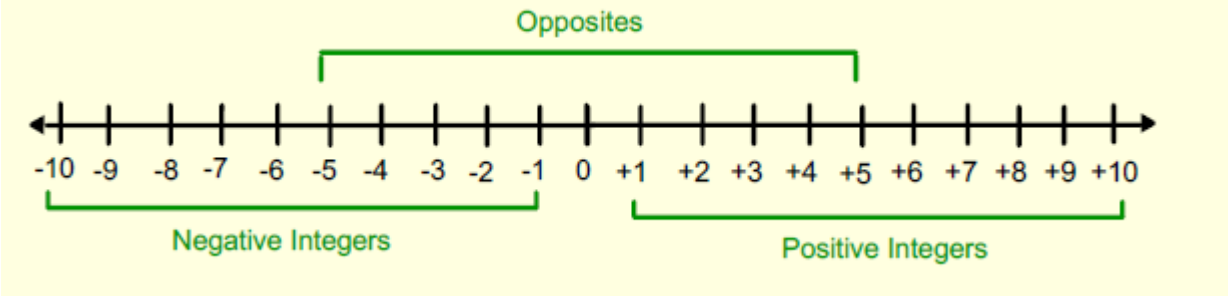
Section 2.1: Representing Integers

What is an Integer?

Integers are the set of positive and negative whole numbers, including zero.



_____ integers are **greater than zero**, while _____ integers are **less than zero.**

Opposite integers are the same distance from zero on the number line, but are on opposite sides of the zero. For example, +5 and -5 are opposite integers.

Integers are often used to represent situations in everyday life.
Money, sea level, temperature, time zones and sports all use integers.

For example,

Money

A **positive** number means you **gain** or **earn** money.

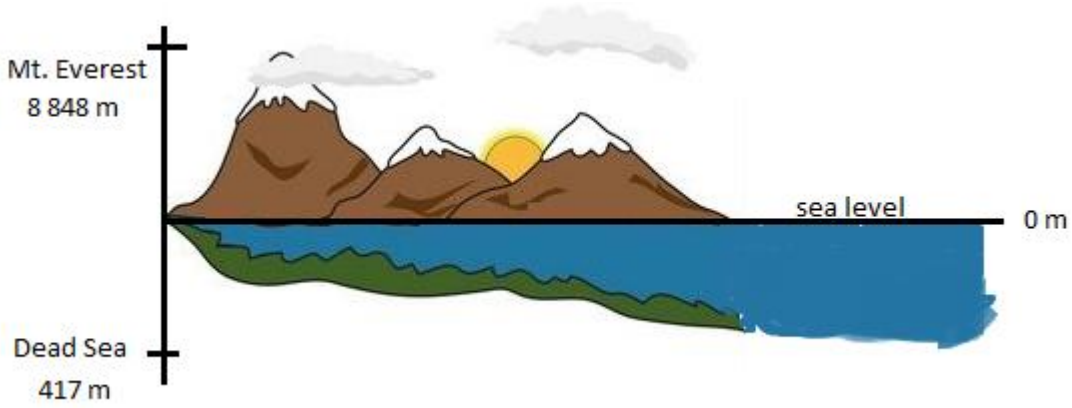
Simon received $20 for his allowance. This would be +20.

A **negative** number means you **lose** or **owe** money.

Mr. Dawe owes $850 to the phone company. This would be –850.

Sea Level

Sea level refers to land elevation or sea depths in reference to the level of the ocean's surface. The ocean's surface is considered to be 0.

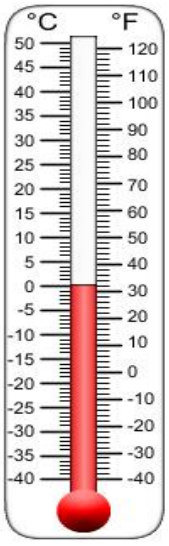


According to the diagram, how would we represent the height of Mt. Everest and the depth of the Dead Sea as integers?

Mt. Everest _____ Dead Sea _____

Temperature

Integers are also used to indicate temperatures above or below 0°C, the freezing point of water.



The temperature in Orlando on Wednesday was 30°C.

As an integer this would be _____.

The temperature in Antarctica was −63°C. As an integer this would be _____.

Integers are commonly used to represent other real life situations as well.

