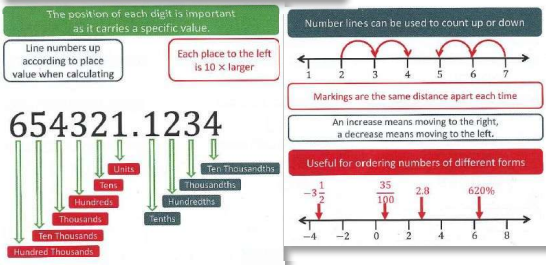


Numbers

Foundation

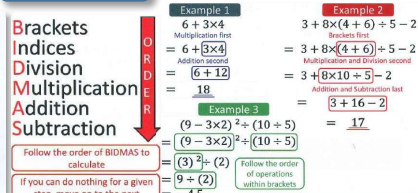
Place value and Number lines



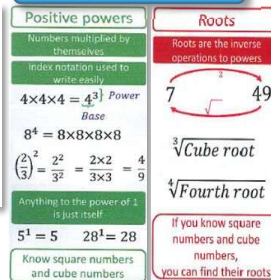
Rounding



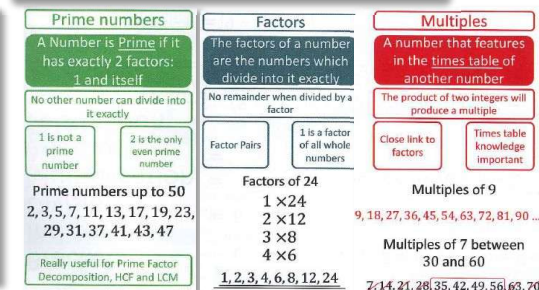
BIDMAS



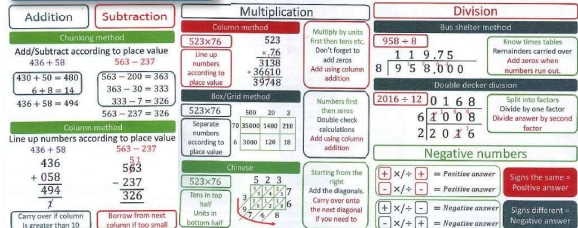
Powers and Roots



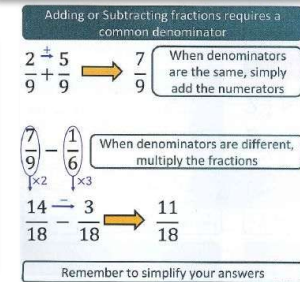
Prime numbers, Factors and Multiples



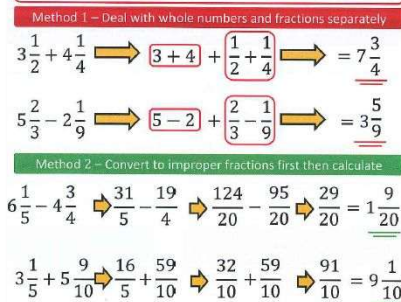
Four operations



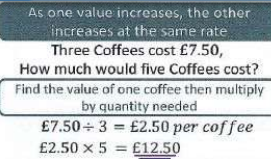
Adding and Subtracting fractions



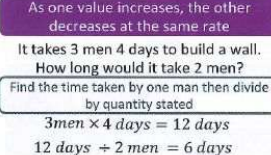
Adding/Subtracting Mixed Numbers



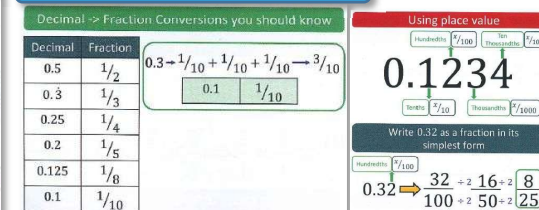
Direct Proportion



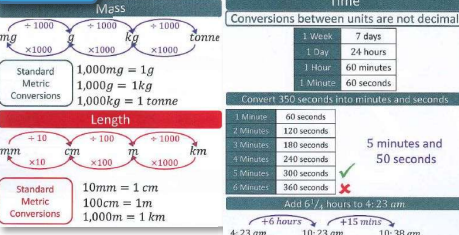
Inverse Proportion



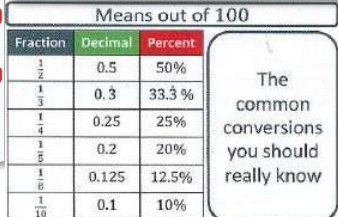
Converting fractions to decimals



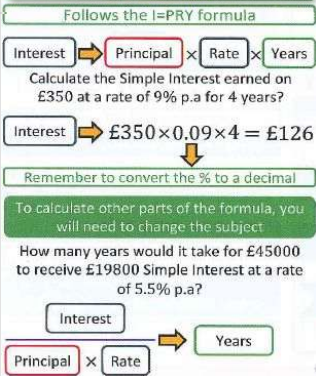
Units



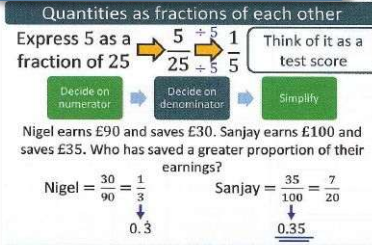
Percentage



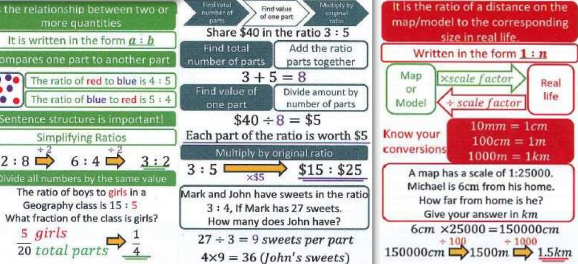
Simple interest



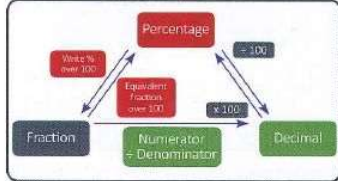
Percentage quantity



Ratio



Conversion Flow Chart



Algebra

Foundation

What is algebra?

Algebra is the language we use to communicate mathematical information

Letters used to represent values are known as variables.

Notation creates shortcuts

$a \times b$ becomes ab coefficient
 $x + x + x + x$ becomes $4x$
 $y \times y$ becomes y^2

$6xy - 5\frac{a}{b} + 21x^4$ $6xy - 5\frac{a}{b} + 21x^4$
 Expression Terms

Same rules of BIDMAS applies to Algebra

Collecting terms

Collecting like terms enables us to simplify expressions making them easier to use

Terms that contain the exact same variable can be classed as 'like' terms and be simplified

Watch out for the sign before each term

$$5x + 6y - 2x - 5y = 3x + y$$

$$5xy + 3x - 2xy + 4y = 3xy + 3x + 4y$$

$$2x^2 + 3x + 5x^2 - 5x = 7x^2 - 2x$$

Identify like terms

Use coefficients to collect like terms

First step in many problems involving Algebra

Algebraic HCF

Look at whole expression, identify HCF and divide out

$$12x - 6y + 3z \quad \text{HCF} = 3$$

$$3(4x - 2y + z)$$

$$ax + aby + 4az \quad \text{HCF} = a$$

$$a(x + by + 4z)$$

Expanding brackets

Multiply terms outside by all terms inside

$$10(x + y + 4) = 10x + 10y + 40$$

$$3x(6x - 2) = 18x^2 - 6x$$

Expanding brackets often the first step in simplifying algebra

$$2(x + 3y) - 7(2x - y) = 2x + 6y - 14x + 7y$$

$$= -12x + 13y$$

FOIL Method

F	First terms	x^2
O	Outside terms	$11x$
I	Inside terms	$4x$
L	Last terms	44

Then simplify $x^2 + 15x + 44$

Multiply each term in first bracket by each term in second

Grid Method

$(x + 4)$	$(x - 3)$
x	x^2
4	$4x$
-3	$-3x$
	-12

Split brackets up around grid

Multiply each term in the grid

Then simplify $x^2 + x - 12$

Creating and solving linear equations

$5k$ $3k - 2$ $3k + 3$
 The perimeter of the triangle is 67cm. Form an equation in x .

$$3k + 3 + 3k - 2 + 5k = 67$$

Once the equation has been created, it can be solved using a balance method or inverse method.

