EXPONENTS

$$\underbrace{2^5}$$

2 is the BASE
5 is the EXPONENT

The entire 2^5 is called a POWER.

$(-3)^2$ The brackets tell us that the base is −3.

-3^2 There are no brackets so the base is 3.
The negative applies to the whole expression.

- $-3^2 = -(3 \times 3) = -9$

$(-)^{odd} = neg$

$(-)^{even} = pos$

$-(-6)^3 = pos$

EXPONENTS

Repeated Multiplication $2^5 = 2 \times 2 \times 2 \times 2 \times 2$

Exponent 0 always equals 1 $(-6)^0 = 1$ $-6^0 = -1$

Multiplying exponents with the same base $5^3 \times 5^2 = 5^{3+2} = 5^5$

Dividing exponents with the same base $7^5 \div 7^2 = 7^{5-2} = 7^3$

Exponent to an exponent $(8^6)^2 = 8^{6\times2} = 8^{16}$

Exponent of a product $(AB)^4 = A^4B^4$ $(4x)^2 = 16x^2$

Exponent of a quotient $(A/B)^3 = A^3/B^3$

If the base is 10 the exponent tells you how many 0's

10^3	$10 \times 10 \times 10$	1000
10^5	$10 \times 10 \times 10 \times 10 \times 10$	100 000

You can write any number using base 10 exponents

$$7803 = 7000 + 800 + 3$$

$$= (7 \cdot 1000) + (8 \cdot 100) + (3 \cdot 1)$$

$$= (7 \cdot 10^3) + (8 \cdot 10^2) + (3 \cdot 10^0)$$

Order of Operations

BEDMAS

- B → Brackets
- E → Exponents
- DM → together left to right
- AS → together left to right

When multiplying or dividing:

$+ \times + = +$
$- \times - = +$
} same signs is positive

$- \times + = -$
$+ \times - = -$
} different signs is negative

two negative directly beside each other becomes a positive

$7 - (-4)$

$7 + 4$

11

FRACTIONS

Changing mixed to improper: Convert 3 $^2/_5$ to an improper fraction.

$$3\frac{2}{5} = \frac{17}{5}$$

Simplying Fractions: divide top and bottom by the same number

$$\frac{6 \div 2}{4 \div 2} = \frac{3}{2}$$

Adding and Subtracting Fractions: Bottom numbers must be the same. Only add or subtract the top numbers

$$\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6}$$

$$= \frac{2+1}{6} = \frac{3}{6} = \frac{1}{2}$$

$$\frac{1}{2} - \frac{1}{6} = \frac{3}{6} - \frac{1}{6}$$

$$= \frac{3-1}{6} = \frac{2}{6} = \frac{1}{3}$$

FRACTIONS

Multiplying Fractions: multiply across the top and multiply across the bottom

$$\frac{1}{2} \times \frac{2}{5} = \frac{1 \times 2}{2 \times 5} = \frac{\cancel{2}\,1}{\cancel{10}\,5} = \frac{1}{5}$$

Dividing Fractions: flip the second fraction and multiply

$$\frac{1}{2} \div \frac{1}{6} = \frac{1}{2} \times \frac{6}{1} = \frac{1 \times 6}{2 \times 1} = \frac{6}{2} = 3$$

Rational Number: any number that can be written as a fraction
(decimals must either end or repeat to turn into a fraction)

Changing decimals to fractions: make the denominator the place value of the final digit
make the numerator the actual number with no decimal

$$0.67 = \frac{67}{100}$$

repeating decimals make the denominator 1 less than the place value

$$0.67676767... = \frac{67}{99}$$

Never allowed 0 on the bottom of a fraction

Need common denominator to compare fractions to see which is bigger or smaller

$$\frac{4}{7} \qquad \frac{5}{9}$$

$$\frac{4}{7}\frac{\times 9}{\times 9} \qquad \frac{5}{9}\frac{\times 7}{\times 7}$$

$$\frac{36}{63} > \frac{35}{63}$$

therfore $\frac{4}{7} > \frac{5}{9}$

Perfect Squares $3 \times 3 = 9$

9 is a perfect square 3 is not a perfect square

Length × Length = Area of a Square

$(\text{Length})^2 = \text{Area}$

Area is always in units^2

Side length is always in units

$\sqrt{\text{Area}} = \text{Length}$

Square Roots of Fractions (must changed mixed numbers first)

$$\sqrt{\frac{4}{9}} = \frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3}$$

$$4\frac{21}{25} = \frac{121}{25} = \sqrt{\frac{121}{25}} = \frac{\sqrt{121}}{\sqrt{25}} = \frac{11}{5}$$

Change decimals to fractions before you take the square root

$$1.44 = \frac{144}{100} \qquad \sqrt{\frac{144}{100}} = \frac{\sqrt{144}}{\sqrt{100}} = \frac{12}{10}$$

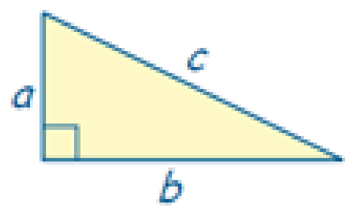
Estimating Square Roots

15 falls between 9 and 16, so $\sqrt{15}$ falls between $\sqrt{9}$ and $\sqrt{16}$ or 3 and 4. $3 < \sqrt{15} < 4$

$\sqrt{15}$ is really close to 4 (which is $\sqrt{16}$). 3.9 is a good estimate

PYTHAGOREAN THEOREM

$a^2 + b^2 = c^2$



Surface Area – the total area of all the surfaces (faces) of an object.

