

Binomial Theorem

The Binomial Theorem is used for expanding brackets in the form $(a + b)^n$

$$(a + b)^n = \binom{n}{0} a^n b^0 + \binom{n}{1} a^{n-1} b^1 + \binom{n}{2} a^{n-2} b^2 + \binom{n}{3} a^{n-3} b^3 + \dots + \binom{n}{n} a^0 b^n$$

Example

You can use either Pascal's Triangle or combinations to find the coefficients

$$\left(2x - \frac{3}{x}\right)^4 = 1(2x)^4 + 4(2x)^3 \left(-\frac{3}{x}\right)^1 + 6(2x)^2 \left(-\frac{3}{x}\right)^2 + 4(2x)^1 \left(-\frac{3}{x}\right)^3 + 1\left(-\frac{3}{x}\right)^4$$

$$\left(2x - \frac{3}{x}\right)^4 = (2x)^4 + \binom{4}{1} (2x)^3 \left(-\frac{3}{x}\right)^1 + \binom{4}{2} (2x)^2 \left(-\frac{3}{x}\right)^2 + \binom{4}{3} (2x)^1 \left(-\frac{3}{x}\right)^3 + \left(-\frac{3}{x}\right)^4$$