Derived from the word 'Equal' $\Rightarrow$ This means that the = symbol is involved $\Rightarrow$ The left side has the same value as the right side.

$$\text{Left Side} = \text{Right Side}$$

The equation is balanced

General 4 step process

Expand brackets and simplify (collect like terms)

If x is on both sides, eliminate smallest value

Eliminate excess number

Divide and solve for x

$$3(x + 1) = 2(x + 2)$$

$$3x + 3 = 2x + 4$$

$$x + 3 = 4$$

$$x = 1$$

Solving fractional linear equations

Equations where fractions are involved

Fractions are divisions and can be eliminated by multiplying

$$\frac{x}{2} = 5 \quad x = 10$$

Remove variable from denominator

$$\frac{2y}{(3-y)} = 4 \Rightarrow 2y = 4(3-y)$$

Cross-multiplying allows us to move terms in a fraction from one side of an equation to the other

$$\frac{x+1}{3} = \frac{x}{2} \Rightarrow 2(x+1) = 3x$$

Using formulas

Explains how to calculate the value of a variable

"The price of a taxi fare in Manchester depends on the distance driven. Each fare is charged a flat fee of £2 and then £3 for each mile driven."

$$C = 2 + 3M$$

For any given trip, can easily work out the cost of a taxi

Area of circle formula

$$A = \pi r^2$$

Subject

Replace letters in the formula with numbers you are given

"The perimeter of a square is 4 times the length of its sides"

$$P = 4l$$

What is perimeter of a square with side length 5cm?

$$l = 5 \quad P = 4(5)$$

$$P = 20\text{cm}$$

Identify the formula and the values to substitute in.

Substitute values in using brackets

Carry out calculation remembering BIDMAS

Laws of Indices

Special indices to consider

$$x^1 = x \quad \text{Anything to the power 1 = itself}$$

$$x^0 = 1 \quad \text{Anything to the power 0 = 1}$$

$$1^x = 1 \quad \text{1 to the power of anything = 1}$$

These laws can be applied if the bases are the same

$$x^a \times x^b = x^{a+b}$$

$$z^3 \times z^7 = z^{10}$$

$$x^a \div x^b = x^{a-b}$$

$$s^2 \div s^5 = s^{-3}$$

$$(x^a)^b = x^{a \times b}$$

$$(e^4)^3 = e^{12}$$

When multiplying powers with the same base - Add the powers

When dividing powers with the same base - Subtract the powers

When raising the power (brackets) - Multiply the powers

Sequences

A series of numbers, patterns that follow a given rule

3 8 13 18... 23 28 33
 $+5 \quad +5 \quad +5 \quad +5 \quad +5 \quad +5$

Each number in the sequence is known as a 'term'

Identify what is happening between each term to generate the rule

General rule is known as n^{th} term.

Triangular Numbers	Square Numbers	Cube Numbers
1	1	1
3	4	8
6	9	27
10	16	64
15	25	125

Compound Measures

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

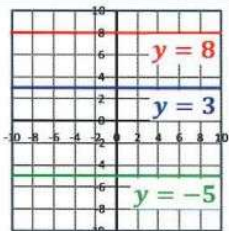
Formulas I must memorise

Graphs

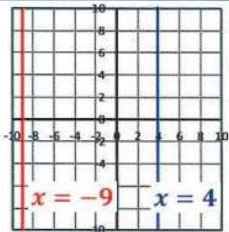
Foundation

Understanding graphs

Horizontal lines
→ $y = ?$

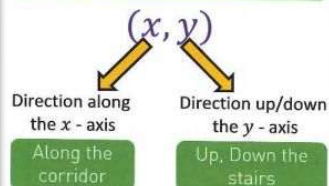


Vertical lines
→ $x = ?$



A set of values that indicate the position of a point.

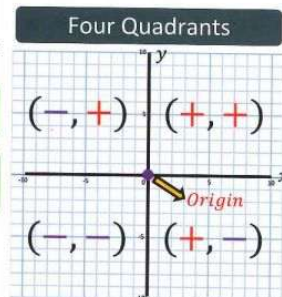
They normally occur in pairs in the form (x, y)



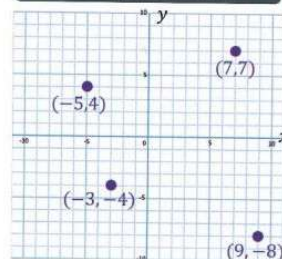
Start from a central point $(0,0)$ - Origin

Reading the coordinates will lead you to the exact position.

