

Pascal's triangle and its secrets

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Practice problems

1. Using Pascal's triangle, find the value of $\binom{7}{3}$.
2. What is the sum of all binomial coefficients for $n = 9$?
3. If $\binom{n}{k} = 28$ and $\binom{n}{k+1} = 56$, use Pascal's Identity to find $\binom{n+1}{k+1}$.

Solutions

1. Using Pascal's triangle, find the value of $\binom{7}{3}$.
 - Construct the triangle up to row 7.
 - Row 5 is 1, 5, 10, 10, 5, 1.
 - Row 6 is 1, 6, 15, 20, 15, 6, 1.
 - Row 7 is 1, 7, 21, 35, 35, 21, 7, 1.
 - The value at position $k = 3$ (the 4th number) is 35.

Answer: 35

2. What is the sum of all binomial coefficients for $n = 9$?
 - Use the row sum formula $\sum_{k=0}^n \binom{n}{k} = 2^n$.
 - Substitute $n = 9$ into the formula: 2^9 .
 - Calculate $2^9 = 512$.

Answer: 512

3. If $\binom{n}{k} = 28$ and $\binom{n}{k+1} = 56$, use Pascal's Identity to find $\binom{n+1}{k+1}$.
 - Pascal's Identity states $\binom{n+1}{k+1} = \binom{n}{k} + \binom{n}{k+1}$.
 - Substitute the given values: $28 + 56$.
 - Calculate the sum: $28 + 56 = 84$.

Answer: 84