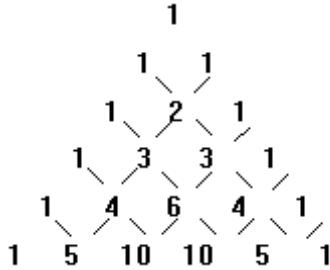


C2 Key Points Binomial Expansion

Using Pascal's triangle – Use when the power is a positive integer



Expand $(2 - x)^5$

$$(2 - x)^5 = (2 + (-x))^5$$

$$= 2^5 + \left[5 \times 2^4(-x)^1\right] + \left[10 \times 2^3(-x)^2\right] + \left[10 \times 2^2(-x)^3\right] + \left[5 \times 2(-x)^4\right] + (-x)^5$$

$$= 32 - 80x + 80x^2 - 40x^3 + 10x^4 - x^5$$

$$(a + b)^5 = a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$$

1) In each term, the sum of the powers = 5.

2) Use appropriate line in Pascal's Triangle.

3) **Remember** the bracket around $(-x)$ e.g. $(2 + (-x))^5$

4) Be careful with the signs.

5) Remember that $(2x)^3$ does **NOT** equal $2x^3$ - Do not forget the brackets. $(2x)^3 = 8x^3$.

Notation

$$\binom{n}{r} = {}^nC_r = \frac{n!}{r!(n-r)!}$$

Where $n! = n(n-1)(n-2)(n-3) \times \dots \times 2 \times 1$ and, by definition $0! = 1$

Formula for binomial expansion

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

$$= a^n + na^{n-1}b + \frac{n(n-1)}{2!} a^{n-2}b^2 + \dots + b^n$$

If we had, for example $(2x - 4y)^3$, we would replace a with $2x$ and b with $(-4y)$ and also n with 3.