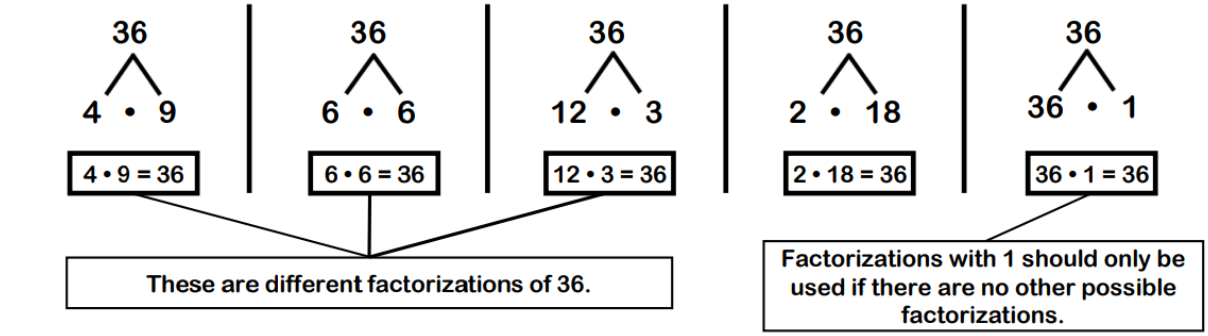
Math: Pre-Algebra Session #1

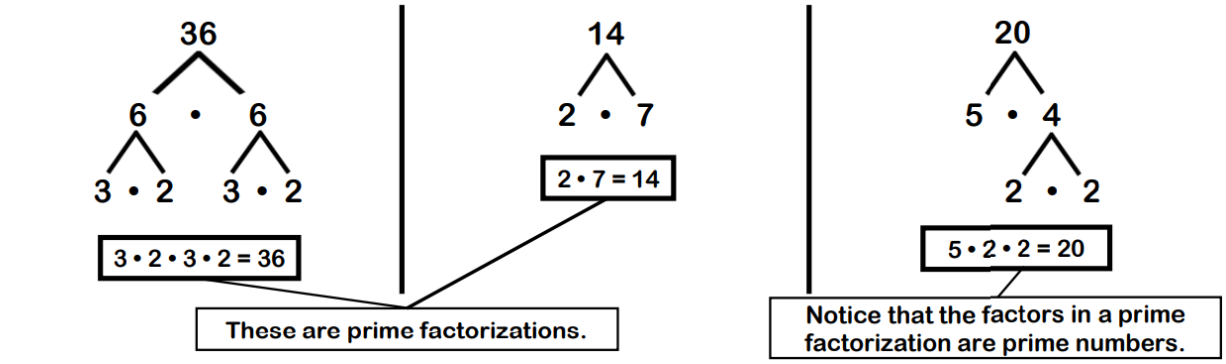
Factorization

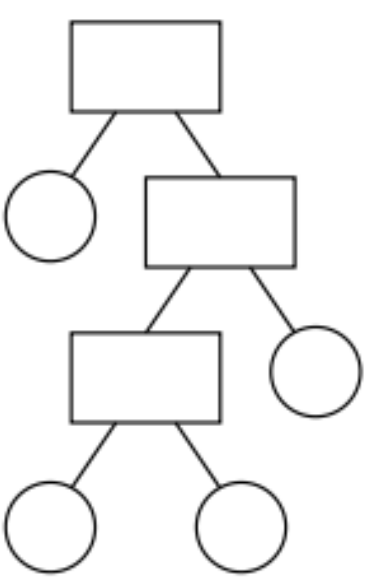
A factor is a number that evenly divides another number, which means all factors will be whole numbers. Let's look at a few ways to factor 36.

