BIDMAS is the acronym to give the priority of operations:
Brackets, **Indices** (powers and roots), **Division** AND **Multiplication**, **Addition** AND **Subtraction**
Do anything in brackets first, then any indices, then, from left to right, and divisions or multiplications, then, from left to right, any additions or subtractions.
Video 211 - https://tinyurl.com/y98jn4wk

= means equals

≠ means not equals

≈ means roughly equals

A **function** is a rule that acts on a number. Eg) x2 (times 2)

An **inverse function** reverses the effect of a function

+ and – are inverse operations

x and ÷ are inverse operations

Key Points:

https://tinyurl.com/y7zu77l9

Squaring a number means multiplying it by itself. The result is a **square number**. Eg) $4^2 = 4 \times 4 = 16$ which is a square number
Video 226 - https://tinyurl.com/ya4v48rn
Cubing a number means multiplying it by itself twice. The result is a **cube number**. Eg) $4^3 = 4 \times 4 \times 4 = 64$ which is a cube number
Video 212 - https://tinyurl.com/ydd72o3d
The **square root** of a number is the number you must square to get the original number. It is the inverse of squaring. Eg) $\sqrt{16} = 4$
Video 228 - https://tinyurl.com/yc28q7lv
The **cube root** of a number is the number you must cube to get the original number. It is the inverse of cubing. Eg) $\sqrt[3]{64} = 4$
Video 214 - https://tinyurl.com/y9q9m7nb

A **prime number** has two factors, itself and 1. Eg) 2, 3, 5, 7, 11, 13, 17, 19, 23…
Video 225 - https://tinyurl.com/ybnk7z5n

To multiply powers of the same number, add the indices, e.g. $4^3 \times 4^8 = 4^{11}$
To divide powers of the same number, subtract the indices, e.g. $4^8 \div 4^3 = 4^5$
Video 174 - https://tinyurl.com/za9u7h2

Knowledge Check:

https://tinyurl.com/ya7obwjs

Rounding is where you approximate a number to make it more manageable.
If we round to decimal places, we get rid of all digits after the required decimal place. The final decimal place goes up by one if the first digit we ignore is 5 or more. Eg) 4.597 = 4.6 (1 d.p.)
Video 278 - https://tinyurl.com/y9x7ltoh
If we round to **significant figures**, we get rid of all digits after the required digits from the left (ignoring leading zeros). The final digit goes up by one if the first digit we ignore is 5 or more. Eg) 0.0465 = 0.047 (2 s.f.)
Video 279a - https://tinyurl.com/yakhqfup
To **estimate** we round all numbers in a calculation to 1 significant figure (1 s.f.).

A **factor** is a number you can multiply by to get a desired number. Eg) 2 is a factor of 8
Video 117 - https://tinyurl.com/zymmfev
A **multiple** is a number you can divide by an integer to get a desired number. Eg) 16 is a multiple of 8
Video 220 - https://tinyurl.com/yaudfco3
Highest Common Factor (**HCF**) is the highest factor that is common to two or more numbers. Eg) 4 is the HCF of 8 and 12
Video 219 - https://tinyurl.com/zel3pzq
Lowest Common Multiple (**LCM**) is the lowest multiple that is common to two or more numbers. Eg) 24 is the LCM of 8 and 12
Video 218 - https://tinyurl.com/y8hg8z35

A **term** is a number, a letter, or a number and a letter multiplied together. Eg) 3, a, 2b, $4c^2$
Video 19 - https://tinyurl.com/hgw9ulw
Letters represent **variables**; the value can vary.
Like terms contain the same letters or power of letters, or are just numbers. Eg) 3 and 4, 3a and 6a, b^3 and $2b^3$
To **simplify** an expression we can **collect like terms**.
Eg) 3a + 2 + 4a = 7a + 2
Video 9 - https://tinyurl.com/z77lutd
We can also simplify multiplications by removing the multiplication symbol and divisions by making into a fraction. Eg) 2 x a = 2a, c ÷ d = c/d or $\frac{c}{d}$
If we have an expression or equation and are given the value of a variable, we can **substitute** this value in. Eg) 3a + b = c where a = 2 becomes 6 + b = c
Video 20 - https://tinyurl.com/zd6tv9j

Key Points:

https://tinyurl.com/y9j5u8ws

A **formula** shows the relationship between terms. Eg) 4a + b = c

An **expression** is a collection of terms. Eg) 2a + 1

An **equation** is an expression equalling another. Eg) 3b + 2 **=** 2d

An **inequality** is where two expressions don't, or don't necessarily, equal each other (**<**, **>**, **≤**, **≥**). Eg) 4f > 6

