Crucial Knowledge


Year 7


Year 8


Year 9

Year 7

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Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 6

Chapter 7

Chapter 8

Chapter 10

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Chapter 16

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Chapter 2

Chapter 3

Chapter 4

Chapter 5

Chapter 6

Chapter 8

Chapter 11

Chapter 12

Chapter 14

Chapter 15

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Chapter 1 - Number

4 Operators

Addition (or **Sum**) **+**
Subtraction (or **Difference**) **–**
Multiplication (or **Product**) **x**
Division **÷**

Place Value

- The 'column values' of numbers

....	Thousands	Hundreds	Tens	Units	Decimal Point	$^1/_{10}$	$^1/_{100}$	$^1/_{1000}$	....

Ordering Decimals

- Set up a table with the decimal point in the same place for each number.
- Put in each number.
- Fill in the empty squares with zeros.
- Compare using the first column on the left.
- If the digits are equal move to the next column to the right until one number is higher.
- This number is the bigger one.

Negative Numbers

+ x + = +	+ ÷ + = +
+ x - = -	+ ÷ - = -
- x + = -	- ÷ + = -
- x - = +	- ÷ - = +

Multiplying and Dividing by 10, 100, 1000

- When we multiply a number by 10, we move every digit one place value to the left.
- When we multiply a number by 100, we move every digit 2 place values to the left.
- When we multiply a number by 1000, we move every digit 3 places to the left.
- We move each digit the same number of places to the left as there are zeros.
- Remember to fill in any blank spaces with 0 place holders.
- For dividing, we follow the same method but move every digit to the right

Home

Chapter 2 - Measures

Length	Area	Capacity and Volume	Mass	Time
1 cm = 10 mm	1 cm^2 = 100 mm^2	1 cl = 10 ml	1 kg = 1000 g	1 minute = 60 seconds
1 m = 100 cm	1 m^2 = 10 000 cm^2	1 litre = 100 cl	1 tonne = 1000 kg	1 hour = 60 minutes
1 km = 1000 m	1 ha = 10 000 m^2	1 litre = 1000 ml		1 day = 24 hours
	1 km^2 = 1 000 000 m^2	1 litre = 1000 cm^3		1 week = 7 days
		1 ml = 1 cm^3		1 year = 365 days

Area and perimeter

Perimeter is distance around shape

Area is space inside a shape (2D), measure in square units

Rectangle Area = *base x height*

Parallelogram Area = *base x height*

Triangle = Area = $1/2\ (base \times height)$

Trapezium Area = $1/2\ (a+b) \times height$

Circle Area = $\pi \times radius^2$

Circumference is the perimeter of a circle

Circumference = $2\pi \times radius$

Terminology of Shape

Height – Perpendicular height

Perpendicular – lines meet at 90 degrees

Parallel – always the same distance apart

Edge – Where 2 faces meet on a 3D shape

Vertices – The point where edges meet (corner) on a 3D shape

Face – side of a 3D shape

Quadrilateral – a 4-sided polygon

Polygon – a 2d shape with straight sides

Scalene – all sides and angles are different

Isosceles – 2 sides and angles are the same

Equilateral – 3 sides and angles are the same

Right – contains a right angle

Acute – an angle less than 90^o

Obtuse – an angle between 90^o and 180^o

Reflex – an angle more than 180^o

Home

Chapter 3 - Expressions

Algebra terminolgy

2y is 2 multiplied by the value of 'y'.

So if y = 5 then 2y = 2 x 5 = **10**

y^2 is the value of 'y' multiplied by itself.

So if y = 5 then $y^2 = 5 \times 5 = 25$

Substitution

We can replace letters with numbers to create an answer.

We are normally given a formula and values to put in, but sometimes we have to create the expression and then put values in.

You are told $E = \frac{1}{2} mv^2$

Calculate E when **m = 10** and **v = 2.5**

$E = \frac{1}{2} \times 10 \times 2.5^2$

$E = 31.25$

Simplfying – Collecting like terms

We can only bring **'like terms'** together to simplify the expression

Rewrite to get your **'like terms together'**

Adding and Subtracting

$4a + 3b + 6a - b = 4a + 6a + 3b - b$

$= 10a + 2b$

$3f^2 + 5g^2 + 3f^2 - 7g^2 = 3f^2 + 3f^2 + 5g^2 - 7g^2 =$

$6f^2 - 2g^2$

Multiplying and Dividing

$4a \times 6a = 24a^2$

(Multiply numbers and add powers)

$30b^5 \div 5b^2 = 6b^3$

(Divide numbers and subtract powers)

Multiplying out single brackets

Bracket create an order (BIDMAS)

