This chart is currently being worked on...

Math

Algebra 1

Add & Subtract parentheses don't matter since gives you same answer
2(x + 3) = 2x + 6

Mult. & Divide parentheses matter! since

5 letter / symbol represents an unknown number
6 - x = 2 "x=4x=4"
Only the same variable you can do math to both sides equally
2(x + 3)= x; 2x +6 = x; x + 6 = x
If cannot solve / not true, doesn't make sense. Plug any number into x to see if true...
2x + 3x = 5x 2x + 3 = 5x; 2x + 3 = 5x; 6 + x = 5; 3 + x = 5x
2x + 3x = 5x 2x + 3 = 5x + 3; 5x + 7 = 5x + 7; 3x ≠ x5; 7 + x = 7

7 less than twice a number is 10
2x - 7 = 10

Algebra Logic Understanding

don't need to -4 from 2x since 2x - 4 is subtracting twice on one side imbalance
$2x - 4 = 6$; $\frac{2x}{2} = \frac{6}{2}$; $x = 3$

Still True → $\frac{2x}{2} = \frac{6}{2}$; $x = 3$

Still True → $0.7x = 0.9x$; $\frac{0.7x}{0.7} = \frac{0.9x}{0.7}$; $x = \frac{9}{7}x$

Still true, only work with

x is an, if variable between two

$2x = 4x + 4$; $x = 2x + 4$

Variable is a symbol/letter placeholder for unknown number, "x" usually used.
$x =$

$2x + 1 = x + 1$; $2x + 1 - 1 = x + 1 - 1$; $2x = x$; $2x - x = x - x$; $x = 0$
add/sub same variable, variable different

Algebra Examples (Equalities =)

1 computer "x" is worth 3 books "b" - 1x = 3b; 2 books can 4 computers (ratio 1x = 2b)
1x = 3b
1x = 2b replace c with 4
x = 24b ???

There 10 eggs in 3 baskets, blue, red and pink. There Blue has 1 more than the red.
There Pink has 2 more than the red.
red has 3 less eggs than the pink.
b + (b + 1) + (b - 3) = 10
How many eggs are in each basket?
b + (b + 1) + (b - 3) = 10
b + b + 1 + b - 3 = 10
3b - 2 = 10
3b = 12
b = 4

Red plug in p "P" r = p - 3; r = 5
Blue plug in and r b = r + 1; b = 2 + 1; b = 3
Pink plug in and r p = r + 2; p = 5 + 2; p = 7

800-meter race. Jonna finished 2 meters ahead of Lori but 3 meters behind Kaitlyn. Kaitlyn ran 12 m/s. Rushed halfway between the first and last woman. (1 = first two)(2 = in what order and distances did the women finish?
a + b - 5
a + 8 = (2) - 3

1 2 3 4 5 6 7 8-9
I L R A S

Bob is 3 years younger than twice the age of Joe. How old is Bob?
Bob = 2 * Jo - 3
B = 2*

What is the value of 2x?
10x + 2 = 7 *sub. 2*
10x = 5 *div x*
2x = 1

Solve
10x + 2 = 7
10x = 5 *div 10 to x is alone*
X = 5/10 *simplify*
X = 1/2 or 0.5

x has the same number of sisters as brothers.
Each of his sisters has only half as many sisters as brothers.
How many brothers and sisters are in the family altogether?

Below, how much is x?
x + 3 = 7
x + 4 = 10
x + 5 = 12

Bob
Bob + 1 = 1 + 1 = 2
Bob + 2 = 1 + 2 = 3
Bob + 3 = 1 + 3 = 4

Linear Algebra

Curve Types

linear	exponential	logarithmic	sine
y=x	y=a^x	y=log(x)	
constant	years-investment, bacteria-multiplying	learning new skill	repeating motion, waves, light, sound

Hyperbolic Curves (Hyperbolas of Sin, Cos, Tan)
Hanging chains, bridges, ropes...

Linear Algebra (Graphs, Coordinates)

Read Left to Right
Positive = moves up (left to right)
Negative = moves down (left to right)

2 points: needed for slope
2 points: needed for growth type (constant?)

y = 10x
y = 2x + 1

Parabolas "Quadratics" (polynomials FOIL & Factor)

Quadratic² — negative version $y=-x^2$ — falling object path, rocket path
Cubic³ — $y=x^3$ — river paths

Continuity (Intro...)

Point, hole, infinite, jump

Jump: nonsolution; Hole: nonsolution; Infinite: nonsolution

Continuity points
Dominator = 0 Ends vertical asymptote

Asymptote Types "Limits"
Horizontal, vertical, oblique

Age difference between 2 people

Summation

$\sum_{start}^{end} 3 = 3+4+5+6 = 54$

Functions

Calculus (how things change, find area under a line, if you know the slope)

Integrals (find area under a line, if you know the slope)

Finds Area under line
when you know the slope

$\int_{2}^{4} f(x)\,dx$ — y and x start ??? end ??? — y=x² is the slope — what's the area from 2 to 5?

$\frac{x^3}{3} = \frac{3^3}{3}$ — add 1 to the slope exponent, put the exponent underneath, then subtract fraction 1 by itself. Fill in 2 coordinates

$\frac{(5)^3}{3} - \frac{(2)^3}{3}$

125/3 - 8/3 = 117/3 =
36 is area

Rectangles sum together
4.5 wide, all rectangles are same width
f(x) is height changes...

