Understanding Integers

Opposites

Look at the words below. Pause the lesson and see if you can find the "opposites".

hot	plus
3 more than	below
above	cold
3 less than	minus

Integers are numbers that have opposites. We call them positive and negative integers.

For example, –3 is the opposite of +3, and +10 is the opposite of –10.

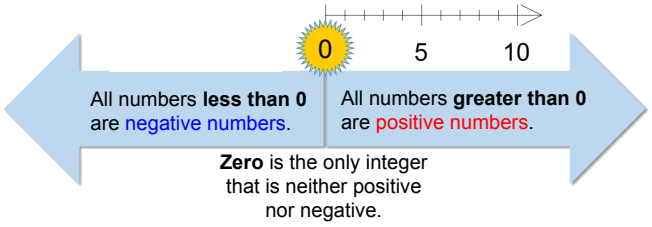
Opposite integers add up to 0.

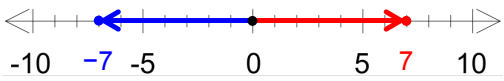
–3 + 3 = 0 –10 + 10 = 0

An Integer Number Line

This number line shows the integers from 0 to 10.

We can show their **opposites** by extending the number line in the opposite direction.

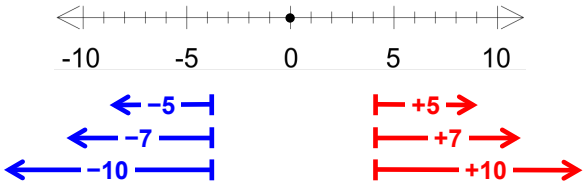




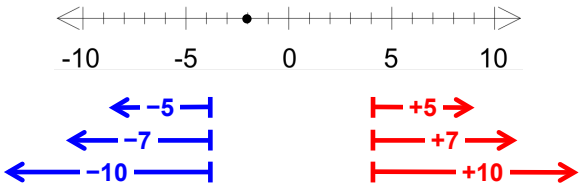
Two integers are **opposites** if they are each the same distance away from zero, but on opposite sides of the number line. One will have a positive sign, the other a negative sign.

Adding Integers Using a Number Line

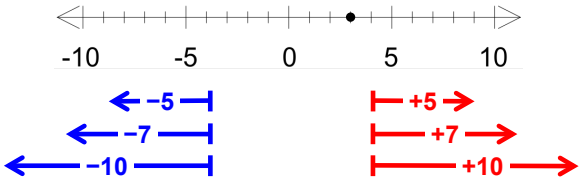
If we add +5 and –5 we get 0.



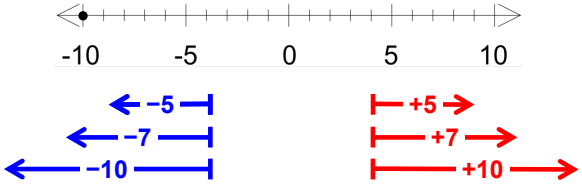
If we add +5 and −7 we get −2.



If we add +10 and −7 we get +3.



If we add −5 and −5 we get −10.

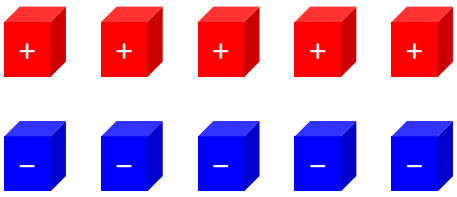


Adding Integers Using Integer Cubes

We represent a positive integer with red cubes.

We represent a negative integer with blue cubes.

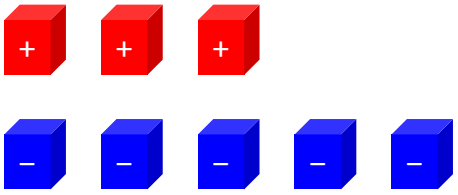
These cubes represent 5 + (–5) = 0



When you combine a positive cube with a negative cube you form a **zero pair**.

We formed 5 zero pairs, so nothing is left.

