

- Introduction to Integers
- Addition of Integers
- Subtraction of Integers

Introduction to Integers

Integers include positive numbers, zero, and negative numbers. They are used to represent quantities that can be above or below a reference point, such as profit and loss, temperature above or below zero, or steps above or below ground level.

For example, if Sunita's mother has 8 bananas but needs to give 10, she borrows 2 bananas, indicating a negative balance to be returned later. Similarly, a shopkeeper records a due amount as -3 to indicate money owed.

Integers can be represented on a number line extending infinitely in both directions, with zero as the central point. Positive integers lie to the right of zero, and negative integers lie to the left.

Representation on Number Line

Mark zero on a horizontal line. Points to the right are positive integers ($+1, +2, +3, \dots$), and points to the left are negative integers ($-1, -2, -3, \dots$). For example, -6 is six units to the left of zero.

Successor and Predecessor

The successor of a number n is $n + 1$, the number immediately following it. The predecessor of n is $n - 1$, the number immediately before it.

Number	Successor
10	11
8	9
-5	-4
-3	-2
0	1

Number	Predecessor
10	9
8	7
5	4
3	2
0	-1

Use of Signs

Positive integers are denoted with a '+' sign or no sign, and negative integers with a '-' sign. For example, profit is represented as +150, loss as -250.

Examples of signed numbers include:

- Height above sea level: positive
- Height below sea level: negative
- Temperature above 0°C: positive
- Temperature below 0°C: negative

Practice Set – Introduction

- Write the following with appropriate signs: 100 m below sea level, 25°C above 0°C, 15°C below 0°C, and five numbers less than 0.
- Find successors and predecessors of given numbers.
- Represent profit and loss with proper signs.

Answer Key – Introduction

- 100 m below sea level: -100 m
- 25°C above 0°C: $+25^{\circ}\text{C}$
- 15°C below 0°C: -15°C
- Five numbers less than 0: $-1, -2, -3, -4, -5$
- Successor of 10 is 11, predecessor of 0 is -1 , etc.
- Profit: $+\text{₹}150$, Loss: $-\text{₹}250$, etc.

Quick Reference

- Integers: $\dots, -3, -2, -1, 0, 1, 2, 3, \dots$
- Successor of n : $n + 1$
- Predecessor of n : $n - 1$
- Positive integers: numbers greater than zero
- Negative integers: numbers less than zero

Glossary

- **Integer:** A whole number that can be positive, negative, or zero.
- **Successor:** The number that comes immediately after a given number.
- **Predecessor:** The number that comes immediately before a given number.
- **Number Line:** A line with numbers placed at equal intervals used to represent integers visually.
- **Positive Number:** A number greater than zero.
- **Negative Number:** A number less than zero.

Addition of Integers

Addition of integers can be visualized on a number line or using colored buttons representing positive and negative units.

Using Number Line

To add two integers, start at the first integer on the number line and move right if adding a positive integer or left if adding a negative integer.

Example: $3 + 5$

Start at 0, move 3 steps right to 3, then 5 steps right to 8. So, $3 + 5 = 8$.

Example: $(-3) + (-5)$

Start at 0, move 3 steps left to -3 , then 5 steps left to -8 . So, $(-3) + (-5) = -8$.

Example: $5 + (-3)$

Start at 0, move 5 steps right to 5, then 3 steps left to 2. So, $5 + (-3) = 2$.

Using Colored Buttons

White buttons represent $+1$ and black buttons represent -1 . Adding positive and negative integers involves pairing and removing one white and one black button as they cancel out to zero.

Example: $(+4) + (-3)$

Four white buttons and three black buttons: remove three pairs, left with one white button, so result is +1.

Rules for Addition

- Adding two positive integers: add and keep positive sign.
- Adding two negative integers: add and keep negative sign.
- Adding one positive and one negative integer: subtract smaller absolute value from larger and take sign of larger.

Practice Set - Addition

- $(-11) + (-12)$
- $(+10) + (+4)$
- $(-32) + (-25)$
- $(+23) + (+40)$
- $(-7) + (+8)$
- $(+5) + (-8)$
- $(-4) + (+3)$
- $(+6) + (-4)$

Answer Key - Addition

- $(-11) + (-12) = -23$
- $(+10) + (+4) = +14$
- $(-32) + (-25) = -57$
- $(+23) + (+40) = +63$
- $(-7) + (+8) = +1$
- $(+5) + (-8) = -3$
- $(-4) + (+3) = -1$
- $(+6) + (-4) = +2$

Quick Reference

- $(+a) + (+b) = +(a + b)$
- $(-a) + (-b) = -(a + b)$
- $(+a) + (-b) = +(a - b)$ if $a > b$
- $(+a) + (-b) = -(b - a)$ if $b > a$

Glossary

- **Additive Inverse:** For any integer n , its additive inverse is $-n$ such that $n + (-n) = 0$.
- **Absolute Value:** The distance of a number from zero on the number line, denoted $|n|$.

Subtraction of Integers

Subtraction of integers can be understood as adding the additive inverse of the number to be subtracted.

Mathematically,

$$a - b = a + (-b)$$

For example, $6 - (-2) = 6 + 2 = 8$.

Using Number Line

To subtract an integer, move to the left if subtracting a positive integer, and move to the right if subtracting a negative integer (which is equivalent to adding its positive counterpart).

Example: $(-5) - (-4)$

Start at -5 , move 4 steps right to -1 . So, $(-5) - (-4) = -1$.

Examples

- $(-10) - (-4) = -10 + 4 = -6$
- $(-3) - (+3) = -3 + (-3) = -6$
- $6 - 2 = 4$
- $6 - (-2) = 6 + 2 = 8$

Practice Set - Subtraction

- Find $(-8) - (-10)$
- Find $(-7) - (+5)$
- Find $(+4) - (-3)$
- Find $(-6) - (-2)$
- Find $(+3) - (+7)$

Answer Key - Subtraction

- $(-8) - (-10) = -8 + 10 = 2$
- $(-7) - (+5) = -7 + (-5) = -12$
- $(+4) - (-3) = 4 + 3 = 7$
- $(-6) - (-2) = -6 + 2 = -4$
- $(+3) - (+7) = 3 + (-7) = -4$

Quick Reference

- Subtraction of an integer is addition of its additive inverse.
- $a - b = a + (-b)$
- Subtracting a negative integer increases the value.

Glossary

- **Additive Inverse:** The number which when added to a given number results in zero.
- **Subtraction:** Operation of finding the difference between two numbers.

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