Pre-Calculus CP 1 – Section 9.5 ICE Name: KEY
Pascal's Triangle & The Binomial Theorem

Use Pascal's Triangle and/or The Binomial Theorem to expand and find information about the following. Show all work, including work you may enter in your calculator.

1) Use Pascal's Triangle (or your calculator) to find the 5^{th} term in the 8^{th} row.

$${}_8C_4 = \boxed{70}$$

2) Use Pascal's Triangle (or your calculator) to find the 13^{th} term in the 20^{th} row.

$${}_{20}C_{12} = \boxed{125{,}970}$$

3) Expand $(3x-4)^5$ using Pascal's Triangle and/or the Binomial Theorem.

$$= \overset{1}{{}_5C_0}(3x)^5 + \overset{5}{{}_5C_1}(3x)^4(-4) + \overset{10}{{}_5C_2}(3x)^3(-4)^2 + {}_5C_3(3x)^2(-4)^3 + {}_5C_4(3x)(-4)^4 + {}_5C_5(-4)^5$$

$$= \boxed{243x^5 - 1620x^4 + 4320x^3 - 5760x^2 + 3840x - 1024}$$

4) Expand $(2x+5y)^7$ using Pascal's Triangle and/or the Binomial Theorem.

$$1(2x)^7(5y)^0 + 7(2x)^6(5y)^1 + 21(2x)^5(5y)^2 + 35(2x)^4(5y)^3 + 35(2x)^3(5y)^4 + 21(2x)^2(5y)^5 + 7(2x)(5y)^6 + 1(2x)^0(5y)^7$$

$$= \boxed{128x^7 + 2240x^6y + 16800x^5y^2 + 70000x^4y^3 + 175000x^3y^4 + 262500x^2y^5 + 218750xy^6 + 78125}$$

5) Find the term containing x^3 in the expansion of $(7x+3)^9$ ← 10 terms using Pascal's Triangle and/or the Binomial Theorem.

x^3y^6 ← 7th term

$${}_9C_6(7x)^3(3)^6 = 84(343x^3)(729)$$
$$= 21{,}003{,}948x^3$$

6) Find the coefficient a of the term ax^2y^8 ← 9th term of in the expansion of $(4x-y)^{10}$. ← 11 terms

$${}_{10}C_8(4x)^2(-y)^8 = 45(16x^2)(y^8)$$
$$= 720x^2y^8$$

7) Find the **coefficient** of the <u>fifth term</u> in the expansion of $(-3x+y)^{14}$ using Pascal's Triangle and/or the Binomial Theorem.

$${}_{14}C_4(-3x)^{10}(y)^4 = 1001(59{,}049x^{10})(y^4)$$
$$= 59{,}108{,}049x^{10}y^4$$

8) Express $\underbrace{1296x^{12}-4320x^{9}y^{2}+5400x^{6}y^{4}-3000x^{3}y^{6}+625y^{8}}$ in the form $(a+b)^{n}$.

5 terms $\Rightarrow$ 4th row

alternating signs $\Rightarrow (a-b)^n$

$1296x^{12} = a^4$

$\Rightarrow a = \sqrt[4]{1296x^{12}} = 6x^3$

$625y^8 = b^4$

$\Rightarrow b = \sqrt[4]{625y^8} = 5y^2$

$\boxed{(6x^3-5y^2)^4}$

9) Express

$$117{,}649x^{18}+1{,}008{,}420x^{15}y^{4}+3{,}601{,}500x^{12}y^{8}+6{,}860{,}000x^{9}y^{12}+7{,}350{,}000x^{6}y^{16}$$
$$+4{,}200{,}000x^{3}y^{20}+1{,}000{,}000y^{24}$$

in the form $(a+b)^{n}$.

7 terms $\Rightarrow$ 6th row

all positive signs, so $(a+b)^n$

$a^6 = 117{,}649x^{18}$

$\Rightarrow a = \sqrt[6]{117{,}649x^{18}} = 7x^3$

$b^6 = 1{,}000{,}000y^{24}$

$\Rightarrow b = \sqrt[6]{1{,}000{,}000y^{24}} = 10y^4$

$\therefore \boxed{(7x^3+10y^4)^6}$