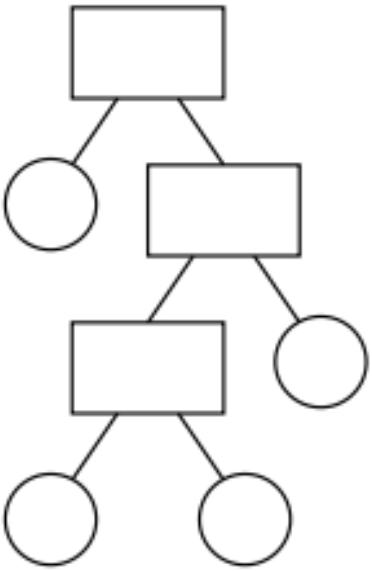


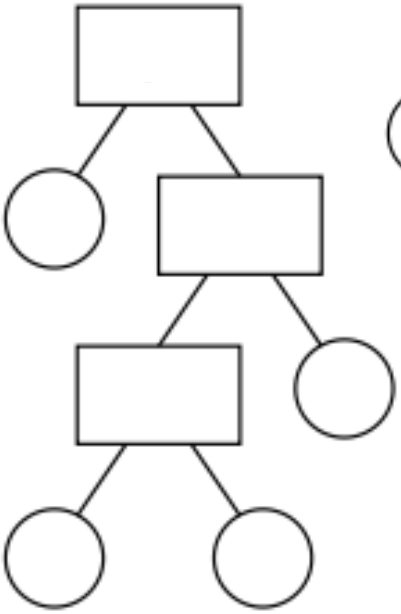
Prime Factorization

Now let's try factoring a number until all the factors are prime factors. We will call the result the prime factorization of the number.









1. Natural Numbers

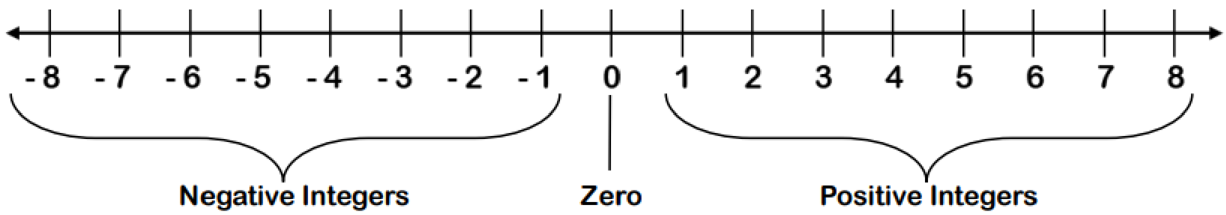
This is the set of all positive integers.

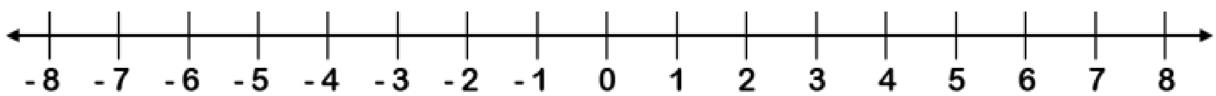
2. Whole Numbers

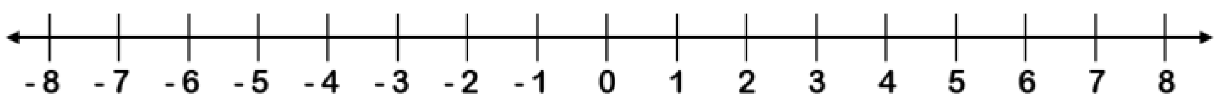
This is the set of all positive integers and zero.

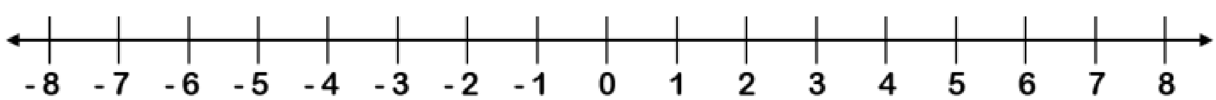
3. Integers

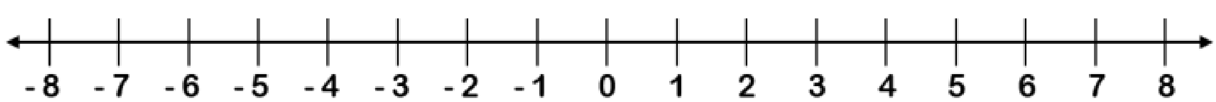
This is the set of all positive integers, negative integers, and zero.