An **identity** is two expressions that always equal each other, regardless of the variables. Eg) 2(a + 5) **≡** 2a + 10

A **not equal** symbol shows that two expressions do not equal each other. Eg) 2a **≠** b
Video 16 - https://tinyurl.com/j5cdu68

To multiply terms, multiply any numbers, put non-like terms next to each other, and add powers of like terms. Eg) 2a x 3a x 4b = $24a^2b$
Video 18 - https://tinyurl.com/ybaxlv6k
To multiply the same variable with powers, add the indices. Eg) $2a^2$ x $4a^3$ = $8a^5$
To divide the same variable with powers, subtract the indices. Eg) $8a^5$ ÷ $2a^3$ = $4a^2$
Video 11 - https://tinyurl.com/ycvjot5b

Knowledge Check:

https://tinyurl.com/yb8a3eto

To **expand brackets**, multiply the terms in the brackets by the multiplier. Eg) 5(a + 2) = 5 x a + 5 x 2 = 5a +10
Video 13 - https://tinyurl.com/hepjutn
To expand **double brackets**, multiply every term in on bracket by every term in the other. Eg) (a + b)(c + d) = a x c + a x d + b x c + b x d = ac + ad + bc + bd
Video 14 - https://tinyurl.com/ycptvous

To **factorise** expressions we reverse the expansion of brackets. We do this by dividing through by the **HCF** (highest common factor) and putting the HCF as the multiplier outside the brackets. Eg) 5a + 10b = 5(a + 2b)

Video 117 - https://tinyurl.com/zymmfev

To rearrange an equation (or inequality), always do the same to both sides of the equation and use the opposite operator to remove a term. Eg) a + 2b = c [- a]

2b = c – a [÷ 2]

$$b = \frac{c-a}{2}$$

We use this to change the subject of a formula.

Video 110 - https://tinyurl.com/y866296z

KS4 – Maths / Unit 2 (F) Algebra

Frequency Tables

These are a useful and clear way of displaying data,
e.g. the table below shows the scores out of ten for 20 students.

Mark	Tally	Frequency
4	II	2
5	II	2
6	III	4
7	IIII	5
8	III	4
9	II	2
10	I	1

Frequency means how often something occurs.

This means 5 students scored 7 marks in their test.

Grouped Frequency Tables

These contain sorted data in groups called **classes,**
e.g. the table below shows the ages of people taking swimming lessons.

Class Interval	Frequency
15 – 25	60
25 – 35	35
35 – 45	22
45 – 55	18
55 – 65	15

Total frequency will tell you the total number of people taking swimming lessons.

This means 18 people who took swimming lessons were between the ages of 45 and 55.

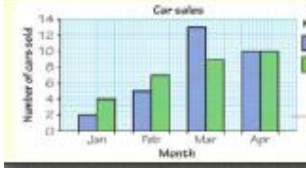
Classes or class widths

Comparative Bar Charts

The table shows the number of cars sold by Kitty and George in the first four months of 2014.

Video 147
Video 148

	January	February	March	April
Kitty	2	5	15	10
George	4	7	9	10



The chart has a key to make it easier to understand.

*A **comparative bar chart** allows you to easily compare the number of cars Kitty and George sold each month.*

Two-Way Tables

Video 319

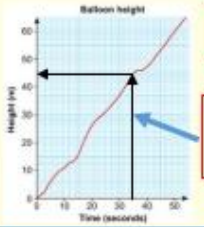
These are used to show how data falls into 2 different categories, for example gender and favourite sport to watch.

What is your favorite sport to watch on television?			
	Football	Basketball	Baseball
Males	40	22	15
Females	12	16	45
Total	52	38	60

A two-way table divides data into groups in rows going across and columns going down the table.