$(7, -4)$ ⇒ Seven units **right**, Four units **down**
 $(-2, 6)$ ⇒ Two units **left**, Six units **up**
 $(-5, -2)$ ⇒ Five units **left**, Two units **Down**



Plotting coordinates



Linear graphs

All straight line graphs follow the same rule

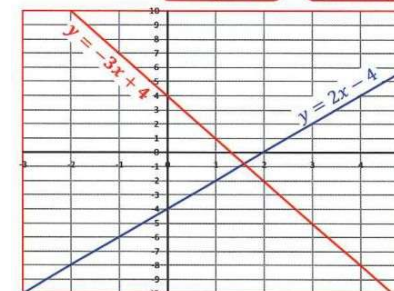
$$y = mx + c$$

Gradient

y intercept

Gradient is the 'steepness' of the line

Calculated by $\frac{\text{Change in } y}{\text{Change in } x}$ or $\frac{\text{Rise up}}{\text{Run along}}$



Equation of line from coordinates

Calculate gradient between points (m)

Substitute in points and solve (c)

Find the equation of the line that passes through $(0,2)$ and $(3,8)$

$$\text{Gradient} = \frac{y_2 - y_1}{x_2 - x_1} \Rightarrow \frac{6}{3} = 2 \Rightarrow (m)$$

$$y = 2x + c \xrightarrow{\text{substitute}} 8 = 2(3) + c$$

$$8 = 6 + c \xrightarrow{\text{solve}} 2 = c$$

$$y = mx + c$$

$$y = 2x + 2$$

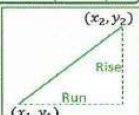
Rate of change

A rate that describes how one quantity changes in relation to another quantity

It is represented by the Gradient of a line

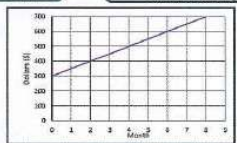
$$\text{Gradient} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\text{Gradient} = \frac{\text{Rise}}{\text{Run}}$$



Interpreting Rates of Change

Gradient → Amount of (y) per Amount of (x)



Rate of change = \$50 per month

Mid points and parallel lines

Midpoints

A midpoint is the halfway point between two end points of a line segment

$$\left(\frac{x_A + x_B}{2}, \frac{y_A + y_B}{2} \right)$$

Add up the x coordinates and halve it

Add up the y coordinates and halve it

Find the coordinate of the midpoint joining the points $(6,11)$ and $(15,-9)$

$$x = \frac{6 + 15}{2} = \frac{21}{2} = 10.5$$

$$y = \frac{11 + -9}{2} = \frac{2}{2} = 1$$

$$\Rightarrow (10.5, 1)$$

The distance between two points will always be the hypotenuse



Parallel lines

Parallel lines are lines that run equidistant to each other and **never** intersect (cross)

Parallel lines have the **same** gradient. Different y - intercepts

$$y = mx + c$$

Same Different

Find the equation of the line parallel to $y = 2x + 4$ that passes through $(4,2)$

Substitute in point and solve (c)

$$y = 2x + c \Rightarrow 2 = 2(4) + c$$

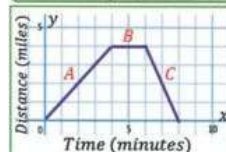
$$2 = 8 + c \Rightarrow -6 = c$$

$$y = 2x - 6$$

Real life graphs

Distance - Time graphs

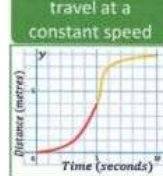
Distance - Time graphs record the journey of an object as it begins to move away from and return to a point.



A Moving away
B Stationary
C Returning

Gradient = Speed

Not all objects travel at a constant speed



$$\text{Gradient} = \frac{\text{rise}}{\text{run}}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

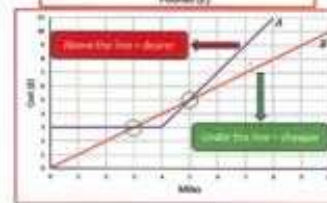
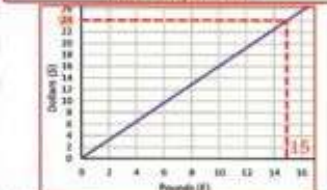
Calculate speed at a specific point by creating a tangent.

Financial graphs

Currency Conversions

Predict future costs

Cost Comparisons

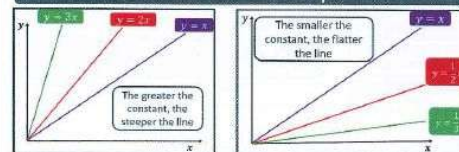


Proportion graphs

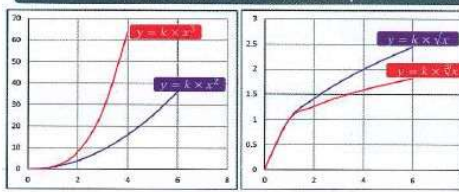
Direct Proportion

$y \propto x \rightarrow y = k \times x$ As one value increases, so does the other