Adding Integers Using Rules

Follow these rules for adding integers.

Same Sign: Add and keep the sign.

Opposite Signs: Subtract and keep the sign of the bigger number.

Same Sign (+)	Same Sign (-)	Opposite Signs (+)	Opposite Signs (-)
8 + 3 = 11	-4 + -3 = -7	-3 + 5 = 2	5 + -9 = -4
Both integers are positive, so the answer is a positive integer.	Both integers are negative, so the answer is a negative integer.	The 5 is bigger than 3, so we will subtract and keep the sign of the 5.	The 9 is bigger than 5, so we will subtract and keep the sign of the 9.

Identity Property of Addition

Identity Property of Addition

$a + 0 = a$ & $0 + a = a$

where a is any integer

The identity property of addition tells us that the sum of 0 and any integer will equal the integer itself.

Commutative Property of Addition

Commutative Property of Addition

$$a + b = b + a$$

where a and b are integers

The commutative property of addition states that the sum of two integers will be the same regardless of their order.

Associative Property of Addition

Associative Property of Addition

$$(a + b) + c = a + (b + c)$$

where a, b, and c are integers

The associative property of addition states that the sum of more than two integers will be the same regardless of which integers are added together first.

Adding Integers Using the Zero Principle

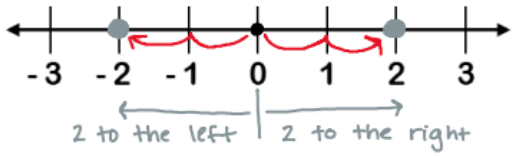
The zero principle states that the sum of two opposite integers will be 0.

Zero Principle

$a + -a = 0$ & $-a + a = 0$

where a and -a are opposite integers

Opposite integers are two integers that are the same distance away from 0, but in opposite directions. For example, 2 and -2 are opposite integers.



Another way to find an opposite integer is to simply place a negative sign (-) in front of the integer you wish to find the opposite of.

This method works well to find the opposite of a positive integer.

Opposite of 8 → - (8) → -8

To find the opposite of a negative integer, there is one extra step.

Opposite of -5 → -(-5) → 5

* Two negatives make a positive

Subtraction of integers can be written as the addition of the opposite integer.

Integer Subtraction to Addition		Integer Subtraction to Addition
$a - b = a + -b$	→	$a - (-b) = a + b$
where a and b are integers		where a and b are integers

1st integer	-	2nd integer	=	1st integer	+	Opposite of 2nd integer	=	Answer
9	-	-14	=	9	+	14	=	23
-6	-	-1	=	-6	+	1	=	

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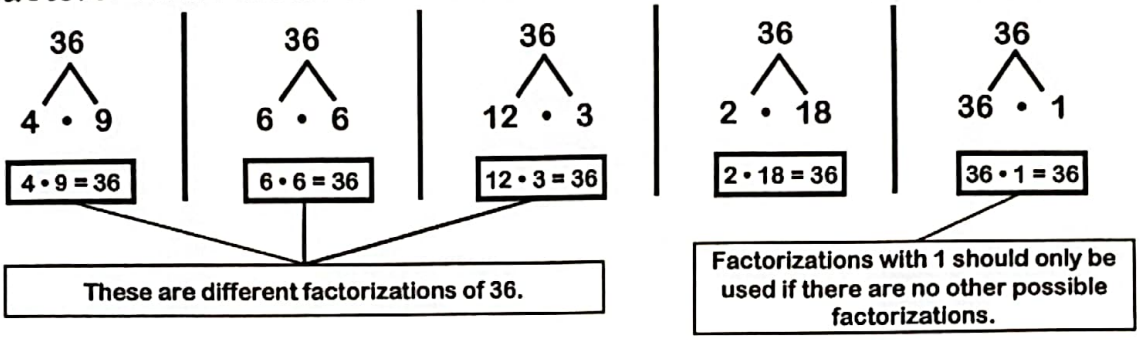
Factorization

A factor is a number that evenly divides another number, which means all factors will be whole numbers. Let's look at a few ways to factor 36.



