Number Patterns and Sequences

Learn to identify and extend number patterns. Master the formulas for arithmetic and geometric sequences.

Arithmetic Sequences

Each term increases by a constant (common difference, d).

Example: 3, 7, 11, 15, 19... (d = 4)

nth term formula:

$a(n) = a(1) + (n - 1) \times d$

Example: $a(10) = 3 + (10-1) \times 4 = 3 + 36 = 39$

Geometric Sequences

Each term is multiplied by a constant (common ratio, r).

Example: 2, 6, 18, 54, 162... (r = 3)

nth term formula:

$a(n) = a(1) \times r^{(n-1)}$

Example: $a(5) = 2 \times 3^4 = 2 \times 81 = 162$

Square Numbers

1, 4, 9, 16, 25, 36, 49, 64, 81, 100...

Pattern: n x n (or n squared)

Cube Numbers

1, 8, 27, 64, 125, 216, 343, 512...

Pattern: n x n x n (or n cubed)

Triangular Numbers

1, 3, 6, 10, 15, 21, 28, 36, 45, 55...

Pattern: $n(n + 1) / 2$

Fibonacci-like Patterns

1, 1, 2, 3, 5, 8, 13, 21, 34, 55...

Each term = sum of previous two terms

How to Find the Pattern

Step 1: Find the differences between consecutive terms

Step 2: If differences are constant, it is arithmetic (use the difference as d)

Step 3: If not, find the ratios between consecutive terms

Step 4: If ratios are constant, it is geometric (use the ratio as r)

Step 5: Otherwise, look for squares, cubes, Fibonacci, or other special patterns

Practice: Find the Next Number

Identify the pattern and write the next two numbers in each sequence.

1. 5, 10, 15, 20, 25, _____, _____
Pattern:

2. 3, 9, 27, 81, _____, _____
Pattern:

3. 2, 5, 10, 17, 26, _____, _____
Pattern:

4. 1, 4, 9, 16, 25, _____, _____
Pattern:

5. 1, 1, 2, 3, 5, 8, _____, _____
Pattern:

6. 100, 50, 25, 12.5, _____, _____
Pattern:

7. 2, 6, 12, 20, 30, _____, _____
Pattern:

8. 1, 8, 27, 64, 125, _____, _____
Pattern:

Answers: 1) 30, 35 (add 5) 2) 243, 729 (multiply by 3) 3) 37, 50 (differences: 3,5,7,9,11,13) 4) 36, 49 (square numbers) 5) 13, 21 (Fibonacci) 6) 6.25, 3.125 (divide by 2) 7) 42, 56 (differences: 4,6,8,10,12,14) 8) 216, 343 (cube numbers)