Linear relationships



Non - linear relationships



Geometry

Foundation

Trapezium

One pair of parallel sides

Isosceles Trapezium

One pair of equal sides
Two pairs of equal angles
Diagonals equal length
One pair of parallel sides

2D shapes

Equilateral	Isosceles	Scalene
All sides equal	Two equal sides	No equal sides
All angles equal (60°)	Two equal angles	No equal angles
Three lines of symmetry	One line of symmetry	No line of symmetry

3D shapes

Faces, Edges and Vertices

Shape	Faces	Edges	Vertices
Cube	6	12	8
Cuboid	6	12	8
Triangular Prism	5	9	6
Pentagonal Prism	7	15	10
Square based Pyramid	5	8	5
Cone	2	1	1
Cylinder	3	2	0
Sphere	1	0	0

Shape	Faces	Edges	Vertices
Cube	6	12	8
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Cone	2	1	1
Cylinder	3	2	0
Sphere	1	0	0

Pythagoras Theorem

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

Finding the Hypotenuse

If you know the lengths of the two shorter sides, you can calculate the length of the hypotenuse.

Finding the Shorter side

If you know the Hypotenuse and a shorter side, you can calculate the length of the other shorter side.

Regular

Side lengths are the same
Interior and exterior angles the same

Irregular

Side lengths are not ALL the same
Interior and exterior angles the not ALL the same

Equal sides are marked with a dash through the line

Number of sides	Name of shape
3	Triangle
4	Quadrilateral
5	Pentagon
6	Hexagon
7	Heptagon
8	Octagon
9	Nonagon
10	Decagon