10: 1x10 2x5

12: 1x12 2x6 3x4

15: 1x15 3x5

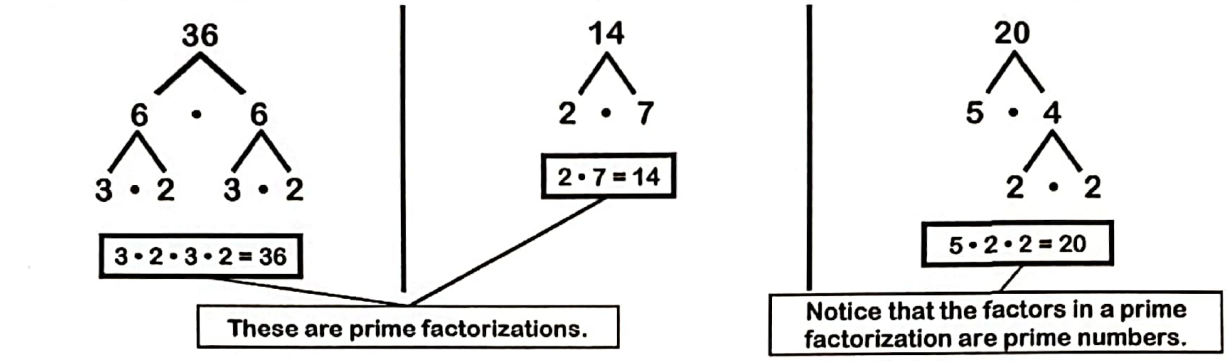
17: 1x17

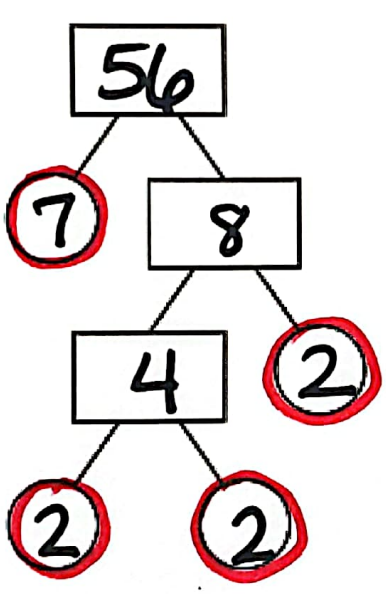
$2 \times 6 = 2 \times (2 \times 3)$

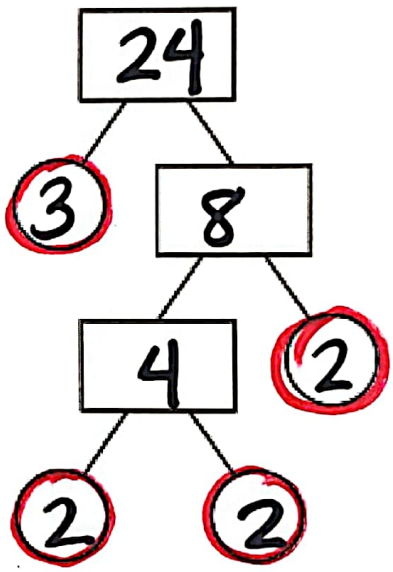
$3 \times 4 = 3 \times (2 \times 2)$

