

Two famous recursive sequences are the Fibonacci sequence and the Lucas sequence. They are best defined recursively (a general term is possible, but messy!)

Recursive definition: $t_1 = 1, t_2 = 1, t_n = t_{n-1} + t_{n-2}, n > 2$

Recursive definition: $t_1 = 1, t_2 = 3, t_n = t_{n-1} + t_{n-2}, n \geq 3$

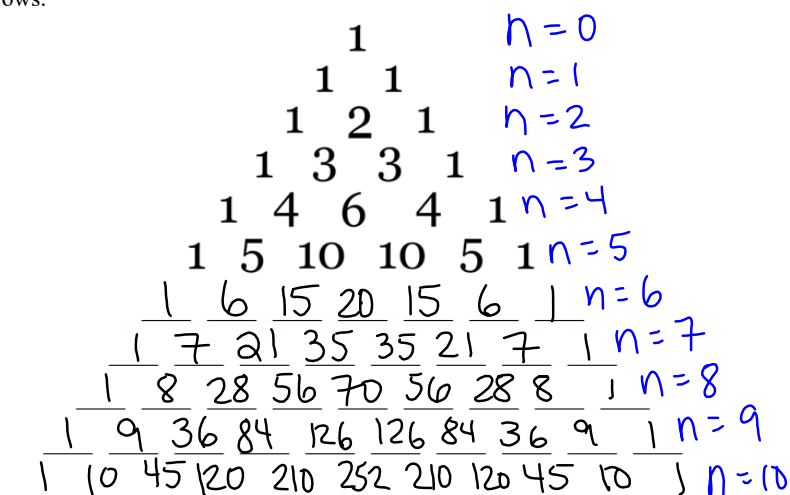
patterns in leaves, petals, vegetables...

$$\phi \approx 1.618033989$$

$$\frac{360^\circ}{\phi} = 137.5^\circ$$

Jan 31-9:35 PM

There is a two-dimensional pattern of numbers that is usually called Pascal's Triangle. It is named after the French mathematician Blaise Pascal, though he was not the first to discover it! Identify the number pattern in the first few rows and complete the next five rows.



Jun 2-12:03 PM

A **binomial** is any expression that is written in the form of $a + b$. For example $x + 1$, $2x - 3y$, $5w^2 - 15$ are all binomial expressions.

Ex 1) For each of these binomial examples, identify a & b .

$$x + 1$$

$$a: \underline{x}$$

$$b: \underline{1}$$

$$2x - 3y$$

$$a: \underline{2x}$$

$$b: \underline{-3y}$$

$$5w^2 - 15$$

$$a: \underline{5w^2}$$

$$b: \underline{-15}$$

We often have to work with powers of binomials, whose exponents are natural numbers. For example $(a + b)^2$, $(a + b)^{15}$, $(a + b)^3$

Notice the patterns when we expand the following:

$$(a + b)^0$$

$$1$$

$$(a + b)^1$$

$$a + b$$

$$(a + b)^2$$

$$a^2 + 2ab + b^2$$

$$(a + b)^3$$

$$a^3 + 3a^2b + 3ab^2 + b^3$$

$$(a + b)^4$$

$$a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$$

$$(a + b)^5$$

$$a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$$

Jun 2-12:20 PM

How do the **coefficients** of the binomial expansions (expanded binomials) relate to the numbers in Pascal's Triangle?

Coefficients for $(a+b)^n$ correspond to the n th row of Pascal's triangle (with first row as $n=0$).

What is the pattern of the exponents of the bases a and b ?

Exponents of each term add to the exponent of the original expression.

eg for $(a+b)^n$ $a \rightarrow$ starts at n , decrease to 0.

$b \rightarrow$ starts at 0, increase to n .

Jun 12-8:27 AM

Ex 2) Use Pascal's Triangle to expand $(x + 2y)^5$

Pascal's Triangle for 5th row: 1, 5, 10, 10, 5, 1

a : x

b : 2y

$$(a+b)^5 = 1a^5 + 5a^4b + 10a^3b^2 + 10a^2b^3 + 5ab^4 + b^5$$

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

$$(x+2y)^5 = x^5 + 10x^4y + 40x^3y^2 + 80x^2y^3 + 80xy^4 + 32y^5$$

Jun 2-12:29 PM

HW U6L2:

1. p.443 #1

2. p.466 #1, 2c, 3c, 4f, 5cf

Dec 15-11:39 AM