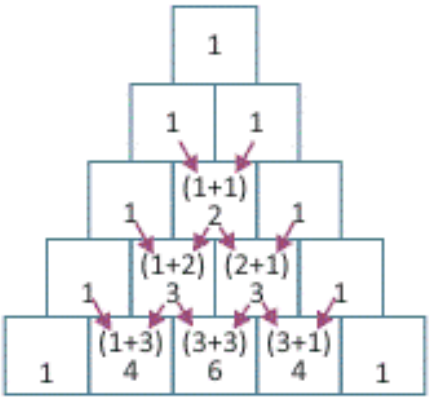
Pascal's Triangle

Understanding the Topic

- Pascal's Triangle is a special triangle of numbers where each number is the sum of the two numbers directly above it.
- The triangle starts with 1 at the top.
- Each row in the triangle starts and ends with 1.
- It shows interesting number patterns like counting numbers, triangular numbers, and powers of 2.



- It is named after a famous French mathematician, Blaise Pascal.

Important Points to Remember

- The first row is 1.
- The second row is 1 1.
- From the third row, each number is the sum of the two numbers above it.
- The triangle is symmetrical, meaning both sides of each row are mirror images.
- The sum of numbers in the n^{th} row is 2^n.
- Pascal's Triangle is useful in patterns, addition, combinations, and many number games.

Examples with Solutions

1. Build a Row

Question: What is the 4th row of Pascal's Triangle.

Solution: Start with 1, then 1 + 2 = 3, 2 + 1 = 3, so the row is 1 3 3 1.

2. Find the Sum of a Row

Question: What is the sum of numbers in the 3rd row.

Solution: $1 + 2 + 1 = 4 = 2^{3-1} = 2^2$.

3. Complete the Pattern

Question: Fill in the missing number: 1 4 __ 4 1.

Solution: 4 + 4 = 8, so the missing number is 6. Full row is 1 4 6 4 1.

4. Recognize Symmetry

Question: Are the numbers in row 5 the same on both sides.

Solution: Yes. Row 5 is 1 5 10 10 5 1 – same on both sides.

5. Triangular Number from Pascal's Triangle

Question: Find the 3rd triangular number from Pascal's Triangle.

Solution: The second number in the 3rd row is 3. So the 3rd triangular number is 3.

Summary Points

- Pascal’s Triangle is a pattern of numbers that grow using simple addition.
- Each number (except 1s) is made by adding the two numbers above it.
- Rows are symmetrical and start and end with 1.
- It contains patterns of counting, triangular numbers, and powers of 2.
- It is helpful in solving math puzzles, games, and understanding patterns.