Time-Series Graph

These are used to show how something changes over time. It is a line graph with time plotted along the horizontal axis
For example the height of a balloon at different times

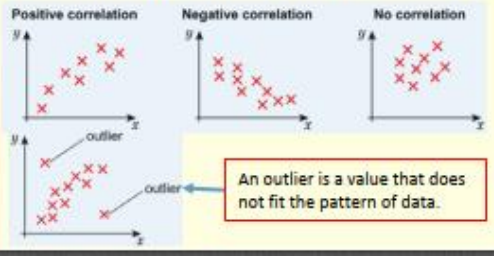


You can estimate the height of the balloon at different times using the graph

E.g. the height of the balloon at 35 seconds is approximately 45m as shown by the arrows on the graph

Scatter Graphs

A scatter graph allows you to see the **relationship** between two sets of data, e.g. your height and your stride length. Correlation is used to describe a relationship between two **variables.**

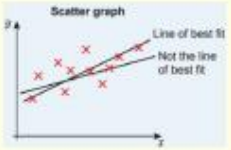


An outlier is a value that does not fit the pattern of data.

A line of best fit

Videos 165 - 168

This is a straight line drawn through the middle of the points on a scatter graph. It should pass as near as many points as possible and represents the **trend** of the points.

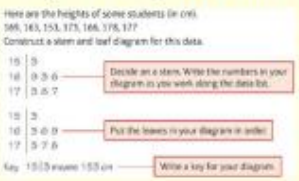


A line of best fit can be used to predict data values within the range of data given.
This is called **interpolation.**
It can also be used to predict data values outside the range of data given.
This is called **extrapolation.**

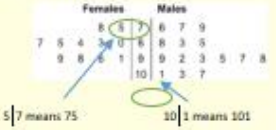
Stem and Leaf Diagrams

Video 169
Video 170

This shows numerical data split into a **'stem'** and **'leaves'**. The leaf is usually the last digit and the stem is the other digits.



A back-to-back stem and leaf diagram compares two sets of data, e.g. the ages of males and females.



Pie Charts

Video 163 - Drawing
Video 164 - Interpreting

This is a circle divided into **sectors.** Each sector represents a set of data. Pie charts are excellent for displaying the most/ least popular type of something.

Plotting pie charts example

The table show the match results of a football team.

Result	Won	Drawn	Lost
Frequency	28	12	20

28 + 12 + 20 = 60 — The total number of games is the total frequency.

1 game = 360° ÷ 60 games = 6° per game — Work out the angle for **one** game.

360° in a circle

28 games won = 28 × 6° = 168°
12 games drawn = 12 × 6° = 72°
20 games lost = 20 × 6° = 120°
Work out the angle for each result.

Draw the pie chart. Give it a title and a key. Or label each section

KS4 Maths / Unit 3 (F) Graphs, Tables and Charts

Corbett Maths video links: V142 V146 V234

Fractions

The basics:

This pizza is ¾ shaded green

3 is the "numerator"
4 is the "denominator"

Notice that 6/8 is exactly the same amount. (both numbers doubled)

Multiplying fractions:

Just multiply numerators, multiply denominators, and ***simplify*** if possible

$\frac{2}{4} \times \frac{2}{4} = \frac{4}{16} = \frac{1}{4}$ (÷4 then ÷4)

Simplifying involves dividing numerator and denominator by their HCF

...HCF is the Highest Common Factor

Fractions of amounts:

Use simpler fractions to find the fraction you actually want:

Eg. ¾ of 32: ¾ of 32 = 32 ÷ 4 = 8
so ¾ of 32 = 8 x 3 = 24

Divide by the denominator, Then multiply by the numerator

In this example, a whole pizza = 32

Simplifying fractions:

Divide numerator and denominator by HCF. You should do this to any final answer fraction where possible.

Percentages of amounts

Calculator allowed?

Turn % into decimal (÷100) and "of" means "multiply".

e.g. 30% of £54 = 30 ÷100 x 54 = £16.20

e.g. 28% of £40 = 28 ÷100 x 40 = £11.20

Reverse percentages:

Use the logic of function machines, which can be run backwards.
You need to figure out the forwards multiplier first.

e.g. $30 dress reduced by 20%:

$30 → X 0.8 → $24

e.g. Sale price after 30% discount = £28

Original price: ? → X 0.7 → £28
£40 → ÷ 0.8 → £28

Calculator *not* allowed?

10% is your starting point.
10% means "a tenth of the amount" (because 10% = 10/100 = 1/10)

You can work out all the other percentages you need by scaling up or down from 10%

e.g. 30% of £54?

10% = £5.40 (a tenth of 54 = 54/10)
20% = £10.80 (20% is double 10%)
30% = £16.20 (30% = 10% + 20%)

e.g. 28% of £40?