Consider the following:

a) Jeremy owes his brother $5 _____
b) A golfer took 2 more strokes than par _____
c) Nicholas went up 8 flights of stairs _____
d) Katelyn earned $40 mowing lawns _____
e) Ryan took the elevator 11 floors down _____

Try the following:

Example 1: Write an integer to represent each situation:

a) 15 degrees above zero _____
b) John dove 15 feet below sea level _____
c) Tim lost 5 pounds _____
d) Emily walked 44 steps forward _____
e) Sonya owes her sister $100 _____
f) Carter spent $22.00 at the movies _____
g) Tyler made $58.00 shoveling driveways _____
h) Sam borrowed $2.00 from Mark _____
i) The temperature dropped 8°C _____
j) Laura got an allowance of $10 _____
k) Matthew spent $15 on lunch _____

Example 2: Write the opposite of each integer listed below

a) +27 _____

b) +18 _____

c) -35 _____

d) +6 _____

e) -12 _____

f) 0 _____

Example 3: Order the integers from least to greatest:

a) $+5, +1, -12, +3, -9$

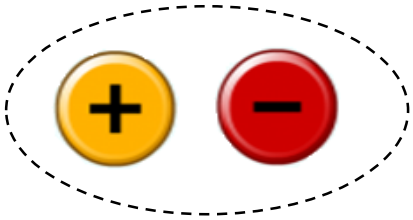
b) $-13, 0, +6, +2, -20, -7$

We can use integer tiles to model positive and negative integers.

Yellow tiles are positive.
One yellow tile represents +1.

Red tiles are negative.
One red tile represents -1.

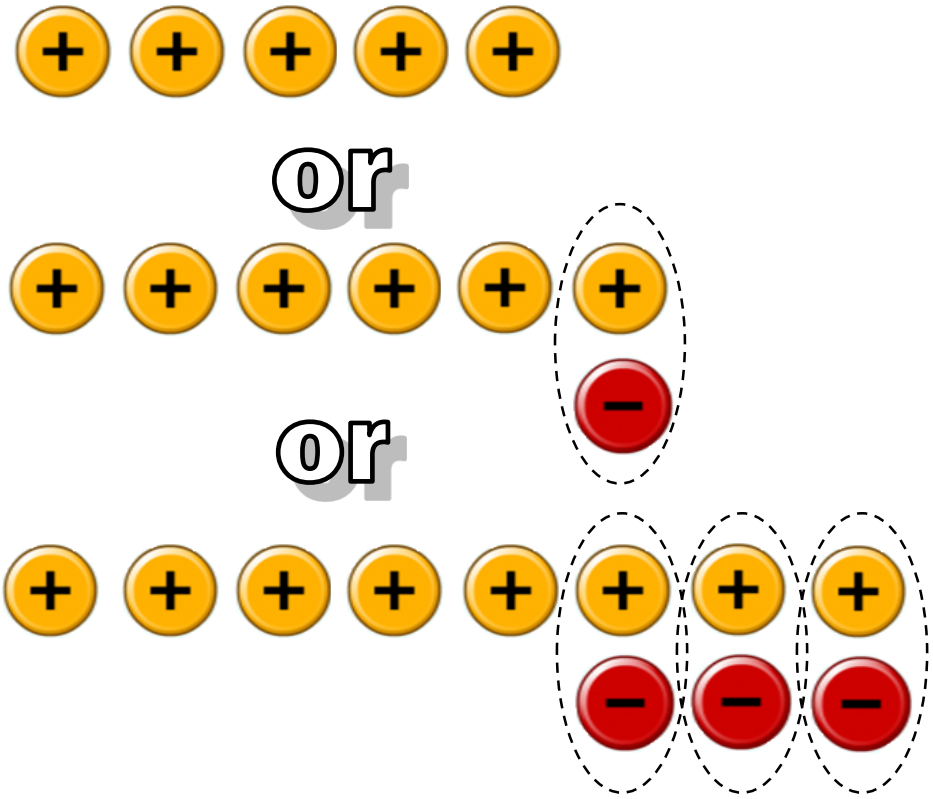
A positive and negative tile together will cancel each other out.
This is called a ZERO PAIR



Zero Pair

An integer can be modeled in many different ways.

For example, +5 can be modeled as follows:

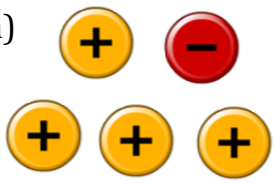


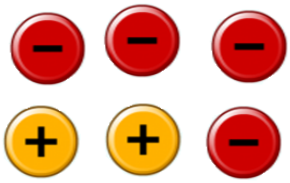
Example 1: Model each integer in two different ways.

a) $+7$

b) -3

Example 2: Write the integer modeled by each set of tiles:

a) 

b) 

c) 

Section 2.2: Adding Integers with Tiles

We can use integer tiles to add or subtract integers.

