$\boxed{\text{BE-PRECALC}}$ MONDAY 2-8-10

1. $(3x-y)^2 = (3x-y)(3x-y) = ?$

2. $(3x-y)^3 = ?$

3. $(3x-y)^4 = ?$

When you expand a binomial like $(x+y)^N$, a pattern emerges:

$$(x+y)^0 = 1x^0y^0 = 1$$

$$(x+y)^1 = 1x^1y^0 + 1x^0y^1 = x+y$$

$$(x+y)^2 = 1x^2y^0 + 2x^1y^1 + 1x^0y^2 = x^2+2xy+y^2$$

$$(x+y)^3 = 1x^3y^0 + 3x^2y^1 + 3x^1y^2 + 1x^0y^3$$

$$(x+y)^4 = 1x^4y^0 + 4x^3y^1 + 6x^2y^2 + 4x^1y^3 + 1x^0y^4$$

$$(x+y)^5 = 1x^5y^0 + 5x^4y^1 + 10x^3y^2 + 10x^2y^3 + 5x^1y^4 + 1x^0y^5$$

PASCAL'S TRIANGLE

$$\begin{array}{ccccccccccccc}
 & & & & & & 1 & & & & & & \\
 & & & & & 1 & & 1 & & & & & \\
 & & & & 1 & & 2 & & 1 & & & & \\
 & & & 1 & & 3 & & 3 & & 1 & & & \\
 & & 1 & & 4 & & 6 & & 4 & & 1 & & \\
 & 1 & & 5 & & 10 & & 10 & & 5 & & 1 & \\
1 & & 6 & & 15 & & 20 & & 15 & & 6 & & 1
\end{array}$$

$\boxed{\text{Ex 1}}$ $\boxed{\text{Pg 802}}$ $\boxed{\text{Ch 12-6 – THE BINOMIAL THEOREM}}$

LETS USE THE PATTERN TO EXPAND BINOMIALS $\Rightarrow$ $(x+y)^{6}$

use 7th row $\Rightarrow$

$$\boxed{1x^6y^0 + 6x^5y^1 + 15x^4y^2 + 20x^3y^3 + 15x^2y^4 + 6x^1y^5 + 1x^0y^6}$$

IS THERE A FORMULA ?

YES

IF N IS A POSITIVE INTEGER :

$$\boxed{(x+y)^N = x^N + Nx^{N-1}y^1 + \frac{N(N-1)}{2!}x^{N-2}y^2 + \dots \frac{N(N-1)(N-2)}{3!}x^{N-3}y^3 + \dots y^N}$$

EX3 Pg803 Expand $(2x-y)^6$ $N=6$, there ARE 7 terms.

WATCH OUT $(2x)^6 = 2^6x^6$

$$\Rightarrow 1, 6, \frac{6\cdot5}{2}, \frac{6\cdot5\cdot4}{3\cdot2\cdot1}, ?, ?, ?$$

$$1, 6, 15, 20, 15, 6, 1$$

$$\therefore \underline{2^6x^6} - \underline{6\cdot2^5x^5y^1} + \underline{15\cdot2^4x^4y^2} - \underline{20\cdot2^3x^3y^3} + \underline{15\cdot2^2x^2y^4} - \underline{6\cdot2^1x^1y^5} + \underline{y^6}$$

$$\boxed{64x^6 - 192x^5y + 240x^4y^2 - 160x^3y^3 + 60x^2y^4 - 12xy^5 + y^6}$$

If you only want one particular term, say the 4th term of $(2x-y)^6$,

use: $$\boxed{(x+y)^N = \sum_{r=0}^{N} \frac{N!}{r!\,(N-r)!} x^{N-r} y^r}$$

Pg 803

Another Form of the Binomial Theorem

Sigma or "Sum" notation

Ex $\sum_{N=3}^{5} N = 3+4+5 = 12$

Starting "index"

Ex) 4th term of $(2x-y)^6$ Let $r=3$

$N=6$, $r=\underline{\underline{3}}$ since terms $\Rightarrow$ 0, 1, 2, 3 ...

$$(x+y)^6 = \sum_{r=0}^{6} \frac{6!}{3!(6-r)} (2x)^{6-r}(-y)^r$$

$$\therefore r=3 \Rightarrow \frac{6!}{3!(3!)} (2x)^3(-y)^3$$

$$= \frac{\cancel{6}\cdot 5\cdot 4}{\cancel{3\cdot 2}\cdot 1} \cdot 2^3x^3 \cdot -1y^3$$

$$= -20 \cdot 8x^3y^3$$

$$= \boxed{-160x^3y^3} \checkmark$$

Ex 4
Pg 803 Find the fifth term of $(4a+3b)^7$

$N=7 \quad r=4$

$(4a+3b)^7 \Rightarrow \frac{7!}{4!(3)!}(4a)^{7-4}(3b)^4$

Fifth term

$\frac{7\cdot\cancel{6}\cdot 5}{\cancel{3\cdot 2}\cdot 1}\cdot 4^3a^3\cdot 3^4b^4$

$35\cdot 64a^3\cdot 81b^4$

$(35\cdot 64\cdot 81)a^3b^4$

$\boxed{181,440a^3b^4} = 5^{th}$ term of $(4a+3b)^7$

Homework: Pg 804 # 7, 8, 9