Warm-up

Thursday, March 5, 2015

1. Put the following equation in vertex form.

$$y = x^2 - 18x + 13$$

2. Given **(x - 2)** is a factor of the following equation, find the other two factors.

$$y = 3x^3 - 2x^2 - 7x - 2$$

3. Expand the binomial $(x + 1)^3$

Objectives

Use the Binomial Theorem and Pascal’s Triangle to expand binomials raised to any power.

Use the Binomial Theorem and Pascal’s Triangle to find specific terms in a expansion polynomial expansion.

Homework

Pop Quiz! (not really)

Expand the binomial $(x+1)^9$

$$(x+1)(x+1)(x+1)(x+1)(x+1)(x+1)(x+1)(x+1)(x+1)$$

Now just multiply all the terms!

Thanks to modern technology, we can just go to the internet!

http://www.calcul.com/show/calculator/binomial-theorem

Result

$$(x+1)^9 = x^9 + 9x^8 + 36x^7 + 84x^6 + 126x^5 + 126x^4 + 84x^3 + 36x^2 + 9x + 1$$

BUT, “we” doesn’t include you. ☺

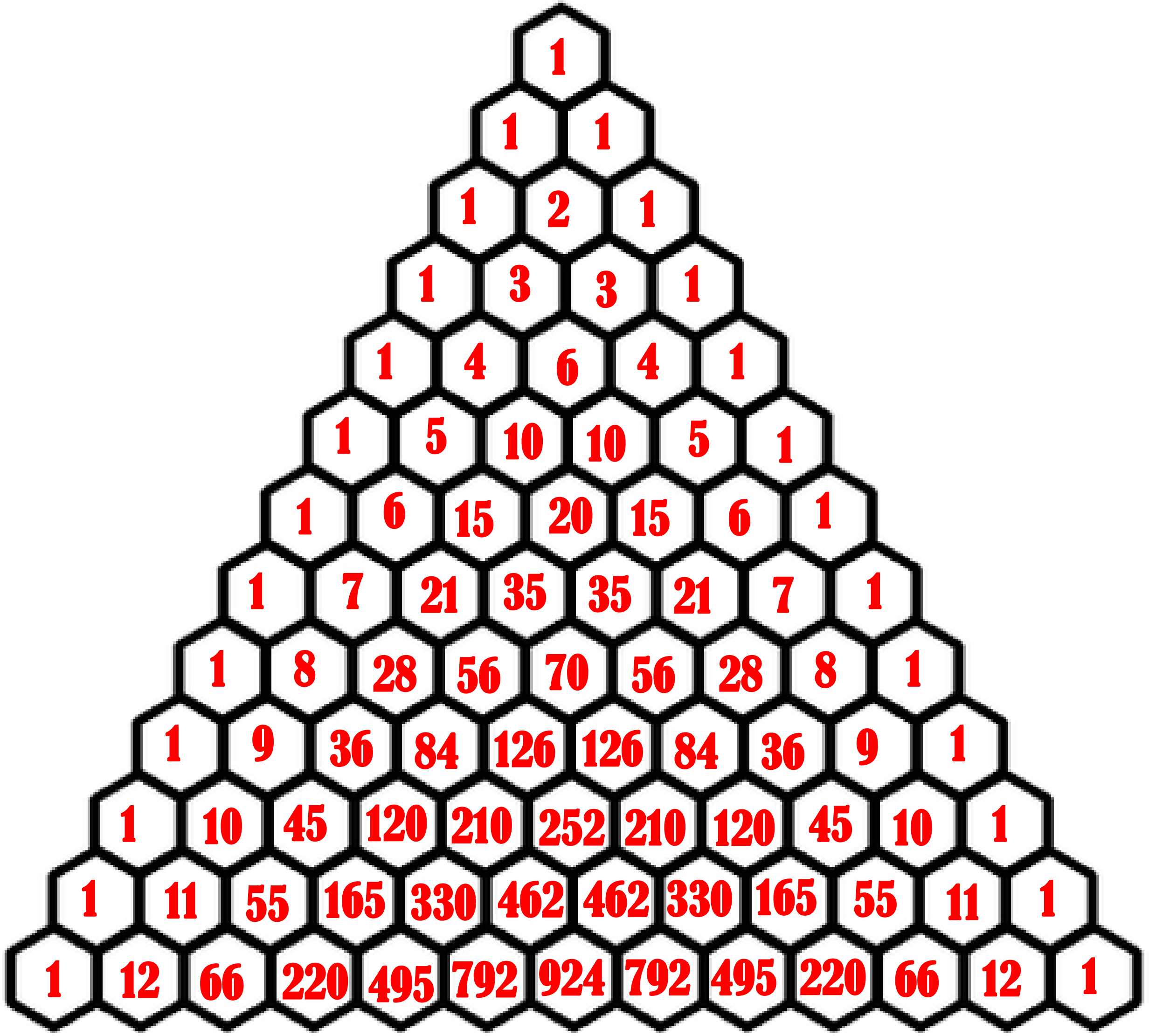
We have other friendlier tools that will help us expand this beast.

