$$4x^2 - 25$$

$$= (2x + 5)$$

Can you factor this? $9x^2 + 49$

$$9x^2 + 49$$

NO, you can only factor the Difference of perfect Squares.

what are these numbers?

Perfect Cubes

Can you factor each?

$$x^2 - 9$$

$$x^3 - 8$$

$$= (x \pm 3)$$

Yes, but not the same way as factoring x^2 - 9. Neither x³ nor 8 are perfect squares.

Factoring the difference of perfect cubes:

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Factor the following:

1.
$$x^3 - 8 \implies (x)^3 - (z)^3$$

 $a = x \qquad b = 2$
 $= (x-z)(x^2 + 2x + 4)$

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Factor:
$$125x^3 - 216 \implies (5x)^3 - (6)^3$$

$$a = 5x \qquad b = 6$$

$$= (5x - 6)(25x^2 + 30x + 36)$$

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

Factor the following:
$$64x^6 + 125$$

= $(4x^2)^3 + (5)^3$
 $9 = 4x^2$ $6 = 5$
= $(4x^2 + 5)(16x^4 - 20x^2 + 25)$

You can't factor the sum of perfect squares, but there IS a way to factor the sum of perfect cubes.

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

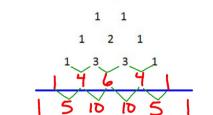
Factor the following:

$$x^{3} + 27 \longrightarrow (x)^{3} + (3)^{3}$$

$$q = x \qquad b = 3$$

$$= (x+3)(x^{2}-3x+9)$$

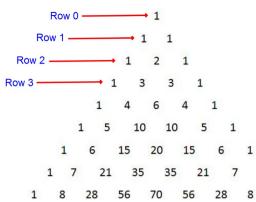
Find the next two rows of this pattern of numbers.



1

This pattern is called: Pascal's Triangle.

Each row starts and ends with a 1. The numbers inbetween are the sum of the 2 numbers above



The Row Number in Pascal's Triangle is the 2nd Number in each row.

Do you see a connection to Pascal's Triangle and the results of expanding powers of (a + b) ?

The coefficients of each term are the numbers in the row of Pascal's Triangle that to corresponds to the exponent of (a + b). Sec 6-8: The Binomial Theorem

Expand each. Write answers in Standard Form.

1.
$$(a + b)^0 = 2$$
. $(a + b)^1 =$

$$(a+b)^0 = 1$$
 $(a+b)^1 = 1a+1b$

3.
$$(a + b)^2 =$$
 4. $(a + b)^3 =$
 $(a + b)^2 = 1a^2 + 2ab + 1b^2$ $(a + b)^3 = 1a^3 + 3a^2b + 3ab^2 + 1b^3$

Do you notice a pattern in the exponents?

$$(a+b)^0=1$$
 Powers of a decrease from left to right Powers of b decrease from right to left $(a+b)^1=a+b$ For each term the powers of a and b add to $(a+b)^2=a^2+2ab+b^2$ $(a+b)^3=a^3+3a^2b+3ab^2+b^3$ $(a+b)^4=a^4+4a^3b+6a^2b^2+4ab^3+b^4$

What do you notice about how many terms each has?

$$(a+b)^{0} = 1$$

$$(a+b)^{1} = a+b$$

$$(a+b)^{2} = a^{2} + 2ab + b^{2}$$

$$(a+b)^{3} = a^{3} + 3a^{2}b + 3ab^{2} + b^{3}$$

$$(a+b)^{4} = a^{4} + 4a^{3}b + 6a^{2}b^{2} + 4ab^{3} + b^{4}$$

The number of terms is one more then the power on (a + b).