What are Integers?

Definition

An **integer** is a positive or negative whole number. The following are all integers:

<p style="text-align:center; color:red;">…, -3, -2, -1, 0, 1, 2, 3, …</p>

Integers are used in math courses and also in everyday life. More specifically, negative integers can be found when reading cold temperatures, when reporting golf scores with respect to par, and when reporting a depth below sea level.

Adding Integers with the Same Sign

When adding integers that share the **same** sign, you:

1. **Add** the numbers together (ignoring the signs for a moment).
2. **Keep the original sign** when writing the sum.

Example 1: 3 + 9

Add 3 and 9 to get 12.
The understood sign of both numbers is positive, so the sum is also positive.
3 + 9 = 12

Example 2: 4 + 11

Add 4 and 11 to get 15.
The understood sign of both numbers is positive, so the sum is also positive.
4 + 11 = 15

Example 3: -5 + (-3)

Add 5 and 3 to get 8.
The sign of both numbers is negative, so the sum is also negative.
-5 + (-3) = -8

Example 4: -7 + (-2)

Add 7 and 2 to get 9.
The sign of both numbers is negative, so the sum is also negative.
-7 + (-2) = -9

Adding Integers with Different Signs

When adding integers that have **different signs**, you:

1. **Subtract** the smaller number from the larger one (ignoring the signs for a moment).
2. The sum carries the **sign of the larger number**.

Example 1: 2 + (-8)

Subtract 2 from 8 to get 6.
The sign of the larger number is negative, so the sum is negative.
2 + (-8) = -6

Example 2: -9 + 1

Subtract 1 from 9 to get 8.
The sign of the larger number is negative, so the sum is negative.
-9 + 1 = -8

Example 3: -5 + 16

Subtract 5 from 16 to get 11.
The sign of the larger number is positive, so the sum is positive.
-5 + 16 = 11

Example 4: 7 + (-3)

Subtract 3 from 7 to get 4.
The sign of the larger number is positive, so the sum is positive.
7 + (-3) = 4

Subtracting Integers

The subtraction of integers can be rewritten as addition, as long as you "add the opposite." By opposite, we mean the same term with the opposite sign. Another name for this is the **additive inverse**.

The opposite of 3 is -3.
The opposite of -10 is 10.
The opposite of x is –x.

When subtracting integers:

1. **Rewrite the problem** as the first term plus the opposite of the second term.
2. **Follow the appropriate addition rules** given above.

Example 1: 5 - 9

This reads as "positive five **minus positive** nine." Rewrite the subtraction as addition, and make sure to add the opposite:
= 5 + (-9)
This now reads as "positive five **plus negative** nine."
We are adding two numbers with different signs so subtract and take the sign of the larger number.   5 – 9 = -4

Note: You can also follow the rules for adding two numbers with different signs stated above and get the same answer. The problem 5 – 9 is the same as adding a positive 5 and a negative 9. There is no need to rewrite the problem.

Example 2: - 3 - 8

This reads as "negative three **minus positive** eight." Rewrite the subtraction as addition, and make sure to add the opposite: -3 + (-8). This now reads as "negative three **plus negative** eight." We are adding two numbers with the same sign, so add and keep the original sign.   -3 -8 = -11

Note: You can also follow the rules for adding two numbers with the same signs stated above and get the same answer. The problem 5 – 9 is the same as adding a positive 5 and a negative 9. There is no need to rewrite the problem.

Example 3: 7 – (-1)

This reads as "positive seven **minus negative** one." Rewrite the subtraction as addition, and make sure to add the opposite: 7 + 1. This now reads as "positive seven **plus positive** one." We are adding two numbers with the same sign so add and keep the original sign.
7 – (-1) = 8

Note: There is also a rule that says a "minus sign outside parentheses is changed to a positive sign and the number(s) inside the parentheses are changed to their opposites."

Multiplying and Dividing Integers

The sign rules for **multiplying and dividing integers** are the same. The rules are listed below and assume that only two numbers are being multiplied or divided.

Positive •/÷ positive = positive
Positive •/÷ negative = negative
Negative •/÷ positive = negative
Negative •/÷ negative = positive

A simple way to remember the sign rules are: same signs become positive; different signs become negative.

Steps:
1. The word "product" means multiplication and the word "quotient" means divide.
2. Perform the indicated operation (either multiplication or division).
3. Note the appropriate sign, based on the chart provided above.

Example 1: 3 • 9

The product of 3 and 9 is 27.
Since both factors are positive, the product is also positive.
3 • 9 = 27

Example 2: -8 • 2

The product of 8 and 2 is 16.
Since the factors have different signs, the product is negative.
-8 • 2 = -16

Example 3: -5 • (-4)
The product of 5 and 4 is 20.
Since the factors have the same sign, the product is positive.
-5 • (-4) = 20

Example #4: -21 ÷ 3

The quotient of 21 and 3 is 7.
Since the numbers have different signs, the quotient is negative.
-21 ÷ 3 = -7

Example #5: -10 ÷ (-2)
The quotient of 10 and 2 is 5.
Since the numbers have the same sign, the quotient is positive.
-10 ÷ (-2) = 5