

Integers

- The set of natural numbers, zero and the negatives of natural numbers form the set of Integers (I or Z).
- There is no smallest integer.
- 1 is the smallest positive integer and -1 is the largest negative integer
- The sum of two positive integers results in a positive integer
- The sum of two negative integers results in a negative integer
- The sum of a positive and a negative integer is the difference of the numbers with the sign of the larger
- On the number line when we:
 - (i) add a positive integer, we move to the right
 - (ii) add a negative integer, we move to the left
 - (iii) subtract a positive integer, we move to the left
 - (iv) subtract a negative integer, we move to the right
- The additive identity for integers is 0
- If a is an integer, $-a$ is the additive inverse of a and a is additive inverse of $-a$; $a + (-a) = (-a) + a = 0$
- Subtraction is the opposite of addition, Therefore, to subtract two integers, we add the additive inverse of the integer that is being subtracted to the other integer
Ex: $23 - 43 = 23 + (\text{Additive inverse of } 43) = 23 + (-43) = -20$
- The multiplicative identity for integers is 1; for any integer a, $1 \times a = a \times 1 = a$.
- Product of two positive integers is a positive integer: $(+) \times (+) = (+)$
- Product of two negative integers is a negative integer: $(-) \times (-) = (+)$
- Product of a positive and a negative integer is a negative integer:
 $(+) \times (-) = (-)$ or $(-) \times (+) = (-)$
- Product of even number of negative integers is positive
- Product of odd number of negative integers is negative
- When an integer is multiplied by -1 , we get the additive inverse of the integer

- $\frac{1}{a}$ is the multiplicative inverse or reciprocal of a where $a \neq 0$, also a

$\frac{1}{a}$ is the multiplicative inverse of a; $a \times \frac{1}{a} = \frac{1}{a} \times a = 1$

- Multiplicative inverse of 1 = 1 and Multiplicative inverse of -1 = -1
- The division of a positive integer by a positive integer results in a positive integer :
- The division of a negative integer by a positive integer results in a negative integer or the division of a positive integer by a negative integer results in a negative integer: or
- The division of a negative integer by a negative integer results in a positive integer :

For any integer a, the below properties hold :

$$a \times 0 = 0 \times a = 0$$

$a \div 0$ is not defined

$$0 \div a = 0, a \neq 0$$

$$\text{and } a \times 1 = 1 \times a = a$$

Where, $a \neq 0$

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Properties of Integers	Basic operations			
	Addition	Subtraction	Multiplication	Division
Closure property (for any 2 integers a and b)	$a + b$ is an integer; integers are closed under addition	$a - b$ is an integer ; integers are closed under subtraction	$a \times b$ is an integer ; integers are closed under multiplication	Integers are not closed under division. ,but
Commutative property (for any 2 integers a and b)	$a + b = b + a$;addition is commutative	$a - b \neq b - a$; subtraction is not commutative	$a \times b = b \times a$;multiplication is commutative	; division is not commutative
Associative property: (For any 3 integers a, b and c)	$a + (b + c) = (a + b) + c$;addition is associative	Subtraction is not associative	$a \times (b \times c) = (a \times b) \times c$; multiplicative is associative	Division is not associative

Distributive property of multiplication over addition:	Distributive property of multiplication over subtraction:
For any three integers a, b and c: $a \times (b + c) = (a \times b) + (a \times c)$ Ex: $-2 (4 + 3) = -2 (7) = -14$ $= (-2 \times 4) + (-2 \times 3)$ $= (-8) + (-6)$	For any three integers, a, b and c : $a \times (b - c) = (a \times b) - (a \times c)$ Ex: $-2 (4 - 3) = -2 (1) = -2$ $= (-2 \times 4) - (-2 \times 3)$ $= (-8) - (-6)$

$$= -14.$$

$$= -2.$$

Commutative, Associative and Distributive properties help in making calculations easier