10% = £4
1% = 40p (divide 10% by 10)
2% = 80p (double 1%)
5% = £2 (half 10%)
20% = £8 (double 10%)

28% = these 4 added together, = £11.20

Fractions, decimals, percentages conversion

Example:

Fraction 24/100 = 6/25 ⇄ decimal 0.24 ⇄ percentage 24%

numerator ÷ denominator

X 100

Write as fraction out of 10, 100, or 1000, and simplify

÷ 100

Some examples:

1/10 =	10/100 =	0.1 =	10%
1/5 =	20/100 =	0.2 =	20%
3/10 =	30/100 =	0.3 =	30%
9/20 =	45/100 =	0.45 =	45%

People often assume a % cannot be over 100, but it can (just like a fraction can be improper* and a decimal can be over 1)

* top-heavy

Battenburg: adding

1. Draw the battenburg grid.
2. Put the fractions on the side, (left to right, top to bottom).
3. Eat the top left corner (cross it out).
4. Do the multiplications.
5. "**ADD** the peanut" (the yellow ones below).
6. Peanut answer is numerator, the remaining number is denominator.
7. Simplify the fraction, if possible.

$\frac{1}{4} + \frac{1}{3} = \frac{7}{12}$

Divide top and bottom of fraction with the HCF that they share

	1	4
1	X	4
3	3	12

Battenburg: subtracting

1. Draw the battenburg grid.
2. Put the fractions on the side, (left to right, top to bottom).
3. Eat the top left corner (cross it out).
4. Do the multiplications.
5. "**SUBTRACT** the peanut" (the yellow ones below).
6. Peanut answer is numerator, the remaining number is denominator.
7. Simplify the fraction, if possible.

$\frac{1}{4} - \frac{1}{3} = \frac{1}{12}$

Divide top and bottom of fraction with the HCF that they share

	1	4
1	X	4
3	3	12

Fractions:

To multiply fractions, just multiply numerators and denominators:

e.g. $\frac{2}{7} \times \frac{4}{5} = \frac{8}{35}$

To divide fractions, KFC (keep, flip, change)

e.g. $\frac{2}{7} \div \frac{4}{5} = \frac{2}{7} \times \frac{5}{4} = \frac{10}{28}$

simplify

An **equation** contains an unknown number (letter) and an equals (=) sign.

You **solve** an equation by working out the value of the unknown.

Video 110 - https://tinyurl.com/y866296z

In an equation, both sides of the = sign have the same value (like balanced scales). As with balanced scales, the two sides remain equal if the same is done to both sides (**balancing method**).

In an equation with **brackets**, expand the brackets first.

To expand brackets, multiply everything within the brackets by any multiplier on the outside.

A **formula** is an equation with two or more **variables** (unknown numbers).

Values can be **substituted** into a formula to get results.

Video 113 - https://tinyurl.com/y76yatx2

Key Points:

https://tinyurl.com/y9cavj7r

An **integer** is a positive or negative whole number, or a zero.

< means **less than** (the thing on the left is less than the thing on the right)

> means **greater than** (left side greater than right side)

≤ means **less than or equal to** (like less than, but the two sides might be equal)

≥ means **greater than or equal to** (like greater than but the two sides might be equal)

Video 176 - https://tinyurl.com/y7py6cf9

You **MUST** do the **SAME** to **BOTH** sides of an equation or inequality
Video 178 - https://tinyurl.com/hkxkrvk

Inequalities can be shown on number lines with empty circles (for less than or greater than) or filled circles (if value could be equal) and arrows in correct direction.
Video 177 - https://tinyurl.com/y72g4v69

Knowledge Check:

https://tinyurl.com/y96fhs9v

Sequences are patterns of numbers that follow a rule.

The numbers in a sequence are called **terms**.

Video 286 - https://tinyurl.com/ydaj355k

The **term-to-term** rule describes how to get from one term to the next.

Video 287 - https://tinyurl.com/y7mp8hdf

The ***nth*** term of a sequence is how to work out the term given its position (*n*) in the sequence.

Video 288 - https://tinyurl.com/hs9qnsx

The ***nth*** term is sometimes called the **general term** of a sequence.

In a **linear sequence** (same difference between each pair of terms) the *n*th term is found by multiplying the position by the difference between the first and second terms, then adding or subtracting a constant to make the output when $n = 1$ actually equal the first term.

As with all mathematical calculations, please remember to use **BIDMAS**:

Brackets then **Indices** then **Division & Multiplication** then **Addition & Subtraction**

Video 211 - https://tinyurl.com/y98jn4wk

KS4 – Maths / Unit 5 (F) Equations, Inequalities & Sequences