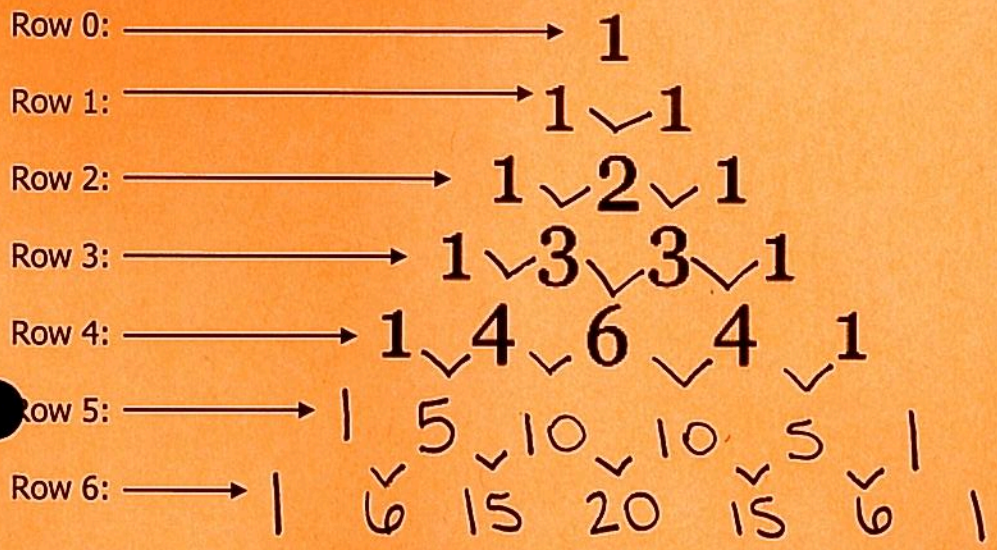
The Binomial Theorem $(x+y)^5 = x^5 + 5x^4y + 10x^3y^2 + 10x^2y^3 + 5xy^4 + y^5$

1. There will be n + 1 terms
2. x and y have symmetrical roles
3. the sum of the powers of each term is n. (as long as x and y are not to a power)
4. coefficients increase then decrease in a symmetrical pattern

Pascal's triangle tells you the coefficients for your expanded binomial:



Binomial Theorem

① Expand $(x+y)^{6}$ — use row 6

Coeff.	1st	2nd	Term
1	x^6	$y^0 = 1$	x^6
6	x^5	$y^1 = y$	$6x^5y$
15	x^4	y^2	$15x^4y^2$
20	x^3	y^3	$20x^3y^3$
15	x^2	y^4	$15x^2y^4$
6	$x^1 = x$	y^5	$6xy^5$
1	$x^0 = 1$	y^6	y^6

$$x^6 + 6x^5y + 15x^4y^2 + 20x^3y^3 + 15x^2y^4 + 6xy^5 + y^6$$

② Expand $(x-2y)^{4}$ — use row 4

Coeff.	1st	2nd	Term
1	x^4	$(-2y)^0 = 1$	x^4
4	x^3	$(-2y)^1 = -2y$	$-8x^3y$
6	x^2	$(-2y)^2 = 4y^2$	$24x^2y^2$
4	$x^1 = x$	$(-2y)^3 = -8y^3$	$-32xy^3$
1	$x^0 = 1$	$(-2y)^4 = 16y^4$	$16y^4$

$$x^4 - 8x^3y + 24x^2y^2 - 32xy^3 + 16y^4$$

③ $(2x^2 - y^3)^{(3)}$ → Expand. use row 3

Coeff.	1st	2nd	Term
1	$(2x^2)^3 = 8x^6$	$(-y^3)^0 = 1$	$8x^6$
3	$(2x^2)^2 = 4x^4$	$(-y^3)^1 = -y^3$	$-12x^4y^3$
3	$(2x^2)^1 = 2x^2$	$(-y^3)^2 = y^6$	$6x^2y^6$
1	$(2x^2)^0 = 1$	$(-y^3)^3 = -y^9$	$-y^9$

$$8x^6 - 12x^4y^3 + 6x^2y^6 - y^9$$

Practice:

Expand the following:

① $(x - 3y)^4$

② $(3x + y^2)^5$

③ $(2x + 3y)^6$