Cone

Square based Pyramid

Sphere

Hemisphere

Pyramids are classified according to their base

Area and perimeter

Perimeter

The total distance AROUND a 2D shape

Adding all the side lengths together

100m 100 + 100 + 35 + 35 = 270m

The process does not change if we have algebraic terms

2x 3x 4x 5x 6x 7x 8x 9x 10x 11x 12x 13x 14x 15x 16x 17x 18x 19x 20x 21x 22x 23x 24x 25x 26x 27x 28x 29x 30x 31x 32x 33x 34x 35x 36x 37x 38x 39x 40x 41x 42x 43x 44x 45x 46x 47x 48x 49x 50x 51x 52x 53x 54x 55x 56x 57x 58x 59x 60x 61x 62x 63x 64x 65x 66x 67x 68x 69x 70x 71x 72x 73x 74x 75x 76x 77x 78x 79x 80x 81x 82x 83x 84x 85x 86x 87x 88x 89x 90x 91x 92x 93x 94x 95x 96x 97x 98x 99x 100x 101x 102x 103x 104x 105x 106x 107x 108x 109x 110x 111x 112x 113x 114x 115x 116x 117x 118x 119x 120x 121x 122x 123x 124x 125x 126x 127x 128x 129x 130x 131x 132x 133x 134x 135x 136x 137x 138x 139x 140x 141x 142x 143x 144x 145x 146x 147x 148x 149x 150x 151x 152x 153x 154x 155x 156x 157x 158x 159x 160x 161x 162x 163x 164x 165x 166x 167x 168x 169x 170x 171x 172x 173x 174x 175x 176x 177x 178x 179x 180x 181x 182x 183x 184x 185x 186x 187x 188x 189x 190x 191x 192x 193x 194x 195x 196x 197x 198x 199x 200x 201x 202x 203x 204x 205x 206x 207x 208x 209x 210x 211x 212x 213x 214x 215x 216x 217x 218x 219x 220x 221x 222x 223x 224x 225x 226x 227x 228x 229x 230x 231x 232x 233x 234x 235x 236x 237x 238x 239x 240x 241x 242x 243x 244x 245x 246x 247x 248x 249x 250x 251x 252x 253x 254x 255x 256x 257x 258x 259x 260x 261x 262x 263x 264x 265x 266x 267x 268x 269x 270x 271x 272x 273x 274x 275x 276x 277x 278x 279x 280x 281x 282x 283x 284x 285x 286x 287x 288x 289x 290x 291x 292x 293x 294x 295x 296x 297x 298x 299x 300x 301x 302x 303x 304x 305x 306x 307x 308x 309x 310x 311x 312x 313x 314x 315x 316x 317x 318x 319x 320x 321x 322x 323x 324x 325x 326x 327x 328x 329x 330x 331x 332x 333x 334x 335x 336x 337x 338x 339x 340x 341x 342x 343x 344x 345x 346x 347x 348x 349x 350x 351x 352x 353x 354x 355x 356x 357x 358x 359x 360x 361x 362x 363x 364x 365x 366x 367x 368x 369x 370x 371x 372x 373x 374x 375x 376x 377x 378x 379x 380x 381x 382x 383x 384x 385x 386x 387x 388x 389x 390x 391x 392x 393x 394x 395x 396x 397x 398x 399x 400x 401x 402x 403x 404x 405x 406x 407x 408x 409x 410x 411x 412x 413x 414x 415x 416x 417x 418x 419x 420x 421x 422x 423x 424x 425x 426x 427x 428x 429x 430x 431x 432x 433x 434x 435x 436x 437x 438x 439x 440x 441x 442x 443x 444x 445x 446x 447x 448x 449x 450x 451x 452x 453x 454x 455x 456x 457x 458x 459x 460x 461x 462x 463x 464x 465x 466x 467x 468x 469x 470x 471x 472x 473x 474x 475x 476x 477x 478x 479x 480x 481x 482x 483x 484x 485x 486x 487x 488x 489x 490x 491x 492x 493x 494x 495x 496x 497x 498x 499x 500x 501x 502x 503x 504x 505x 506x 507x 508x 509x 510x 511x 512x 513x 514x 515x 516x 517x 518x 519x 520x 521x 522x 523x 524x 525x 526x 527x 528x 529x 530x 531x 532x 533x 534x 535x 536x 537x 538x 539x 540x 541x 542x 543x 544x 545x 546x 547x 548x 549x 550x 551x 552x 553x 554x 555x 556x 557x 558x 559x 560x 561x 562x 563x 564x 565x 566x 567x 568x 569x 570x 571x 572x 573x 574x 575x 576x 577x 578x 579x 580x 581x 582x 583x 