

Homework 2: Combinations and Pascal's Triangle

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1 Homework

Problem 1.

How many ways are there to descend from the top of Pascal's triangle to the n -th row?

Problem 2.

Let A, B be points on a circle, and T be a point on the line AB outside of the circle. Let TC be the tangent from T to the circle. Show that $TC^2 = TA \cdot TB$

2 Reading

Problem 3.

a) Show that identity

$$\binom{n}{k} = \binom{n-1}{k-1} + \binom{n-1}{k}$$

algebraically.

$$\begin{aligned} \binom{n-1}{k-1} + \binom{n-1}{k} &= \frac{(n-1)!}{(n-k)!(k-1)!} + \frac{(n-1)!}{(n-k-1)!k!} \\ &= \frac{(n-1)!k}{(n-k)!k!} + \frac{(n-1)!(n-k)}{(n-k)!k!} \\ &= \frac{(n-1)!(n-k+k)}{(n-k)!k!} = \frac{n!}{(n-k)!k!} = \binom{n}{k} \end{aligned}$$