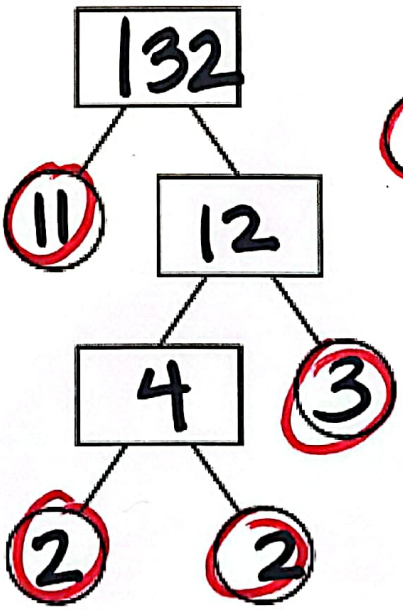
Prime Factorization

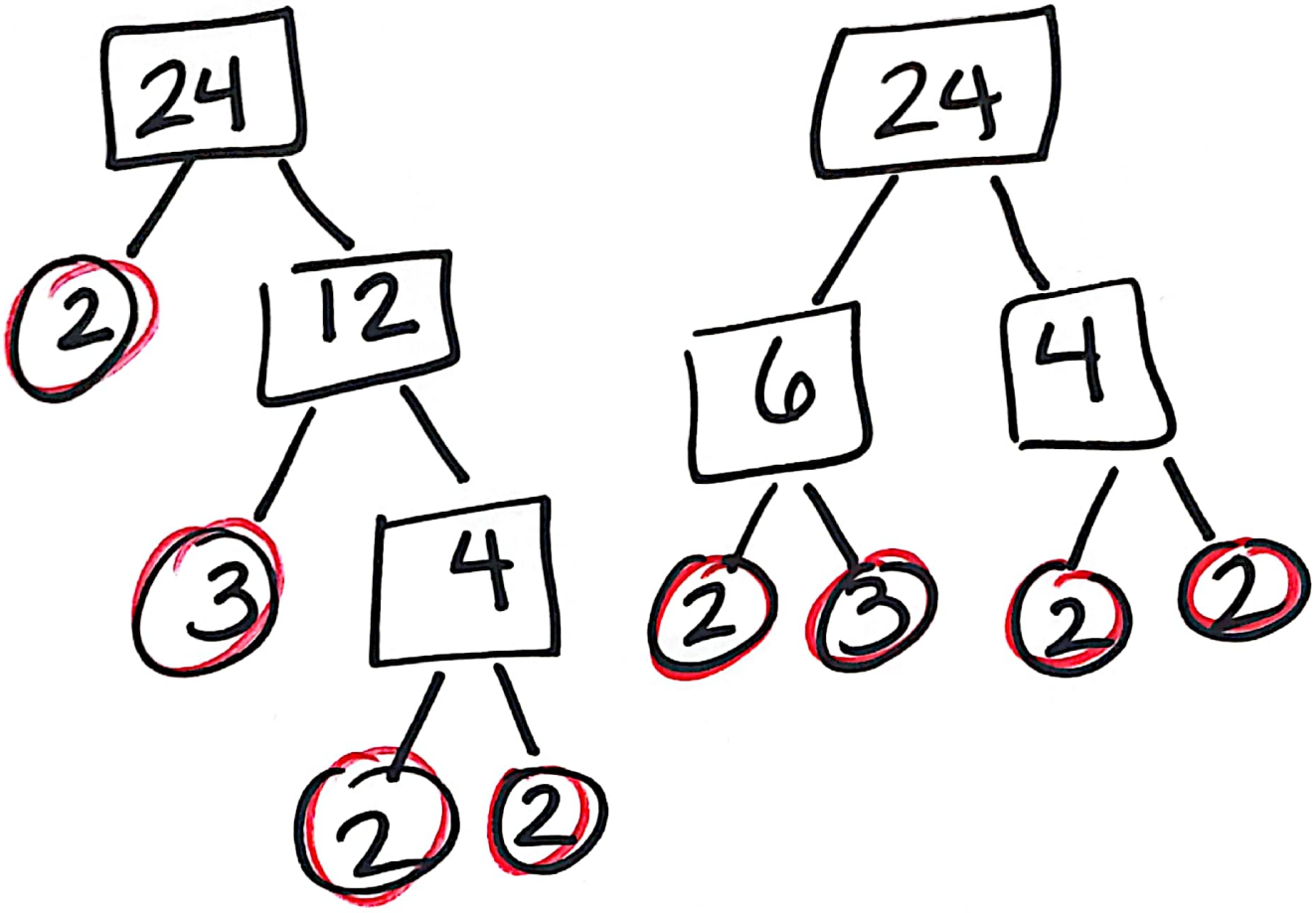
Now let's try factoring a number until all the factors are prime factors. We will call the result the prime factorization of the number.