584x 585x 586x 587x 588x 589x 590x 591x 592x 593x 594x 595x 596x 597x 598x 599x 600x 601x 602x 603x 604x 605x 606x 607x 608x 609x 610x 611x 612x 613x 614x 615x 616x 617x 618x 619x 620x 621x 622x 623x 624x 625x 626x 627x 628x 629x 630x 631x 632x 633x 634x 635x 636x 637x 638x 639x 640x 641x 642x 643x 644x 645x 646x 647x 648x 649x 650x 651x 652x 653x 654x 655x 656x 657x 658x 659x 660x 661x 662x 663x 664x 665x 666x 667x 668x 669x 670x 671x 672x 673x 674x 675x 676x 677x 678x 679x 680x 681x 682x 683x 684x 685x 686x 687x 688x 689x 690x 691x 692x 693x 694x 695x 696x 697x 698x 699x 700x 701x 702x 703x 704x 705x 706x 707x 708x 709x 710x 711x 712x 713x 714x 715x 716x 717x 718x 719x 720x 721x 722x 723x 724x 725x 726x 727x 728x 729x 730x 731x 732x 733x 734x 735x 736x 737x 738x 739x 740x 741x 742x 743x 744x 745x 746x 747x 748x 749x 750x 751x 752x 753x 754x 755x 756x 757x 758x 759x 760x 761x 762x 763x 764x 765x 766x 767x 768x 769x 770x 771x 772x 773x 774x 775x 776x 777x 778x 779x 780x 781x 782x 783x 784x 785x 786x 787x 788x 789x 790x 791x 792x 793x 794x 795x 796x 797x 798x 799x 800x 801x 802x 803x 804x 805x 806x 807x 808x 809x 810x 811x 812x 813x 814x 815x 816x 817x 818x 819x 820x 821x 822x 823x 824x 825x 826x 827x 828x 829x 830x 831x 832x 833x 834x 835x 836x 837x 838x 839x 840x 841x 842x 843x 844x 845x 846x 847x 848x 849x 850x 851x 852x 853x 854x 855x 856x 857x 858x 859x 860x 861x 862x 863x 864x 865x 866x 867x 868x 869x 870x 871x 872x 873x 874x 875x 876x 877x 878x 879x 880x 881x 882x 883x 884x 885x 886x 887x 888x 889x 890x 891x 892x 893x 894x 895x 896x 897x 898x 899x 900x 901x 902x 903x 904x 905x 906x 907x 908x 909x 910x 911x 912x 913x 914x 915x 916x 917x 918x 919x 920x 921x 922x 923x 924x 925x 926x 927x 928x 929x 930x 931x 932x 933x 934x 935x 936x 937x 938x 939x 940x 941x 942x 943x 944x 945x 946x 947x 948x 949x 950x 951x 952x 953x 954x 955x 956x 957x 958x 959x 960x 961x 962x 963x 964x 965x 966x 967x 968x 969x 970x 971x 972x 973x 974x 975x 976x 977x 978x 979x 980x 981x 982x 983x 984x 985x 986x 987x 988x 989x 990x 991x 992x 993x 994x 995x 996x 997x 998x 999x 1000x 1001x 1002x 1003x 1004x 1005x 1006x 1007x 1008x 1009x 1010x 1011x 1012x 1013x 1014x 1015x 1016x 1017x 1018x 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1849x 1850x 1851x 1852x 1853x 1854x 1855x 1856x 1857x 1858x 1859x 1860x 1861x 1862x 1863x 1864x 1865x 1866x 1867x 1868x 1869x 1870x 1871x 1872x 1873x 1874x 1875x 1876x 1877x 1878x 1879x 1880x 1881x 1882x 1883x 1884x 1885x 1886x 1887x 1888x 1889x 1890x 1891x 1892x 1893x 1894x 1895x 1896x 1897x 1898x 1899x 1900x 1901x 1902x 1903x 1904x 1905x 1906x 1907x 1908x 1909x 1910x 1911x 1912x 1913x 1914x 1915x 1916x 1917x 1918x 1919x 1920x 1921x 1922x 1923x 1924x 1925x 1926x 1927x 1928x 1929x 1930x 1931x 1932x 1933x 1934x 1935x 1936x 1937x 1938x 1939x 1940x 1941x 1942x 1943x 1944x 1945x 1946x 1947x 1948x 1949x 1950x 1951x 1952x 1953x 1954x 1955x 1956x 1957x 1958x 1959x 1960x 1961x 1962x 1963x 1964x 1965x 1966x 1967x 1968x 1969x 1970x 1971x 1972x 1973x 1974x 1975x 1976x 1977x 1978x 1979x 1980x 1981x 1982x 1983x 1984x 1985x 1986x 1987x 1988x 1989x 1990x

