Whole Numbers

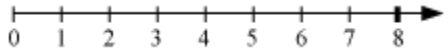
- If we subtract 1 from a whole number, then we will get its **predecessor** and if we add 1 to a whole number, then we will find its **successor**.

  For example, the predecessor of 15 is 15 – 1 = 14 and its successor is 15 + 1 = 16.

- Each whole number has a successor. All whole numbers, except zero, has a predecessor.

- **Number line:**

  To draw a number line, we take a line and mark a point on it, labelling it 0. Then, we mark the points to the right of zero at equal intervals and label them as 1, 2, 3 …, as follows:

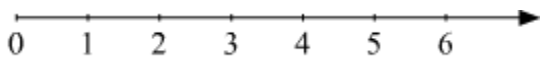


  On the number line, we can say that out of any two whole numbers, the number on the right of the other number is greater.

  Example: Place predecessor of 6 on the number line.

  Solution:

  The predecessor of 6 is 5. On the number line, we can show 5 as follows:



- **Closure Property of whole numbers:**

- Whole numbers are closed under addition. For example, the sum of whole numbers 3 and 8 is 11 (3 + 8 = 11), which is again a whole number.
- Whole numbers are closed under multiplication. For example, the multiplication of whole numbers 4 and 7 is 28 (4 × 7 = 28), which is again a whole number.
- Whole numbers are not closed under subtraction. For example, 5 – 2 = 3 is a whole number, but 1 – 2 = –1 is not a whole number.
- Whole numbers are not closed under division. For example, 98 ÷ 4 = 2 is a whole number, but 2 ÷ 5 = $\frac{2}{5}$ is not a whole number.

- **Properties of whole numbers:**

  We can add or multiply two whole numbers in any order, that is, 12 + 5 = 5 + 12 = 17 and 9 × 8 = 8 × 9 = 72.

  This property of addition and multiplication of whole numbers is known as **commutative**.

  Addition and multiplication of whole numbers are **associative**.

  For example: (17 + 19) + 25 = 17 + (19 + 25) = 61.

  Similarly, (6 × 13) × 19 = 6 × (13 × 19) = 1482.

  These properties help some mathematical calculations easier.

  Example: Find the value of 4 × 17 × 25.

  Solution:

  4 × 17 × 25 = 4 × 25 × 17 (commutative over multiplication)

  = (4 × 25) × 17

  = 100 × 17

  = 1700

- **Distributive property of whole numbers for multiplication over addition:**

  $a \times (b + c) = a \times b + a \times c$
  The property also holds true for multiplication over subtraction.

This property also helps in making mathematical calculations easier.

Example:

Simplify 38 × 68 + 32 × 38

Solution:

$$\begin{aligned} 38\times 68+32\times 38 &= 38\times 68+38\times 32 \quad (\text{Commutative property}) \\ &= 38\times(68+32) \quad (\text{Distributive property}) \\ &= 38\times 100 \\ &= 3800 \end{aligned}$$

- Addition of any whole number to zero gives the same whole number. Therefore, zero is the **additive identity** of whole numbers.

  For example, 5 + 0 = 5, 9 + 0 = 9.

- Multiplication of any whole number with 1 gives the same whole number. Therefore, 1 is the **multiplicative identity** of whole numbers.

  For example, 9 × 1 = 9.

- Multiplication of any whole number with zero, gives zero as the result.

  For example, 5 × 0 = 0