Integers

Introduction

Integers are whole numbers along with their negative numbers and zero. They are used in many real-life situations such as measuring temperature, calculating profit and loss, keeping scores in games, and representing heights above or below sea level. This chapter explains the properties of integers and the basic operations performed on them.

What are Integers?

Definition

Integers are a set of numbers that includes positive numbers, negative numbers, and zero.

Examples:

- Positive Integers: 1, 2, 3, 4...
- Negative Integers: -1, -2, -3, -4...
- Zero: 0

Integers are represented on a **number line**.

Representation on a Number Line

Number Line

A number line helps us compare and understand integers.

- Numbers increase as we move to the **right**.
- Numbers decrease as we move to the **left**.
- Zero lies at the centre of the number line.
- Every positive integer has a corresponding negative integer.

Addition of Integers

Rules for Addition

When adding integers:

- **Positive + Positive = Positive**
- **Negative + Negative = Negative**
- **Positive + Negative:** Subtract the smaller number from the larger one and keep the sign of the larger number.

Examples:

- 5 + 3 = 8
- (-4) + (-6) = -10
- 8 + (-3) = 5
- (-9) + 4 = -5

Subtraction of Integers

Rules for Subtraction

To subtract integers, add the additive inverse of the second number.

Formula:

a − b = a + (-b)

Examples:

- 7 − 4 = 3
- 5 − (-2) = 7
- (-6) − 3 = -9
- (-8) − (-5) = -3

Multiplication of Integers

Rules for Multiplication

The sign of the product depends on the signs of the numbers.

- (+) × (+) = (+)
- (-) × (-) = (+)
- (+) × (-) = (-)
- (-) × (+) = (-)

Examples:

- 4 × 5 = 20
- (-6) × (-2) = 12
- (-7) × 3 = -21

Division of Integers

Rules for Division

The rules of division are similar to multiplication.

- (+) ÷ (+) = (+)
- (-) ÷ (-) = (+)
- (+) ÷ (-) = (-)
- (-) ÷ (+) = (-)

Examples:

- 20 ÷ 5 = 4
- (-18) ÷ 3 = -6
- (-24) ÷ (-6) = 4

Division by **zero is not defined**.

Properties of Integers

Important Properties

- **Closure Property:** Integers are closed under addition, subtraction, and multiplication, but not under division.
- **Commutative Property:** Applies to addition and multiplication only.
- **Associative Property:** Applies to addition and multiplication only.
- **Distributive Property:** Multiplication distributes over addition and subtraction.
- **Additive Identity:** 0
- **Multiplicative Identity:** 1

Applications of Integers

Real-Life Uses

Integers are used in everyday life to represent:

- Temperature above and below 0°C.
- Profit and loss in business.
- Bank deposits and withdrawals.
- Elevation above and below sea level.
- Scores in games and sports.

Key Points

- Integers include positive numbers, negative numbers, and zero.
- Integers are represented on a number line.
- The sign rules are important for multiplication and division.
- Subtraction can be converted into addition using the additive inverse.
- Division by zero is not possible.
- Integers are widely used in real-life situations.

Chapter Summary

Integers are numbers that include positive numbers, negative numbers, and zero. They can be represented on a number line and are used in many real-life situations. This chapter explains the rules of addition, subtraction, multiplication, and division of integers, along with their important properties and applications.