line up your equal signs" as illustrated in class.

a. Find $2 - (-7)$

b. Find $-2 - (-7)$

c. Find $-2 - 7$

d. Find $7 - 12$

e. Find $-7 - (-12)$

f. Find $12 - (-7)$

Problem set 3

Evaluate each expression. Make sure that you "line up your equal signs" as illustrated in class.

a. Evaluate $2a + b$ when $a = 11$ and $b = -22$.

b. Evaluate $w - (x - y)$ when $w = -10$, $x = -2$, and $y = -4$.

c. Evaluate $w - (x - y)$ when $w = 10$, $x = 2$, and $y = 4$.

d. Evaluate $x^2 - 3(2y^2 - 8)$ when $x = 0$ and $y = 1$.

Problem set 4

Simplify each expression.

a. $3 + (-4x) + (-21)$

b. $-y + 1 + (-72y)$

c. $3(4 + 12x) - (-25x)$

d. $4t + (-9) - (-3t) + (-85)$

e. $\frac{-7}{6}w + \frac{8}{3}w$

f. $3.9w - 17.32w + (-8)$