These cubes represent 3 + (–5) = –2

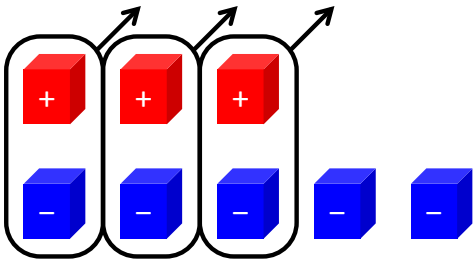


We formed 3 zero pairs, and 2 negative integers are left.

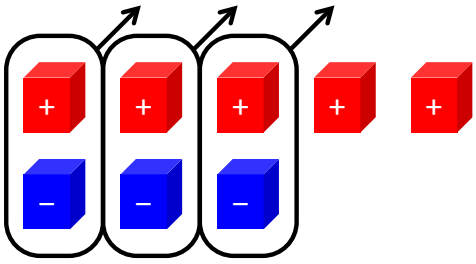
When we show the addition of integer cubes on paper, we do it this way.

We draw a loop around each zero pair and add an arrow to show that it disappears.

Pause the lesson and see if you can represent 5 + (–3) using integer cubes. (Draw squares on paper)



$$3+(-5)=-2$$

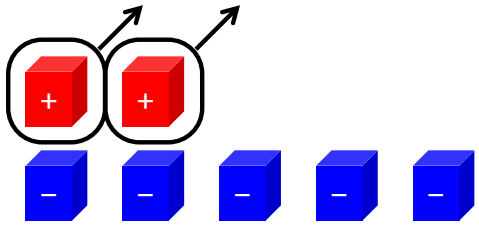


$$5+(-3)=2$$

Subtracting Integers Using Integer Cubes

When we subtract integers, we can subtract a:

- Positive from a negative
  $-3 - 2 = -5$



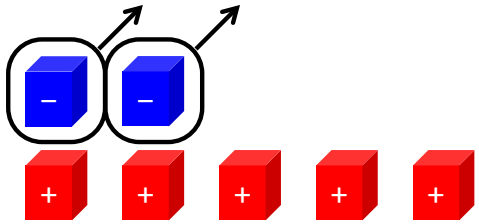
Start with 3 negative integer cubes.

Add 2 zero pairs.

Subtract 2 positive integer cubes, leaving 5 negative integer cubes.

By adding two zero pairs, you are bringing in 2 positive integers without changing the net value of −3.

- Negative from a positive
  $3 - (-2) = 5$



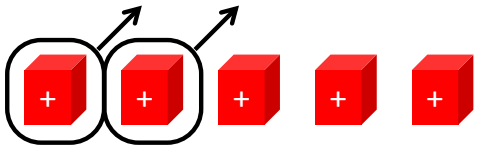
Start with 3 positive integer cubes.

Add 2 zero pairs.

Subtract 2 negative integer cubes, leaving 5 positive integer cubes.

By adding two zero pairs, you are bringing in 2 negative integers without changing the net value of +3.

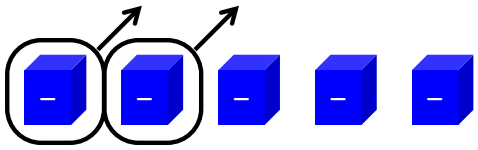
- Positive from a positive
  $5 - 2 = 3$



Start with 5 positive integer cubes.

Subtract 2 positive integer cubes, leaving 3 positive integer cubes.

- Negative from a negative
  $-5 - (-2) = -3$



Start with 5 negative integer cubes.

Subtract 2 negative integer cubes, leaving 3 negative integer cubes.

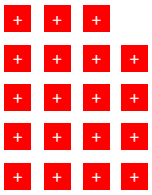
Temperature Scales

Temperature scales on thermometers include positive and negative integers.

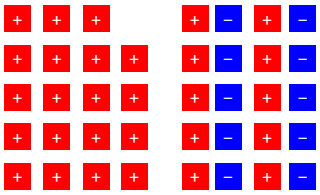
If the temperature rose from −10°C to 19°C, how many degrees did it change?