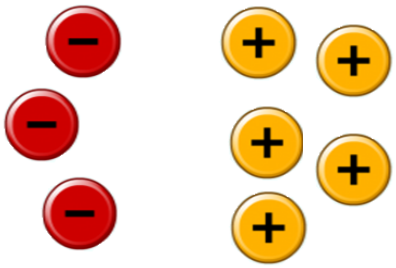
To add integers, we simply represent the integers with tiles and cross out any zero pairs, if any exist.

For example,

a) $(+2) + (+3)$

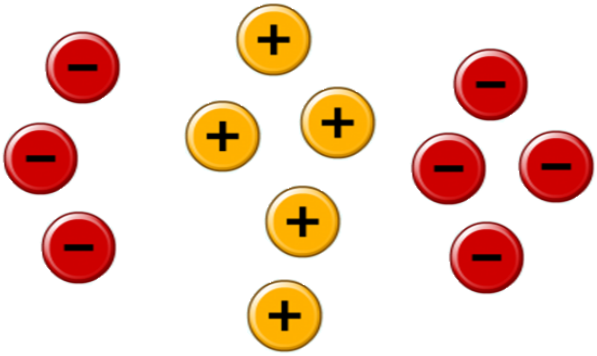
_____

b) $(-3) + (+5)$

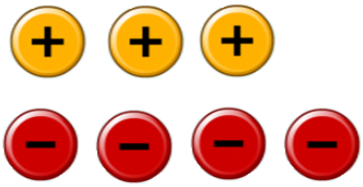


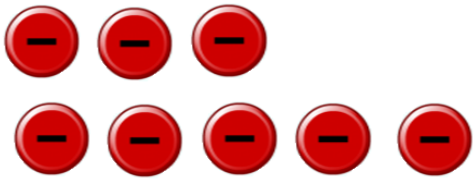
_____

c) $(-3) + (+6) + (-4)$



Example 1: Write the addition equation for each example below and solve.

a) 

b) 

Example 2: Complete each addition equation.

a) $(+3) + \_\_\_\_\_ = (-2)$

b) $\_\_\_\_\_ + (-6) = (-9)$

c) $(-12) + \_\_\_\_\_ = (-4)$

Example3: Write the next three terms in each pattern. What do you add each time?

a) –5, -3, -1, +1, ...

b) 3, -1, -5, -9, -13, ...

Section 2.3: Adding Integers on a Number Line

Number lines are useful for adding and subtracting integers.

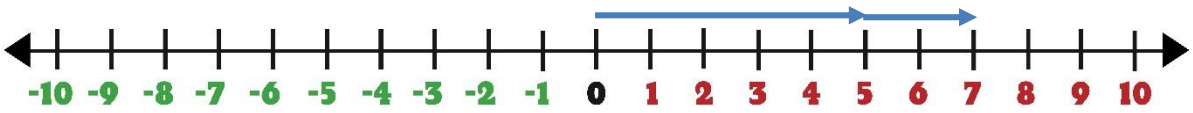
To add integers on a number line, remember the following:

1. starting at zero, move to the first number on the number line
2. the second integer indicates how many spaces to move in the positive or negative direction.

Examples:

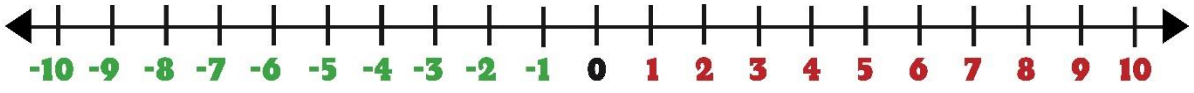
a) $(+5) + (+2)$

Start at zero and move 5 spaces to the right. From this point we move another two spaces right. We end on _____.

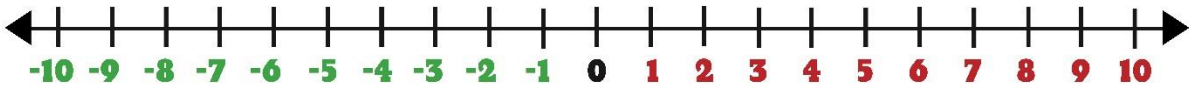


b) $(-4) + (-2)$

Start at zero and move 4 spaces left. From this point, we move another 2 spaces left. We end on _____.



