Pascal's Triangle

The Logic

"Edges are 1, middle is Sum"

1. The Edges : The first and last number of every row is always 1.

2. The middle : Any number inside the triangle is the sum of the two numbers directly above it in the previous row.

formula : current_row $[j]$ = previous_row $[j-1]$
$$+$$
$$previous\_row [j]$$

The Visual Model

Don't think of it as a pyramid. Think of it as a Stack of Arrays.

Row 0 : $[1]$

Row 1 : $[1,1]$

Row 2 : $[1,2,1]$ ⟵ 2 Comes from 1+1 above

Row 3 : $[1,3,3,1]$ ⟵ 3 Comes from 1+2 above

The Algorithm

for every new row i :

1. Start : Add 1.

2. Middle : Loop through the Previous Row.
   Add neighbour : $prev[j-1] + prev[j]$.

3. End : Add 1.

Critical Index Logic

If we are building Row i (e.g., Row 3), we look at Row $i-1$ (Row 2).

To calculate the number at index j in the new row:

- Take the left Parent : prev_row $[j-1]$
- Take the Right Parent : prev-row $[j]$
- Add them together.

Cheat Sheet

- Outer loop : range(1, numRows)   (Builds rows top to Bottom).
- Inner loop : range (1, i) (fills the gap between the 1's).
- Edges : Always manual (row.append(1))
- middle : Calculated (prev $[j-1]$ + prev $[j]$)