Brackets are also an invisible multiply

$6(a + 3) = 6 \times a + 6 \times 3 = 6a + 18$

$5(2b - a) = 5 \times 2b + 5 \times -a = 10b - 5a$

$2m(3m - 5) = 2m \times 3m + 2m \times -5 = 6m^2 - 10m$

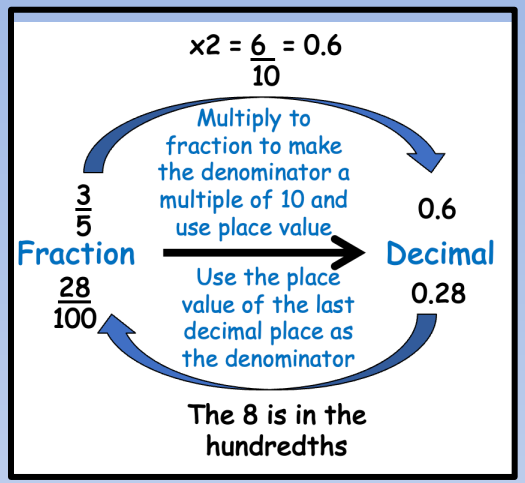
Home

Chapter 4 - FDP

Fractions
- Bottom term is the denominator
- Top term is the numerator

Fractions of a quantity
- Divide by the denominator
- Multiply by the numerator

Simplifying Fractions
Divide the numerator and denominator by their highest common factor.



Fraction Arithmetic
Multiplying – Multiply top by top and bottom by bottom.
Dividing - **'Keep Change Flip'.**
Addition or Subtraction – You need same bottom number **(denominator).** Add or subtract the numerator, keep the denominator the same.

Percentages
- An amount out of 100

- **With a calculator:**

What is 40% of £50

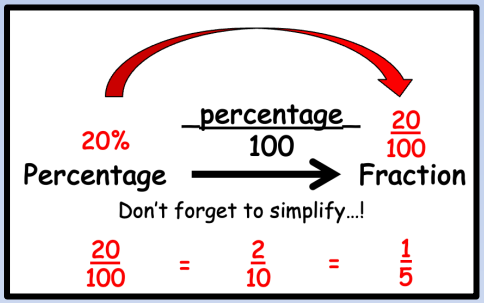
Percentage ÷ 100 x amount

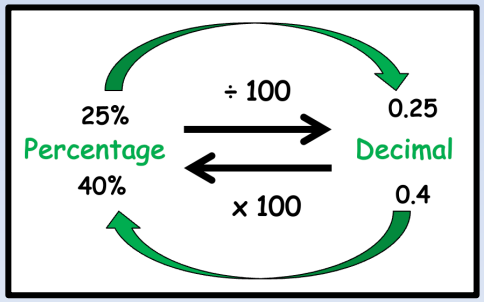
- **Changing to a percentage:**

Amount ÷ total x 100

- **Without a calculator:**

1% = divide by 100
10% = divide by 10
25% = divide by 4
50% = divide by 2





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Chapter 5 – Angles and 2D Shapes

Use of Protractor

- Estimate the size of the angle
- Line up the cross with the origin of the angle
- Rotate the protractor to align the baseline of the angle with the protractor
- Follow the upper line of the angle and measure on the protractors arc to read the degrees

Angle Reasoning

Angles on straight line = 180^o
Angles in a triangle = 180^o
Angles in quadrilateral = 360^o
Angles at a point = 360^o

Angles with parallel lines

Vertically opposite angles are always equal
F – Corresponding angles are always equal
Z – Alternate angles are always equal
C – Co-Interior always add to 180

Polygons

A shape with 3 or more straight sides
Total Interior Angles = (n-2) x 180
Interior + Exterior = 180^o
Sum of Exterior = 360^o

Home

Chapter 6 - Graphs

Coordinates

Remember “along the corridor then up the stairs”
X and y values should be written on the axes
There are 4 quadrants

Horizontal and Vertical Lines

- An equation in the form y= always gives a horizontal line.
- An equation in the form x= always gives a vertical line.