$19° - (-10°) = 29°$

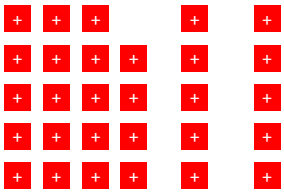
Start with 19 positive integer cubes.



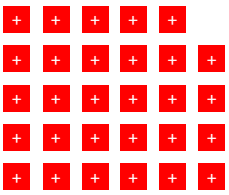
Introduce 10 zero pairs.

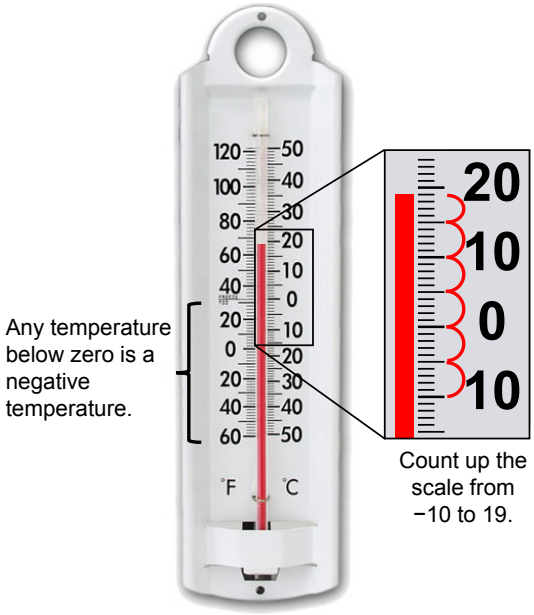


Subtract 10 negative integer cubes.



29 positive integer cubes remain.





Altitudes

Altitude is the height above or below sea level.

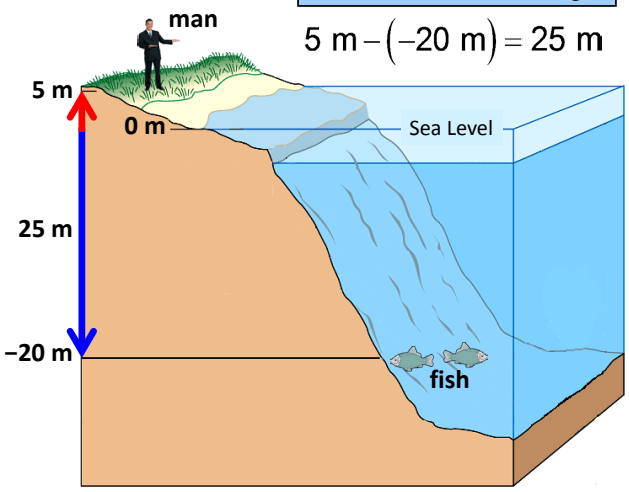
Altitudes **above sea level** are **positive** integers.

Altitudes **below sea level** are **negative** integers.

If the man is at an altitude of 5 m and the fish are at −20 m, how far apart are they vertically?

Subtracting a **negative** is the same as adding.

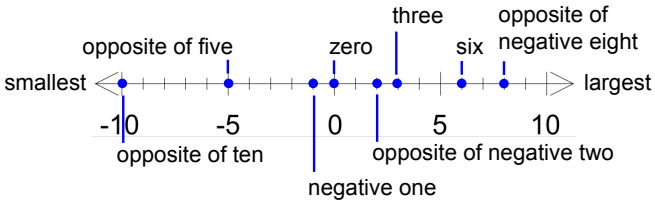
$5\text{ m} - (-20\text{ m}) = 25\text{ m}$



Example

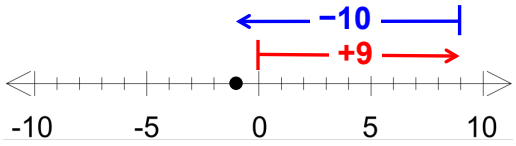
1. Arrange the following integers in order from smallest to largest:

six	opposite of negative two
opposite of five	negative one
zero	opposite of ten
three	opposite of negative eight

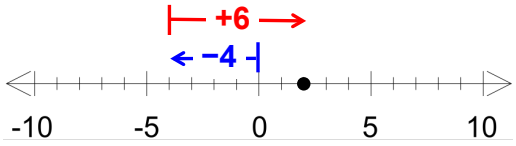


2. Represent the following number sentences on the number line. Use a red line for positive numbers and a blue line for negative numbers. Show the sum with a black dot.

