1.2.6 Binomial Coefficients

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Definition

$$\binom{n}{k} = \frac{n!}{k!(n-k)!} = \frac{n(n-1)...(n-k+1)}{k(k-1)...(1)}.$$

For example,

$$\binom{5}{3} = \frac{5 \cdot 4 \cdot 3}{3 \cdot 2 \cdot 1} = 10,$$

Note how

$$\frac{n!}{(n-k)!} = n(n-1)...(n-k+1)$$

For example, when $n = 6$ and $k = 3$,

$$6 \cdot 5 \cdot 4 = \frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{3 \cdot 2 \cdot 1} = \frac{n!}{(n-k)!}$$