

Pascal's Triangle and The Binomial Theorem

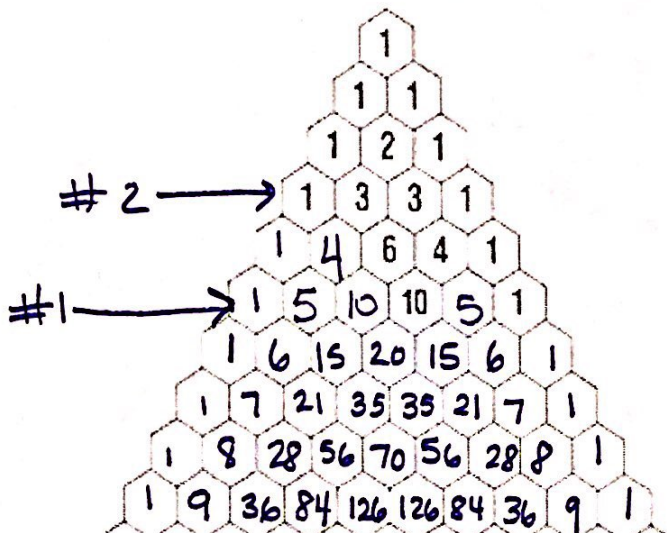
Expand $(x + 2)^2$

$$(x+2)(x+2)$$

$$x^2 + 4x + 4$$

Now expand $(x + 2)^5$. Think it is going to take a long time???

Here is a short cut: Pascal's Triangle



We will use this formula:

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

The blanks represent the numbers in the corresponding row of Pascal's Triangle.

Expand
1. $(x + 2)^5$

1	$(x)^5$	$(2)^0 = 1x^5(1) = 1x^5$
5	$(x)^4$	$(2)^1 = 5x^4(2) = 10x^4$
10	$(x)^3$	$(2)^2 = 10x^3(4) = 40x^3$
10	$(x)^2$	$(2)^3 = 10x^2(8) = 80x^2$
5	$(x)^1$	$(2)^4 = 5x(16) = 80x$
1	$(x)^0$	$(2)^5 = 1(1)(32) = 32$

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

2. $(2x + 4)^3$

1	$(2x)^3$	$(4)^0 = 1(8x^3)(1) = 8x^3$
3	$(2x)^2$	$(4)^1 = 3(4x^2)(4) = 48x^2$
3	$(2x)^1$	$(4)^2 = 3(2x)(16) = 96x$
1	$(2x)^0$	$(4)^3 = 1(1)(64) = 64$

$$8x^3 + 48x^2 + 96x + 64$$

3. $(2x - 3)^5$

1	$(2x)^5$	$(-3)^0 = 1(32x^5)(1) = 32x^5$
5	$(2x)^4$	$(-3)^1 = 5(16x^4)(-3) = -240x^4$
10	$(2x)^3$	$(-3)^2 = 10(8x^3)(9) = 720x^3$
10	$(2x)^2$	$(-3)^3 = 10(4x^2)(-27) = -1080x^2$
5	$(2x)^1$	$(-3)^4 = 5(2x)(81) = 810x$
1	$(2x)^0$	$(-3)^5 = 1(1)(-243) = -243$

$$32x^5 - 240x^4 + 720x^3 - 1080x^2 + 810x - 243$$