Data Handling

Foundation

Mean, Median, Mode and Range

Mean

Mean = $\frac{\text{Total of all values}}{\text{number of values}}$
3, 3, 4, 5, 5, 8, 9, 15

$$\text{Mean} = \frac{52}{8} = 6.5$$

Collect it all together and share it out evenly

Using the mean to find the total amount
 $\text{Mean} \times \text{Number of values}$

Ezytown FC have scored an average of 3.8 goals per game in their last 15 matches. How many goals have they scored?
 $3.8 \times 15 = 57 \text{ goals}$

Median

Median = Middle value (Numbers written in order)
3, 3, 4, 5, 5, 8, 9, 15

$$\text{Median} = 5$$

Finds the middle value

Use of formula to find location of median
 $\text{Location} = \frac{n+1}{2}$

The median of 45 values would be the 23rd number when written in order
 $\frac{45+1}{2} = 23$

Mode

Mode = Most common value/item
3, 3, 4, 5, 5, 8, 9, 15

$$\text{Mode} = 3 \text{ and } 5$$

Average usually used for qualitative data

Occurrence of no mode
If every value appears equally, there is no mode

1, 1, 3, 3, 7, 7

Each value appears twice so there is no mode

Range

Range = Largest - Smallest
3, 3, 4, 5, 5, 8, 9, 15

$$\text{Range} = 15 - 3 = 12$$

Reveals how close/far apart the values are

Interpreting measures of spread
The Smaller the range, the closer and more 'consistent' the values are.

The Larger the range, the more varied and more 'inconsistent' the values are.

Types of data

Quantitative

Data that is **numeric**

Discrete

Data that can be **counted** and only has certain values
People on a bus
Shoe Size
Dress size

Continuous

Data that can be **measured** to various levels of accuracy
Height of a tree
Speed of a car
Mass of a person

Qualitative

Data that is **descriptive**

Categorical data

Data which can be grouped into categories
Hair colour
Favourite food
Sport

Grouped Data

Data which is organised into classes

Primary

Data collected by you

Secondary

Data gathered from another source

Elements

A set is a collection of things, called elements

The set of prime numbers less than 12 $A = \{2, 3, 5, 7, 11\}$

Intersections (∩) and Unions (∪)

$A = \{2, 3, 5, 7, 11\}$ $B = \{1, 3, 5, 7, 9\}$

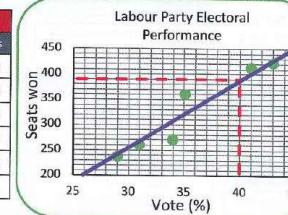
$A \cap B = \{3, 5, 7\}$ – Intersection of A and B