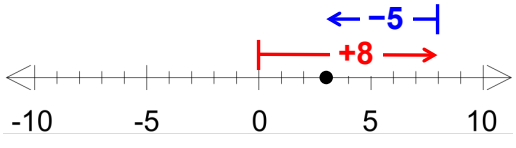
a. 9 + (–10) = –1



b. –4 + 6 = 2

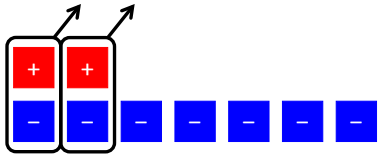


c. 8 + (–5) = 3

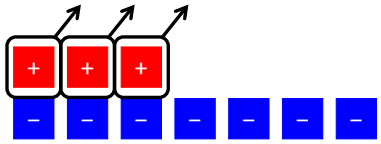


3. Represent the following number sentences using integer cubes.

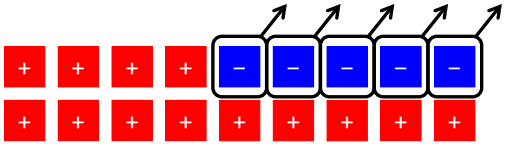
a. 2 + (–7) = –5



b. –4 – 3 = –7



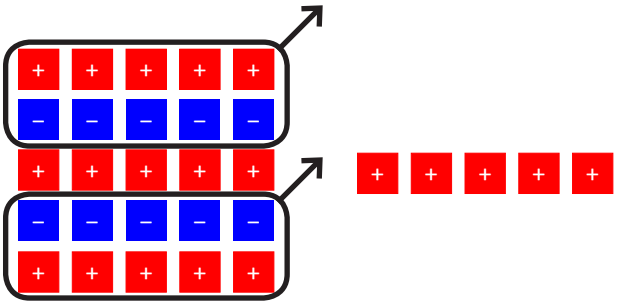
c. 8 – (–5) = 13



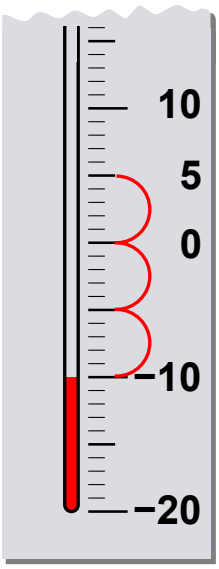
4. What temperature would be 15°C more than the temperature shown on the thermometer?

The temperature starts at –10°C and goes up 15°C.

–10 + 15 = 5°C

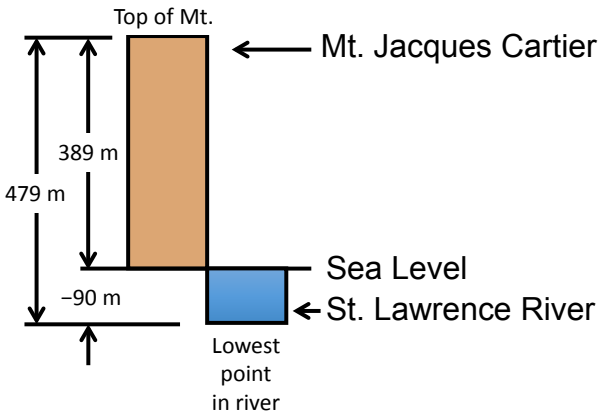


Count up 15 degrees on the thermometer.



5. The lowest point of the St. Lawrence River is 90 meters below sea level. The top of Mt. Jacques Cartier is 389 meters above sea level. How many meters higher is the top of Mt. Jacques Cartier than the lowest point of the St. Lawrence River? Show your work.

We'll represent the mountain (brown rectangle) and the river (blue rectangle) with the sea level between them.



Now we'll add the altitudes.

389 – (–90) =

389 + 90 = 479 m