Pascal's Triangle

Blaise Pascal
1623-1662

Didn't invent this triangle but used it to explore the relationships between the binomial coefficients.

Invented the roulette wheel and is credited with building the foundations of probability theory.



When we start expanding binomials to increasing powers, we start to notice patterns in both the powers and the coefficients.

Consider the expansions of $(a+b)^n$ for the first few values of n:

Row	Power	Expanded Form	Coefficients Only
0	$(a+b)^0$	1	1
1	$(a+b)^1$	$1a^1 + 1b^1$	1 1
2	$(a+b)^2$	$1a^2 + 2a^1b^1 + 1b^2$	1 2 1
3	$(a+b)^3$	$1a^3 + 3a^2b^1 + 3a^1b^2 + 1b^3$	1 3 3 1
4	$(a+b)^4$	$1a^4 + 4a^3b^1 + 6a^2b^2 + 4a^1b^3 + 1b^4$	1 4 6 4 1

What do you notice?

PASCALS TRIANGLE GIVES US THE COEFFECIENTS OF EACH TERM IN THE EXPANSION!


But wait!
There's more!

More Patterns Emerge!

Consider the expansions of $(a + b)^n$ for the first few values of n:

Row	Power	Expanded Form	Coefficients Only
0	$(a + b$ [illegible]	1	1
1	$(a + b)^1$	$1a^1 + 1b^1$	1 1
2	$(a + b)^2$	$1a^2 + 2a^1b^1 + 1b^2$	1 2 1
3	$(a + b)^3$	$1a^3 + 3a^2b^1 + 3a^1b^2 + 1b^3$	1 3 3 1
4	$(a + b)^4$	$1a^4 + 4a^3b^1 + 6a^2b^2 + 4a^1b^3 + 1b^4$	1 4 6 4 1

What do you notice?

THE BINOMIAL THEROEM GIVES US THE POWERS OF THE VARIABLES IN THE EXPANSION

take note

Theorem **Binomial Theorem**

For every positive integer n,

$$(a+b)^n = P_0a^n + P_1a^{n-1}b + P_2a^{n-2}b^2 + \cdots + P_{n-1}ab^{n-1} + P_nb^n$$

where $P_0, P_1, \ldots, P_n$ are the numbers in the nth row of Pascal's Triangle.

Use Pascal's Triangle and the Binomial Theorem to expand $\mathbf{(x+2)^7}$.

1. How many terms?

	+		+		+		+		+		+		+	

2. What are the coefficients? (Pascal)

3. What are the variable/power combinations? (Binomial Theorem)

4. Simplify

Use Pascal's Triangle and the Binomial Theorem to expand **$(2x - 3)^4$**.

1. How many terms?

	+		+		+		+	

2. What are the coefficients? (Pascal)

3. What is **a** and what is **b**? Fill in the variable/power combinations? (Binomial Theorem)

4. Simplify

OK, You try problems 5 and 7 on your handout.

5. $(x - 3)^5$

7. $(x + 2)^3$

What is the **third** term of $\mathbf{(2x+1)^5}$.

1. How many terms?

	+		+		+		+		+	

1a. How many terms do I care about?

2. What are the coefficients? (Pascal)

3. What are the variable/power combinations? (Binomial Theorem)

4. Simplify

What is the **eleventh** term of $\mathbf{(2x + y^2)^{10}}$.

1. How many terms?

1a. How many terms do I care about?

2. What are the coefficients? (Pascal)

3. What are the variable/power combinations? (Binomial Theorem)

4. Simplify

OK, You try problems 9 and 13 on your handout.

9. third term of $(x + 3)^{12}$

13. seventh term of $(x - 4y)^{6}$

Now it's time to torture you neighbor.

Depending in which group you are in…

1. **Create an expansion problem. Keep you exponent under 11.**

2. **Create a problem in which you have to find a specific term in an expansion.**

Now exchange problems. Then you have to check their answers are correct!