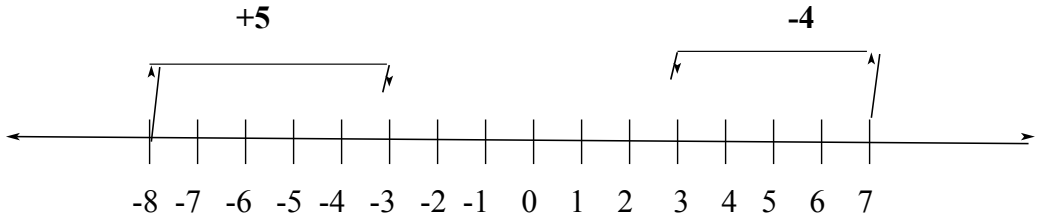
Addition and Subtraction of Integers

Integers are the negative numbers, zero, and positive numbers

Addition of integers

An integer can be represented or graphed on a number line by an arrow. An arrow pointing to the right represents a positive number. An arrow pointing to the left represents a negative number. The absolute value of the number can be determined by counting the distance to zero, or by counting the distance between numbers in the arrow. The integers 5 and –4 are shown on the number line in the figure below.

Example:



Example:

Another example of integers or positive and negative numbers is used with a checking account or dealing with money. A deposit to your checking account or pocket is an example of an addition called a positive integer (number or amount); a deduction or expense is an example of a negative integer (number/amount).

If there is a balance of $25 in a checking account, and a check is written for $30, the account will be overdrawn/overspent by $5.

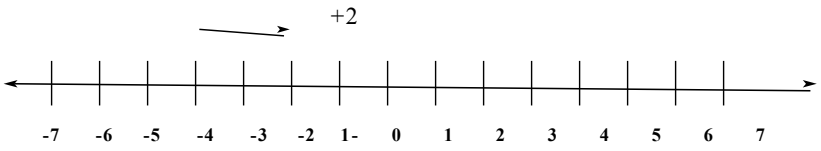
The sum of two integers can be shown on a numberline. To add two integers, find the point on the number line corresponding to the first addend (integer). The sum is the number directly below the tip of the arrow.

Example:

4 + 2 = 6

-4 +(-2) = - 6

-4 + 2 = -2



4 + (-2) = 2

The signs of the addends can categorize the sums shown above.

The addends have the same sign.

4 + 2 = 6 **positive 4 plus positive 2 equals 6**
-4 + (-2)= -6 **negative 4 plus negative 2 equals –6**

The addends have different signs.

-4 + 2 = -2 **negative 4 plus positive 2 equals negative 2**

4 + (-2) = -6 **positive 4 plus negative 2 equals positive 2**

The rule for adding two integers depends on whether the signs of the addends are the same or different.

Rule for Adding Two Integers:

TO ADD INTEGERS WITH THE SAME SIGN, add the absolute values of the numbers. Then attach the sign of the addends.

TO ADD INTEGERS WITH DIFFERENT SIGNS, find the absolute values of the numbers. Subtract the smaller absolute value from the larger absolute value. Then attach the sign of the addend with the largest value.

Examples:

Add: **(-4) +(-9) = -13**
-14 + (-47) = - 61
6 + -13 = - 7
162 + (-247) = -85
-8 + 8 = 0

Note: in the last example we are adding a number and its opposite –8 + 8 = 0. The sum of a number and its additive inverse is always zero.

The properties of addition of whole numbers hold true for integers too.

The Addition Property of Zero $a + 0 = a$ or $0 + a = a$

The Commutative Property of Addition $a + b = b + a$

The Associative Property of Addition $(a + b) + c = a + (b + c)$

The Inverse Property of Addition $a + (-a) = 0$ or $-a + a = 0$

Add: (-4) + (-6) +(-8) + 9

Add the first two numbers (-4) + (-6) = (-10)

Add the sum to the third number (-10) + (-8) = (-18)

Continue until all the numbers have been added (-18) + 9 = -9

Example:
Add the five changes in price of stock:

-2 + (-3) + (-1) + (-2) + (-1)
= (-5) + (-1) +(-2) + (-1)
= (-6) +(-2) + (-1)
= -8 + (-1)
= -9

The change is – 9. This means that the price of the stock fell $9 per share.

Example:

Evaluate –x + y when x = -15 and y = -5. **-x + y**

Replace x with –15 and y with –5 **-(-15) + (-5)**

Simplify –(-15). **=15 + (-5)**

Add **= 10**

Example:

Is – 7 a solution of the equation $x + 4 = -3$?

Replace x by - 7 and then simplify. $-7 + 4 = -3$

$-3 = -3$

The results are equal. –7 is a solution of the equation.

Subtraction of integers

Recall that the sign – can indicate the sign of a number, as in –3 (negative 3), or can indicate the operation of subtraction, as in 9 – 3 (nine minus three).

Subtraction of integers can be written as the addition of the opposite number. To subtract two integers, rewrite the subtraction expression as the first number plus the opposite of the second number. Some examples are shown below.

First number	-	second number	=	First number	+	opposite of the second number		
8	-	15	=	8	+	(-15)	=	-7
8	-	(-15)	=	8	+	15	=	23
-8	-	15	=	-8	+	(-15)	=	-23
-8	-	(-15)	=	-8	+	15	=	7

Rule for Subtracting Two Integers

To subtract two integers, add the opposite of the second integer to the first integer. This can be written symbolically as $a - b = a + (-b)$.

Subtract (-15) – 75

Rewrite the subtraction operation as he sum of the first number and the opposite of the second number. The opposite of 75 is - 75.

(-15) - 75
= (-15) + (-75)
= - 90

Add.

When subtraction occurs several times in an expression, rewrite each subtraction as addition of the opposite and then add.

Subtract : -13 - 5 - (-8)

	-13 - 5 - (-8)
Rewrite each subtraction as addition of the Opposite.	= -13 + (-5) + 8
	= -18 + 8
Add.	= - 10