Parallel lines

- Parallel lines have the same gradient

Plotting Straight Lines

- When plotting a linear graph always plot at least three coordinates.
- First create a table of values
- Substitute in values to form coordinate points
- Plot the coordinates one at a time

Home

Chapter 7 - Calculations

BIDMAS

The **order** you do calculations in:

B rackets
I ndices
D ivision
M ultiplication
A ddition
S ubtraction

Rounding

Decimal places (column after decimal point)
Significant Figures (highest value column)

Negative Numbers

+ x + = +	+ ÷ + = +
+ x - = -	+ ÷ - = -
- x + = -	- ÷ + = -
- x - = +	- ÷ - = +

Home

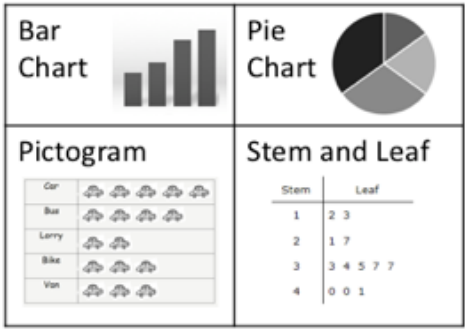
Chapter 8 - Statistics

Mean, median, mode and range

You must be able to get measures from a list of values or values in a frequency table

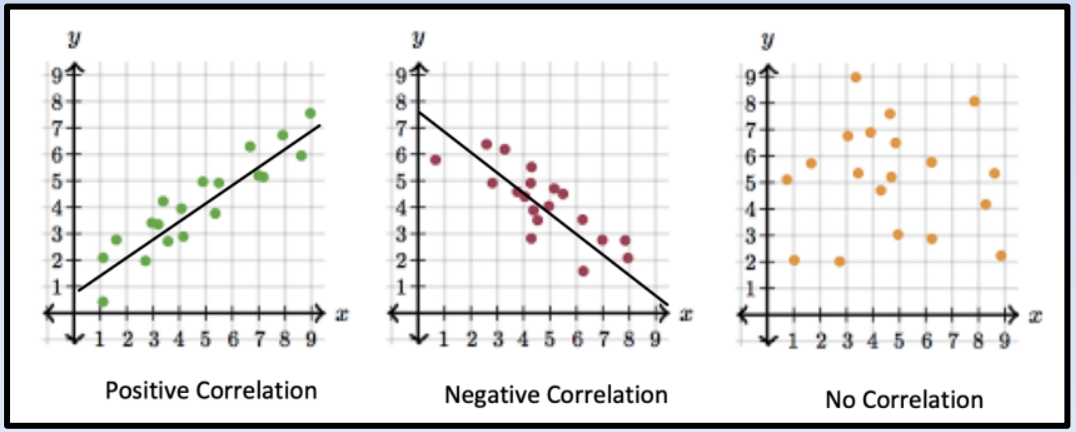
MEAN = Total of values ÷ Number of values
MEDIAN – The middle value when written in size order
MODE – The value that occurs the most often
RANGE – Maximum value – Minimum value

Displaying data



Interpreting data

- Get values from bar charts
- Get values from pie Charts
- Use key to get values from Stem and Leaf diagram
- Use key to get values from Pictogram



Home

Chapter 10 - Equations

Solving equations

- To get a numerical answer for a letter
- We have to do the same to both sides of the equals sign
- If we move things across the equals sign we use the opposite operation

Solve $4y + 1 = 17$

Move +1 over to become -1

$4y = 17 - 1$ so $4y = 16$

Move x4 over to become ÷4 so $y = 16 \div 4$

$y = 4$

Solve $2(3y + 1) = 20$

Expand bracket

$2 \times 3y = 6y$ and $2 \times 1 = 2$ so

$6y + 2 = 20$ Move +2 over to become -2

$6y = 20 - 2$ so $6y = 18$

Move x6 over to become ÷6 so $y = 18 \div 6$

$y = 3$

Home

Chapter 11 – Powers and Roots

Factors and Multiples

- A factor divides into a number without leaving any remainder
- A multiple of a number is any number in its times table

Prime Numbers

Have **exactly two factors**

No other whole numbers, except **1** and **itself** divide into them

Highest Common Factor (HCF)

Write down all the factors from the numbers and find the biggest value on both lists – This is the **Highest Common Factor**

Lowest Common Multiple (LCM)

Write down all the multiples of the two numbers and find the smallest on both lists – This is the **Lowest Common Multiple**

Home

Chapter 15 – Ratio and Proportion

Ratio as a measure

A ratio is a comparison of parts
Use a colon (:) to separate parts of a ratio
A colon is read as 'to'
2 or 3 parts
Understand the parts add up and stay in proportion

Cancelling ratios

Like simplifying fractions
Look for common factors
Do the same to both parts of the ratio

3:6
÷3 ÷3
1:2

Equivalent ratios

Same values but different numbers
Values used can get larger, as well as smaller
Do same to all parts

3:6
x4 x4
12:24

Dividing a given ratio

The question matches the order of items to the order of parts in the ratio. The first thing mentioned gets the first part of the ratio
Find the total number of parts in the ratio (+)
Divide the amount to be shared by the total parts (÷)
Multiply by each part of the ratio (x

Example

Q: Adam and Ben share £45 in the ratio 1:2. Who gets how much?