Integrals and derivatives are opposite

$\int f(x)\,dx$ — rectangle height — Rectangle width — Sum Loop (x 1B)

Derivs (Find area under a line, if you know the slope)

Finds Slope at any Point
some days are uneven and don't have a clean slope

$\frac{dy}{dx} = \frac{x}{2}$

d means change

Transformations (translation, rotation, reflection, dilation)

Find center point of dilation o rotation

Lines and Angles

Length Measurements

Millimeter (mm), meter, centimeter (cm), 10mm; Kilometer (km), 1000meters; mm, 1,000,000mm

Inch, foot, yard, mile — (in) 1in *25.4mm; (ft) 12in; (yd) 36in; (mi) 63,360in

lightyear: *distance light travels in 1yr - Solar unit: *distance from earth to sun

Number & Counting

Counting keeps track of quantity. Counting is universal, choose how you count! Humans use 10 symbols before adding another symbol. Base 10 digits. Pig is military and can be any amount of symbols like 16 hexadecimal.

Same thing, no matter how it's written, numbers are universal

Once you run out of symbols, carryover and reset.

Base10: 0 1 2 3 4 5 6 7 8 9
Base16: 0 1 2 3 4 5 6 7 8 9 A B C D E F
Base20: 0 1 2 3 4 5 6 7 8 9 A B C D E F G H I J
Base60: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59

Arithmetic (Basic Math (using the numbers)

Equals
These are the same (=)
$\frac{1}{2} \cdot \frac{2}{4} \cdot \frac{3}{6} \cdot \frac{4}{8} = 2$

Addition
"sum" is the answer

Subtraction
"difference" is the answer

Multiplication
Repeated addition
"product" is the answer

Division
"quotient" is the answer

Exponents

Exponent
Multiply number by itself
$2^1 = 1$; $x^0 = 1$; $999^0 = 1$ because

$4^1 = 4 \times 4$; $4^2 = 4 \times 4 \times 4$; $4^3 = 4 \times 4 \times 4 \times 4$; $4^4 = 4 \times 4 \times 4 \times 4 \times 4$

3 Bacteria that double every 5 minutes. How much bacteria after 1 hour?
$3x^2 = x(??)$
= 863

Cancel out
$\sqrt{x^2} = x$
$\sqrt{x^4} = x^2$

Multiple same
$\sqrt{3\sqrt{3}} = \sqrt{36}$

Transformations

Geometry (Physical Things)

2D Circle; 2D Triangle; 2D Rectangle; Other Quadrilaterals (Kite, Trapezoid, Parallelogram, Rhombus); 7) hepagon; 8) octagon ....

Equilateral; Scalene; Isosceles; Right; Obtuse; Acute

Square; Rectangle; Rhombus; Parallelogram; Trapezoid; Kite

Ellipse; Oval; Semi-circle; Crescent; Lune; Annulus; Sector; Segment

Combinations Examples

what is the total given?

Platonic solids

Polygons
lines extending from a point evenly

Geometry 3D

1) Sphere; 2) Tetrahedron; 3) Cube; 4) Octahedron; Dodecahedron; Icosahedron

Special shapes Cone

Euler's Polyhedra Formula
F + V = E + 2
Cube: 6 + 8 - 12 = 2

Geometry 4D, 5D...

Platonic Solids in all geometry's
5 in 3D

Topology

Knots

Logarithms / Radicals / Square Roots

Logarithm Sqrtoot

$a\sqrt{b} + c\sqrt{b} = (a+c)\sqrt{b}$
$a\sqrt{b} \cdot \sqrt{b} = a\sqrt{b}$
$\sqrt{18} + \sqrt{50} = 3\sqrt{2} + 5\sqrt{2} = 8\sqrt{2}$ *3 & 5 both have √2 so you can add them* Can split radicals up into 2 nums that multiply to 18
$3\sqrt{6} \cdot 5\sqrt{18} = 3\sqrt{6} \cdot 5\sqrt{3} = 15\sqrt{18} = 15\sqrt{2} \cdot \sqrt{9} = 15\sqrt{9}$ & 15 both have √2 so you can subtract*

$\sqrt{2}^2 = 5$; $\sqrt{5}\sqrt{5} = \sqrt{25}$; $\sqrt{5}^2 = 5$

Titration
Kara once numbers get big fast
Repeated exponents

$2^1 = 4 \times 4$; $4^2 = 4 \times 4 \times 4$; $4^3 = 4 \times 4 \times 4 \times 4$

Rational Expressions (dividing variables)

$\frac{30x^4}{40x^2}$; $\frac{7x^4}{7x^2}$; $\frac{5x^4}{5x^2}$ — Divide common factors

$\frac{72x^6y}{64x^4y^3}$; $\frac{9x^3}{8}$

$\frac{5x^2-5x}{8x-24}$; $\frac{5x(x-3)}{8(x-3)}$; $\frac{5x}{8}$

$x^2-8x+15$ $(x-5)(x-3)$ $\frac{(x-5)}{2(x+3)}$
$2x^2-18$ $2(x^2-9)$ $2(x+3)(x-3)$

$\frac{5^2}{2}$; $\frac{5^3}{2}$; $\frac{5^4}{2}$

$x^4 \cdot x^3 = x^7$
$(x^2)^3 = x^6$
$x^{-1} = \frac{1}{x}$
$3x^{-4} = \frac{3}{x^4}$

Quotation Types

Combination Permutation
How many ways can you make change for 50c: Nickel(5), Dime(10), Quarter(25)

Algebra (equality, inequality)

Slope Algebra

Exponents and Log

Multiply number by itself...
4 x 4 = 4 x 4 x 4 x 4

Factorial
5! = 5 x 4 x 3 x 2 x 1 = 120

Inequalities (Equals)

Greater > Greater or Equal ≥ Inclusive; Less < Less or Equal ≤ Inclusive; Inclusive: ≥ ≤ ≠ ≠ ≠