Natural Numbers

Natural numbers are the counting numbers starting from 1, 2, 3, and so on. They are used to count objects naturally.

Predecessor and Successor

For any natural number n, its successor is $n + 1$ and its predecessor is $n - 1$ (if $n > 1$).

Examples:

- Successor of 16 is $16 + 1 = 17$.
- Predecessor of 17 is $17 - 1 = 16$.

Note that 1 has a successor but no predecessor in natural numbers.

Worked Illustration

Find the predecessor and successor of 19.

Successor: $19 + 1 = 20$

Predecessor: $19 - 1 = 18$

Practice Set

- Write the predecessor and successor of 1997, 12000, 49, 100000.
- Is there any natural number that has no predecessor?
- Is there any natural number which has no successor? Is there a last natural number?

Answer Key

- Predecessor and successor of 1997: 1996 and 1998.
- Predecessor and successor of 12000: 11999 and 12001.
- Predecessor and successor of 49: 48 and 50.
- Predecessor and successor of 100000: 99999 and 100001.
- 1 has no predecessor in natural numbers.
- There is no last natural number; natural numbers go on infinitely.

Quick Reference

Term	Definition
Natural Numbers	Counting numbers starting from 1
Successor	Next number: $n + 1$
Predecessor	Previous number: $n - 1$ (if $n > 1$)

Glossary

- **Natural Numbers:** Numbers used for counting starting from 1.
- **Successor:** The number that comes immediately after a given number.
- **Predecessor:** The number that comes immediately before a given number.

Whole Numbers

Whole numbers are the set of natural numbers along with zero. That is, $\{0, 1, 2, 3, \ldots\}$.

Zero is added as the predecessor of 1 to form whole numbers.

Concept Explanation

Whole numbers include zero and all natural numbers. Every whole number has a successor, and every whole number except zero has a predecessor.

Practice Set

- Are all natural numbers also whole numbers?
- Are all whole numbers also natural numbers?
- Which is the greatest whole number?

Answer Key

- Yes, all natural numbers are whole numbers.
- No, zero is a whole number but not a natural number.
- There is no greatest whole number; they go on infinitely.

Quick Reference

Set	Elements
Natural Numbers	1, 2, 3, 4, ...
Whole Numbers	0, 1, 2, 3, 4, ...

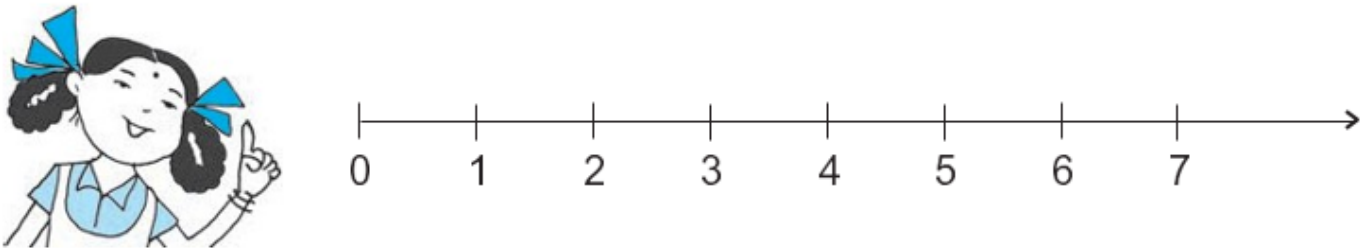
Glossary

- **Whole Numbers:** Natural numbers including zero.

The Number Line

A number line is a straight line with points marked at equal intervals representing numbers.

Start by marking 0 on the line, then mark points to the right at unit distances labeled 1, 2, 3, and so on.



The distance between two points a and b on the number line is $|b - a|$.