Prime Factors:

→ 24 : 2, 2, 2, 3 ←

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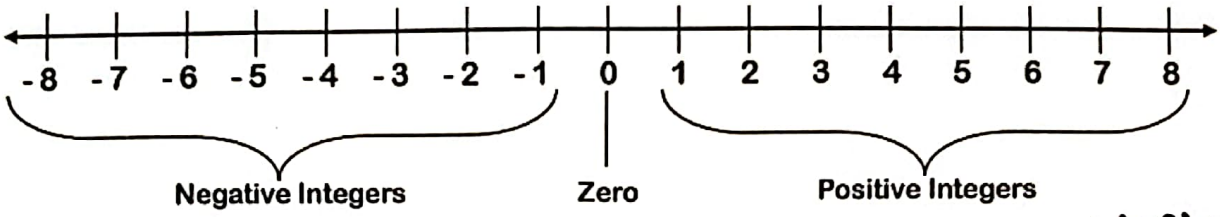
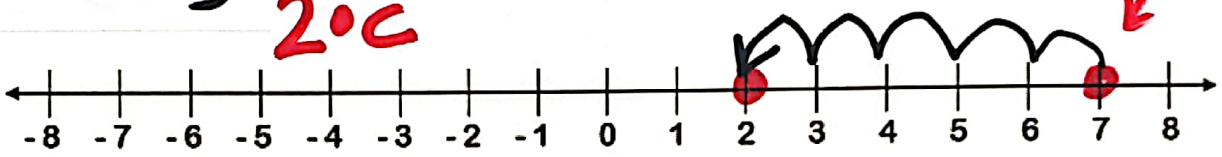
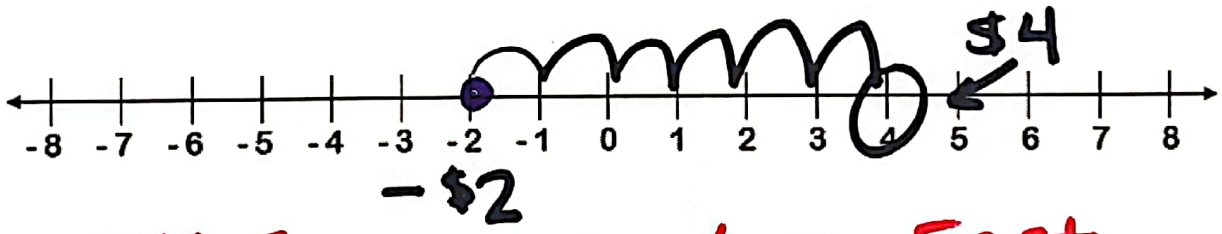


Today is 5°C cooler.



Owe $2

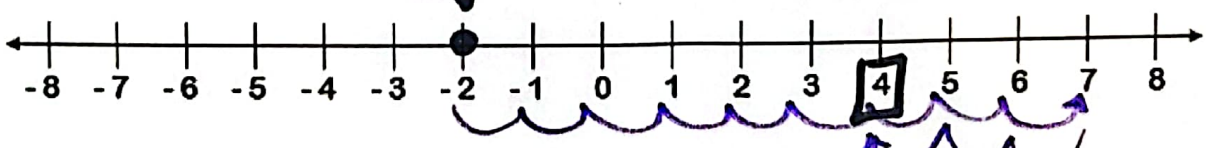
Today I earn $6



Walk 5 m. west, 6 m. East.

Elevator starts

up 9, down 3



finish on floor # 4

Adding Integers Using Rules

Follow these rules for adding integers.

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Both integers are positive, so the answer is a positive integer.	Both integers are negative, so the answer is a negative integer.	The 5 is bigger than 3, so we will subtract and keep the sign of the 5.	The 9 is bigger than 5, so we will subtract and keep the sign of the 9.

