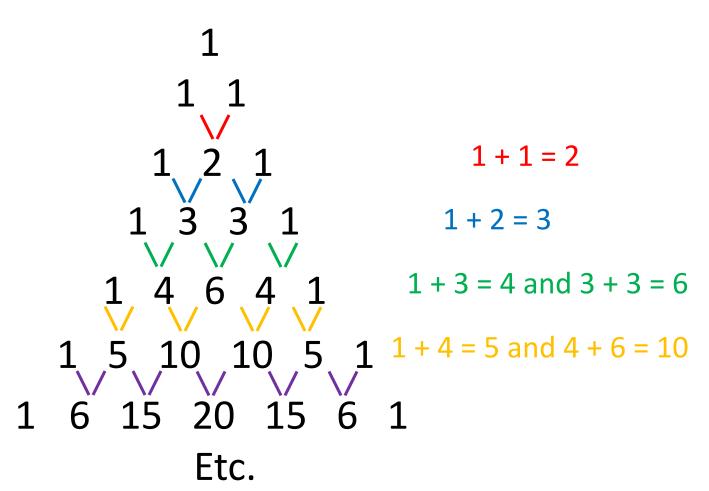
Pascal's Triangle

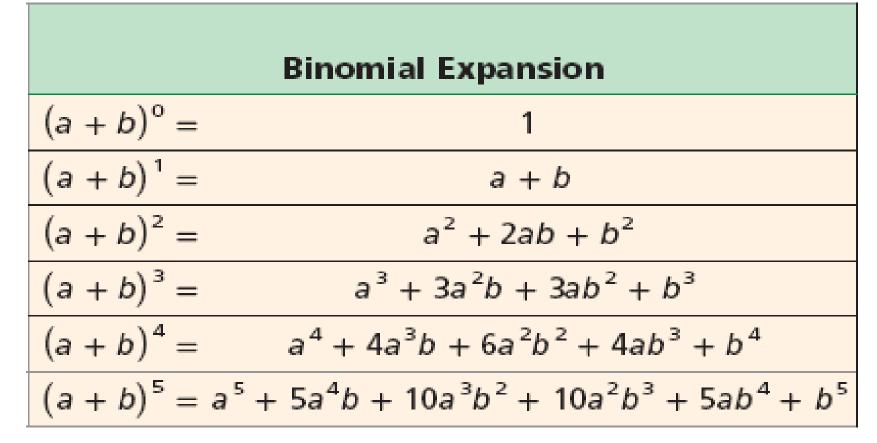
Pascal's Triangle is a shortcut to simplify a binomial raised to a power. i.e. $(x + 3)^5$, $(2 - 5x)^7$, etc.

Example) Simplify $(x + 2)^5$ $(x + 2)^5 = (x + 2)^2(x + 2)^2(x + 2)^2$ $(x + 2)^2 = x^2 + 4x + 4$ by FOIL $(x + 2)^5 = (x^2 + 4x + 4)(x^2 + 4x + 4)(x + 2)$ $(x + 2)^5 = (x^4 + 8x^3 + 24x^2 + 32x + 16)(x + 2)$ Distribute the trinomials $(x + 2)^5 = x^5 + 10x^4 + 40x^3 + 80x^2 + 80x + 32$ Distribute the binomial The make Pascal's Triangle:

Each row has a one as its first and last term.

Any middle term is found by adding the two terms diagonally left and right above it.





The rows of Pascal's triangle give the coefficients of each term.

The exponents of "a" decrease (a³, a², a¹, a⁰)

while the exponents of "b" increase (b⁰, b¹, b², b³)

Expand the binomial $(3x - 4)^4$

$$a = 3x$$
 and $b = -4$

14641Write the row for Pascal's Δ

 $\begin{array}{ll} 1a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + 1b^4 & \mbox{Write the formula} \\ & \mbox{Substitute a and b} \\ 1(3x)^4 + 4(3x)^3(-4) + 6(3x)^2(-4)^2 + 4(3x)(-4)^3 + 1(-4)^4 \\ & \mbox{Simplify} \end{array}$

 $81x^4 - 432x^3 + 864x^2 - 768x + 256$

Expand the binomial $(x + 2)^7$

a = x and b = 2

1 7 21 35 35 21 7 1 Write the row for Pascal's Δ Write the formula $1a^7 + 7a^6b + 21a^5b^2 + 35a^4b^3 + 35a^3b^4 + 21a^2b^5 + 7ab^6 + 1b^7$ Substitute a and b $1x^7 + 7x^6(2) + 21x^5(2)^2 + 35x^4(2)^3 + 35x^3(2)^4 + 21x^2(2)^5 + 7x(2)^6 + 1(2)^7$

Simplify

 $x^7 + 14x^6 + 84x^5 + 280x^4 + 560x^3 + 672x^2 + 448x + 128$

Determine the coefficient of x^2 in the expansion of $(3 - x)^3$

$$a = 3$$
 and $b = -x$

1 3 3 1

Write the row for Pascal's Δ

 $1a^3 + 3a^2b + 3ab^2 + 1b^3$

Write the formula, and find the term with x²

Substitute a and b

Simplify

 $9x^2$

 $3(3)(-x)^2$