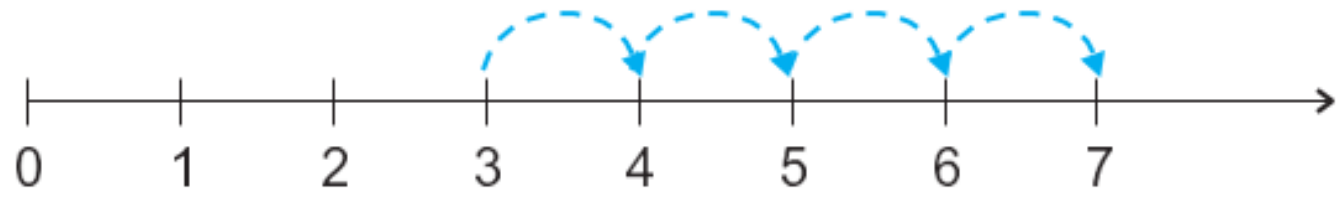
Ordering on the Number Line

If a number x lies to the right of y, then $x > y$. Conversely, if x lies to the left of y, then $x < y$.

Addition on the Number Line

Addition corresponds to moving to the right on the number line.

Example: To find $3 + 4$, start at 3 and move 4 units to the right.



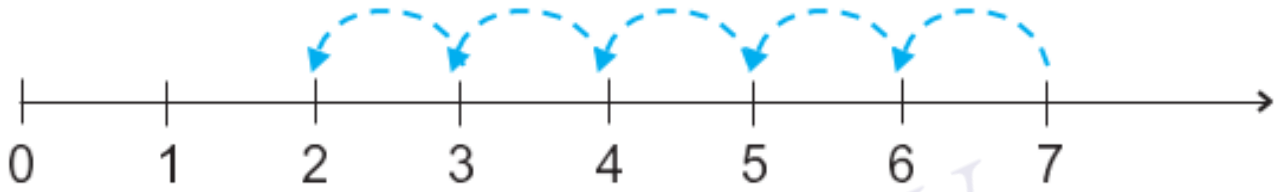
Mathematically:

$$3 + 4 = 7$$

Subtraction on the Number Line

Subtraction corresponds to moving to the left on the number line.

Example: To find $7 - 5$, start at 7 and move 5 units to the left.



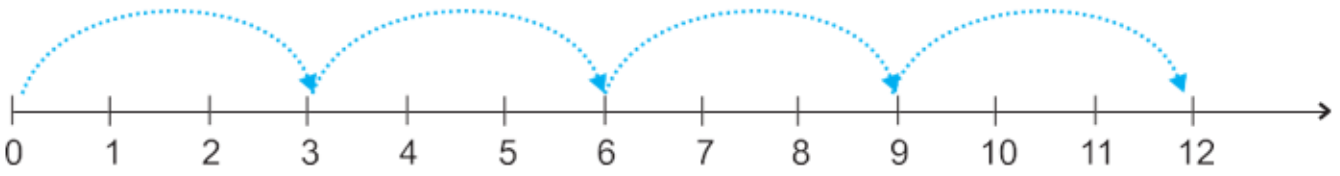
Mathematically:

$$7 - 5 = 2$$

Multiplication on the Number Line

Multiplication corresponds to making equal jumps starting from zero.

Example: To find 4×3, make 4 jumps of 3 units each starting from 0.



Mathematically:

$$4 \times 3 = 3 + 3 + 3 + 3 = 12$$

Practice Set

- Find $4 + 5$, $2 + 6$, $3 + 5$, and $1 + 6$ using the number line.
- Find $8 - 3$, $6 - 2$, and $96 - 9$ using the number line.
- Find 2×6, 3×3, and 4×2 using the number line.
- Mark 30, 12, and 18 on the number line and identify which is farthest left.
- Place the successor of 12 and the predecessor of 7 on the number line.

Answer Key

- $4 + 5 = 9$
- $2 + 6 = 8$
- $3 + 5 = 8$
- $1 + 6 = 7$
- $8 - 3 = 5$
- $6 - 2 = 4$
- $96 - 9 = 87$
- $2 \times 6 = 12$
- $3 \times 3 = 9$
- $4 \times 2 = 8$
- Farthest left among 30, 12, and 18 is 12.
- Successor of 12 is 13; predecessor of 7 is 6.

Quick Reference

Operation	Number Line Movement
Addition	Move right
Subtraction	Move left
Multiplication	Repeated equal jumps from zero

Glossary

- **Number Line:** A line with numbers marked at equal intervals.

- **Unit Distance:** The distance between two consecutive numbers on the number line.
- **Successor:** The next number to the right on the number line.
- **Predecessor:** The previous number to the left on the number line.