Scatter graph

We use scatter graphs when we are interested in the relationship between two variables

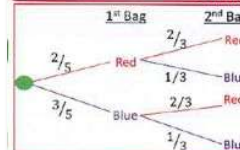
Points plotted like coordinates

Year	Vote (%)	Seats
2015	31	232
2010	29	258
2005	35	356
2001	41	413
1997	43	418
1992	34	271



Probability tree diagrams

Probability trees are really useful to calculate the probabilities of combined events happening



Multiply along branches

$$P(\text{Red and Red}) = \frac{4}{15}$$

$$P(1 \text{ Red and } 1 \text{ Blue}) = \frac{2}{15} + \frac{6}{15} = \frac{8}{15}$$

Add together all combinations

Averages from frequency tables

Cars	Frequency	fx
0	4	0
1	11	11
2	12	24
3	7	21
4	6	24
Sum	40	80

This column is created by multiplying the frequency (f) by the number in the category (x)

This enables us to find out the total amount which is needed for the mean

Mean

$$\text{Mean} = \frac{\text{Total of all values}}{\text{number of values}}$$

$$\text{Mean} = \frac{\text{Total of } fx \text{ column}}{\text{Total frequency}}$$

$$\text{Mean} = \frac{80}{40} = 2$$

Mode

Mode = Most common value/item
The category with the highest frequency
2

Range

Range = Largest - Smallest
 $4 - 0 = 4$

Median

Median = Middle value (Numbers written in order)

$$\text{Location} = \frac{n+1}{2}$$

$$\text{Location} = \frac{40+1}{2} = 20.5$$

The median lies between 20th and 21st value

Cars	Frequency
0	4
1	11
2	12
3	7
4	6
Sum	40

Median = 2

Add down the frequency column. When location value has been exceeded, that is the group where the median lies.

Pie charts

Nationality	Guests	Angle
Spanish	30	150°
British	24	120°
French	10	50°
German	8	40°
Total	72	

Find degrees per value
 $(360^\circ \div \text{total})$



$$1 \text{ Guest} = \frac{360^\circ}{72} = 5^\circ$$

Line chart

Line charts are useful for displaying time series data



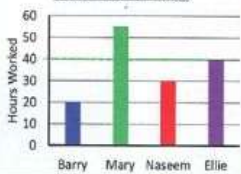
Data points within the lines are important

Lines visualise change

Extract required data carefully

Bar Charts

Hours Worked per Week



Title

Axes

Scales

Labels

Bars (equal width) (equal gaps)

Read off bars

Ellie = 40 hours

Pictograms

Using a symbol to represent certain amount

Farmer	Pumpkins
Harry	20
Sami	50
Doug	40
Rachael	25

1 symbol = 10 Pumpkins

Harry: 2 symbols

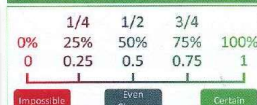
Sami: 5 symbols

Doug: 4 symbols

Rachael: 2.5 symbols

Probability

The likelihood of an event happening



Counting outcomes

Working out how many combinations there are

Rolling a die and flipping a coin

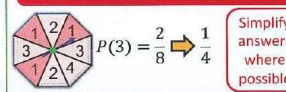
	1	2	3	4	5	6
Heads	H, 1	H, 2	H, 3	H, 4	H, 5	H, 6
Tails	T, 1	T, 2	T, 3	T, 4	T, 5	T, 6

This is a sample space diagram

There are 12 possible outcomes from this event

Calculating probability

$$P(\text{Event}) = \frac{\text{number of successful outcomes}}{\text{total number of outcomes}}$$



Simplify answers where possible

The 'OR' rule (mutually exclusive)

$$P(a \text{ or } b) = P(a) + P(b)$$

$$P(2 \text{ or } 4) = \frac{2}{8} + \frac{1}{8} = \frac{3}{8}$$

The 'AND' rule (independent)

$$P(a \text{ and } b) = P(a) \times P(b)$$

Flip a coin twice

$$P(2 \text{ tails}) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

Multiply each probability

Types of events

Mutually exclusive
Events that cannot happen at the same time

Rolling a die $\rightarrow P(1 \text{ and } 6)$

All probabilities from the event will sum to make 1

Independent events

Events where the outcome of one **doesn't** affect the outcomes of the others

Picking a counter out of a bag, replacing it and repeating.

Dependent events

Events where the outcome of one **does** affect the outcomes of the others

Picking a counter out of a bag, not replacing it and repeating.

Calculating expected outcomes

$$P(\text{event}) \times \text{number of trials}$$