$+6 + 4 = +10$ $\quad 5+2=7$

$+3 + 6 = +9$ $\quad 3+1=4$

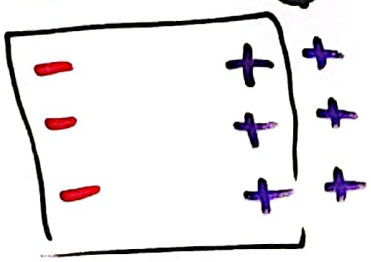
$+6 - 4 = +2$ $\quad +3-1=+2$

$-6 + 4 = -2$ $\quad -3+1=-2$

$-6 - 4 = -10$ $\quad -3-1=-4$

$-3 + 6 = +3$ $\quad 10 + -7$

$10-7=+3$



$-10+7=-3$

Identity Property of Addition

Identity Property of Addition

$a + 0 = a$ & $0 + a = a$

where a is any integer

The identity property of addition tells us that the sum of 0 and any integer will equal the integer itself.

$6 + 0 = 6$

$0 + 6 = 6$

$-6 + 0 = -6$

Commutative Property of Addition

Commutative Property of Addition

$a + b = b + a$

where a and b are integers

The commutative property of addition states that the sum of two integers will be the same regardless of their order.

$3 + 2 = 5$

$2 + 3 = 5$

$5 + 1 = 6$

$1 + 5 = 6$

$2 + 7 = 9$

$7 + 2 = 9$

Associative Property of Addition

Associative Property of Addition

$(a + b) + c = a + (b + c)$

where a, b, and c are integers

The associative property of addition states that the sum of more than two integers will be the same regardless of which integers are added together first.

$(3+2)+5$

$5 + 5 = 10$

$3 + (2 + 5) = 10$

$3 + 7$

Adding Integers Using the Zero Principle

The zero principle states that the sum of two opposite integers will be 0.

Zero Principle

$a + -a = 0$ & $-a + a = 0$

where a and -a are opposite integers

$+8 - 8 = 0$

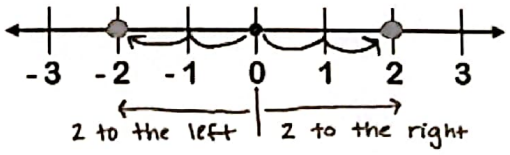
$-2 + 2 = 0$

$+3 - 3 = 0$

$-14 + 14 = 0$

$9 - 9 = 0$

Opposite integers are two integers that are the same distance away from 0, but in opposite directions. For example, 2 and -2 are opposite integers.



$2 - -5 = 2 + 5 = 7$

$-2 - -5 = -2 + 5 = 3$

see next page

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This method works well to find the opposite of a positive integer.

Opposite of 8 → - (8) → -8

To find the opposite of a negative integer, there is one extra step.

Opposite of -5 → -(-5) → 5

*** Two negatives make a positive**

$$4 - -3 = 4 + 3 = 7$$

$$8 - -4 = 8 + 4 = 12$$

$$-8 - -4 = -8 + 4 = -4$$

$$-10 - -7 = -10 + 7 = -3$$

$$-3 - -3 = -3 + 3 = 0$$

Subtraction of integers can be written as the addition of the opposite integer.

Integer Subtraction to Addition	→	Integer Subtraction to Addition
$a - b = a + -b$ where a and b are integers		$a - (-b) = a + b$ where a and b are integers

1st integer	-	2nd integer	=	1st integer	+	Opposite of 2nd integer	=	Answer
9	-	-14	=	9	+	14	=	23
-6	-	-1	=	-6	+	1	=	-5

$-2 - -10 = -2 + 10 = +8$

$2 - -4 = 2 + 4 = 6$

$-9 + 0 = -9$

$-9 - -3 = -9 + 3 = -6$

$-10 - -5 = -10 + 5 = -5$

$-3 + -2 = -3 - 2 = -5$

$-3 - +2 = -3 - 2 = -5$