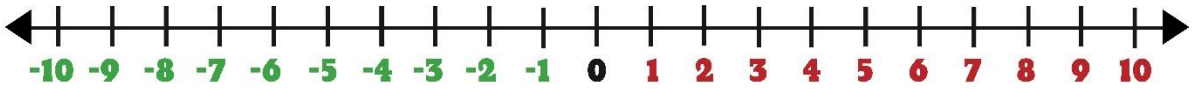
c) $(+3) + (-6)$



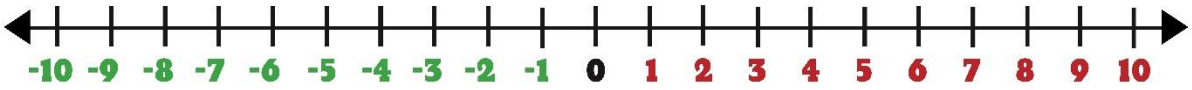
Try the following:

Example 1: Using the number lines below, add the following:

a) $(+6) + (-2)$

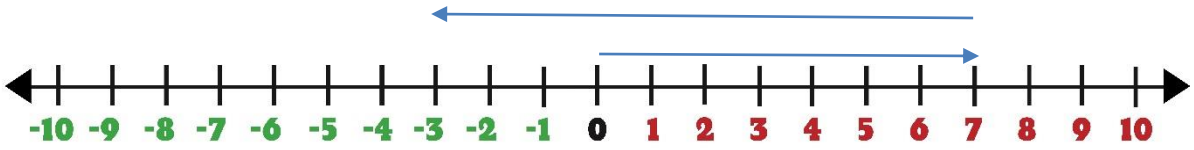


b) $(-7) + (+5)$

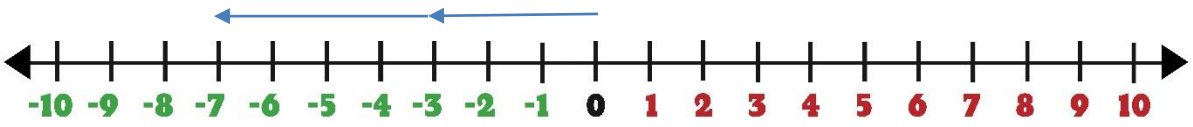


Example 2: Write the addition equation modeled by each number line below:

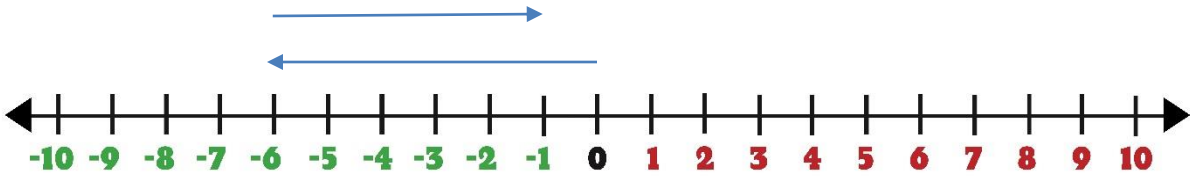
a)



b)



c)



Practice Problems

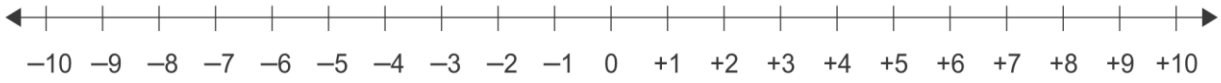
1. Use integer tiles to find each sum and complete each equation.

a) $(+6) + (-12) =$ ____ b) $(-10) + (-4) =$ ____ c) $(-8) + (-9) =$ _____

2. Use the number lines to solve each of the following:

a) $(+4) + (-6) =$ ____

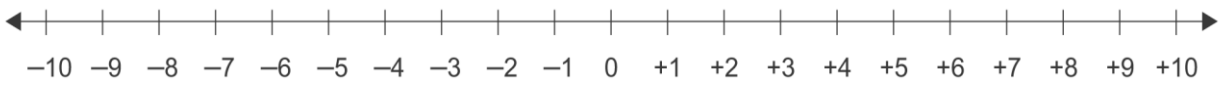
b) $(-7) + (+8) =$ ____



c) $(-10) + (+3) =$ ____

d) $(+9) + (-6) + (-7) =$ ____

e) $(-1) + (+8) + (-15) =$ ____



2. Write an addition statement for each situation. Find the sum.
What does the sum represent?

a) The temperature in Victoria was 15°C in the afternoon. By midnight, the temperature had dropped 8°C.

b) The temperature in Calgary was – 10°C. A Chinook caused the temperature to rise 12°C.

c) The temperature in Ottawa was – 3°C. A cold front passed and the temperature dropped 8°C.

d) The temperature in St. John's was – 4°C at 4 a.m. By noon, the temperature had risen 10°C.