Do not include holes or overlaps (remember it overlaps on two sides)

$\sqrt{9}$ $\sqrt{15}$ $\sqrt{16}$

closer

3 4

3.9

MAKING EQUATIONS FROM LISTS OF NUMBERS

1. Make list using given information if you are not given lists

2. Decide which list is the pattern and which is just the term number (note: the term number always counts up by 1)

3. find the pattern (add or subtract the same amount each time)

4. write the pattern as a math rule (expression)
   Ex. add 5 each time is 5n
   subtract 3 each time is -3n

5. Test the first term number using the rule and make sure you get the right answer in the pattern. If you do not get the right answer decide how much to add or subtract to the rule to get the correct answer. Write a new rule

Time	Cost
0	10
1	15
2	20
3	25
4	30

Time: Term Number List
Cost: Pattern List

Pattern: adding 5 → 5n

Test Term 1: 5(1) = 5

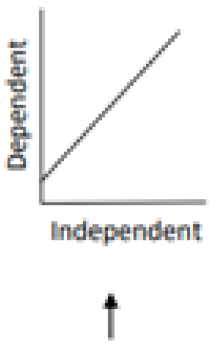
not true
Term 1 should be 15
need to add 10
So add 10 to rule

New Rule: 5n + 10

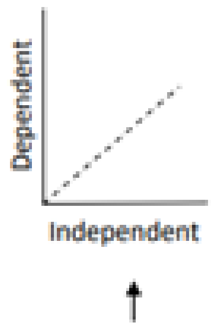
INDEPENDENT VARIABLE ALWAYS GOES ON THE X AXIS WHEN GRAPHING

DEPENDENT VARIABLE ALWAYS GOES ON THE Y AXIS WHEN GRAPHING

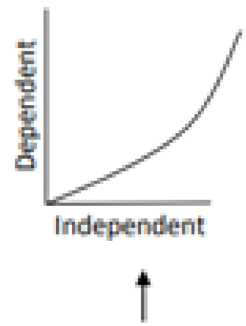
Linear: -if you join the dots it forms a straight line



Linear Relation



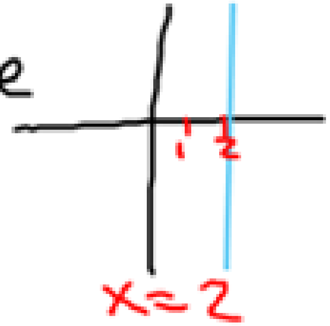
Linear Relation



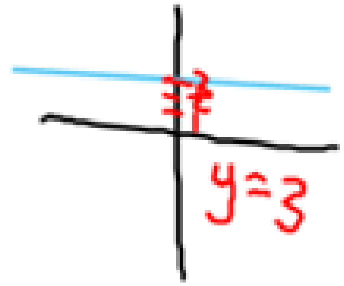
Nonlinear Relation

DISCRETE DATA: no part values allowed, do NOT connect the dots. ex # of people

CONTINUOUS DATA: part values are okay, connect the dots with a line ex time, height, Straight up and down graphs the equation is always $x = \#$



Flat across graphs the equation is always $y = \#$



$y=mx+b$

m=slope

b= y intercept → where the line crosses the y axis

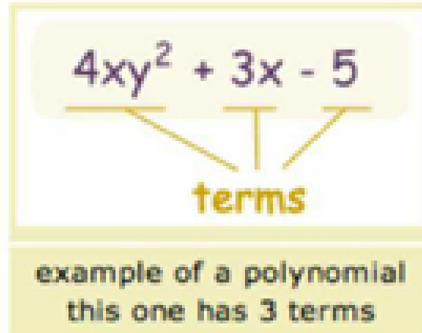
slope = $\frac{\text{rise (how far up)}}{\text{run (how far over)}}$

interpolation: information from inside the graph

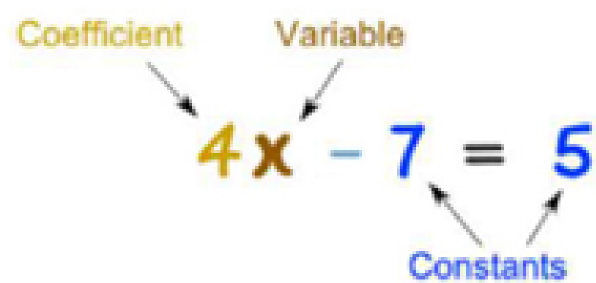
extrapolation: information from outside the graph

POLYNOMIALS

Terms are separated by plus or minus



Degree: largest exponent



Only add and subtract like terms (same letter and same exponent)

$$6x^2 + 10x - 7 \quad + \quad 2x^2 + 4x$$

$$\rightarrow (6+2)x^2 + (10+4)x + -7$$

$$\rightarrow 8x^2 + 14x - 7$$

If adding or subtracting a polynomial in brackets use arrows to help you

$$5y^2 + 2xy - 9 \; - \; (2y^2 + 2xy - 3)$$

$$3y^2 - 6$$

Multiplying by a polynomial: use arrows

$$2x(x + 3xy)$$

$$2x^2 + 6x^2y$$

Dividing polynomials: everything on top gets divided by the term on the bottom

$$\frac{9x^2 + 12x \text{ [redacted]}}{3x}$$

$$\frac{9x^2}{3x} + \frac{12x}{3x}$$

$$3x + 4$$


= + 1
= + x
= + x^2
= −1
= − x
= − x^2