3. Represent each sentence with integers, then find each sum.
   What does the sum represent?

a) The elevation of the base of the building is 345 m above sea level.
   The building is 50 m high.

b) The elevation of the base of the building is 75 m below sea level.
   The building is 15 m high.

c) The elevation of the top of the trench is 237 m below sea level.
   The trench is 10 m deep.

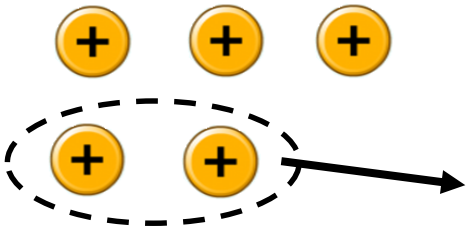
4. These are the scores on each hole of mini-golf. Find the total score.

Score	−2	+1	0	+3	−1	+2	−1	0	−2

Section 2.4: Subtracting Integers with Tiles

To use tiles to subtract integers, we model the first integer, then remove the number of tiles indicated by the second integer.

For example, $(+5) - (+2)$



We are left with _____.

Let's consider $(+4) - (+6)$.

How do we remove +6 when we only have +4?

Example 1:

a) $(-6) - (+4)$

b) $(+3) - (-1)$

c) $(+6) - (+5)$

d) $(-3) - (+5)$

Look closely at your answers above and then look again at the equations. What do you notice? Can you write a rule to make subtracting easier?

Example 2: Complete each equation.

a) $(-3) - \_\_\_\_\_ = +2$

b) $\_\_\_\_\_ - (+1) = (+4)$

c) $(+8) - \_\_\_\_\_ = +10$

Practice Problems

1. Use tiles to subtract.

a) (+7) – (+4) b) (–9) – (–5) c) (+8) – (+12)

d) (–3) – (–8) e) (+7) – (–3) f) (–5) – (+4)

2. What do you subtract from each integer to get the answer +4?
Use coloured tiles if they help.

a) +6 b) –3 d) 0

3. What do you subtract from each integer in question 2 to get the answer –4?

4. Subtract.

a) (–5) – (–8) b) (–12) – (–4) c) (+8) – (+11)

d) 0 – (+3) e) (–8) – (–5) f) (+11) – (+8)

5. Complete the magic square for a magic sum of 0.

Subtract –2 from each entry. Is it still a magic square?

–1		–3
		+2
+3	–4	

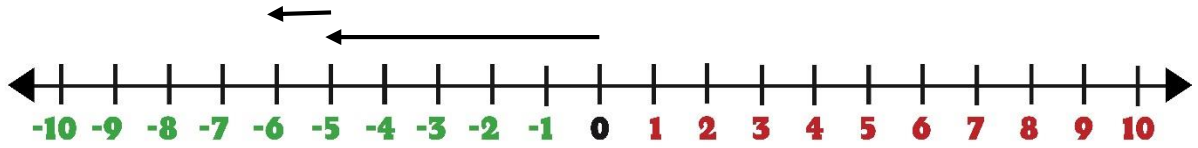
Section 2.5: Subtracting Integers on a Number Line

To subtract integers using a number line, start at the first integer.

For example,

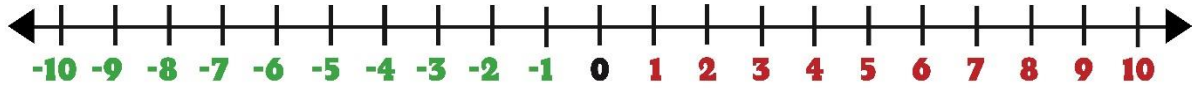
a) $(-5) - (+1)$

Move to -5. To subtract one, we move left one space.

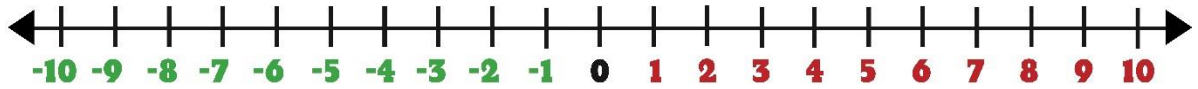


When we move left another space, we end on _____.

b) $(+3) - (+5)$



c) $(+4) - (-7)$



Practice Problems

Subtract the following integers using the number line provided.

1. (+9) – (+3)

2. (+4) – (-2)

3. (-2) – (+5)

4. (-2) – (-4)