A: **1 + 2 = 3 parts in total**
£45 ÷ 3 = £15 per part
1:2
x15 x15
15:30
Adam gets £15 and Ben gets £30

Home

Chapter 16 - Probability

Probability definition and scale

Outcome – A possible result of an experiment

Event – A set of outcomes

Impossible – An outcome that cannot happen

Certain – An event that must happen

Sample space diagrams

- A list of all possible outcomes from an event.
- We use this to help calculate probabilities

Probability and relative frequency

A list of all probabilities adds up to 1

Relative frequency = $\frac{Times\ occured}{Number\ of\ trials}$

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Area and perimeter

Perimeter is distance around shape

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Perpendicular – lines meet at 90 degrees

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Chapter 3 - Expressions

Simplfying – Collecting like terms

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Rewrite to get your **'like terms together'**

Adding and Subtracting

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(Divide numbers and subtract powers)

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Brackets are also an invisible multiply

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Substitution

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Calculate E when **m = 10** and **v = 2.5**

$E = \frac{1}{2} \times 10 \times 2.5^2$

$E = 31.25$

Powers

If we multiply powers we add. $y^3 \times y^4 = y^{(3+4)} = y^7$

If we divide powers we subtract. $y^{10} \div y^6 = y^{(10-6)} = y^4$

Anything to the power zero is always 1

Home

Chapter 4 - FDP

Fractions

- Bottom term is the denominator
- Top term is the numerator

Fractions of a quantity

- Divide by the denominator
- Multiply by the numerator

Fraction Arithmetic

Multiplying – Multiply top by top and bottom by bottom.

Dividing - **'Keep Change Flip'.**

Addition or Subtraction – You need same bottom number **(denominator).** Add or subtract the numerator, keep the denominator the same.

Percentages

- An amount out of 100

- **With a calculator:**

What is 40% of £50

Percentage ÷ 100 x amount

- **Changing to a percentage:**

Amount ÷ total x 100

- **Without a calculator:**

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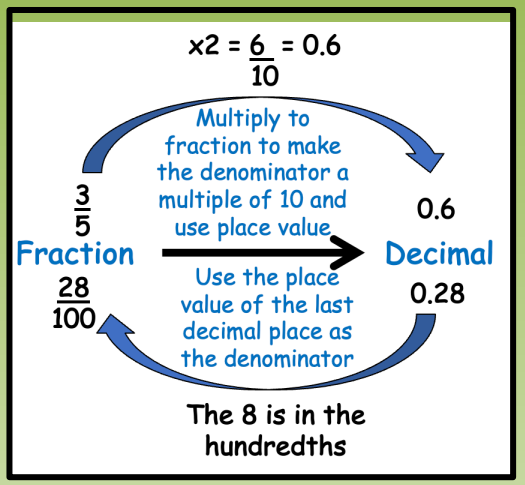
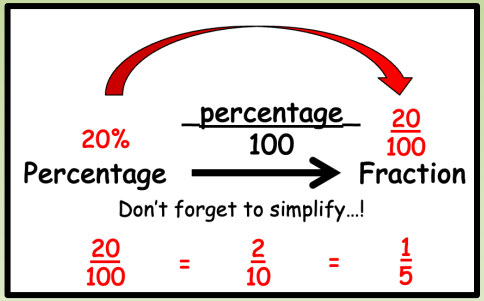
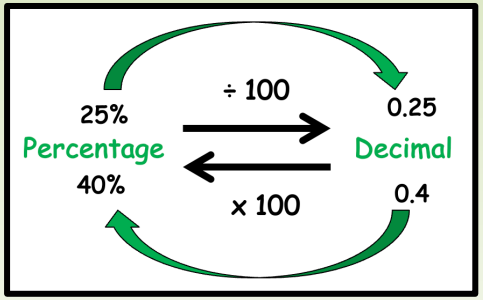
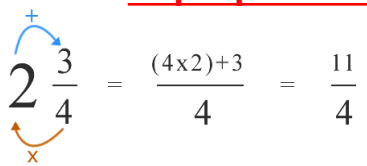




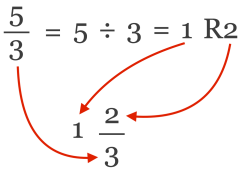


Improper and Mixed Fractions

Improper to mixed:



Mixed fractions to improper



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Chapter 5 – Angles and 2D Shapes

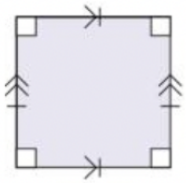
Polygons

A shape with 3 or more straight sides
Total Interior Angles = (n-2) x 180
Interior + Exterior = 180°
Sum of Exterior = 360°

Angles with parallel lines

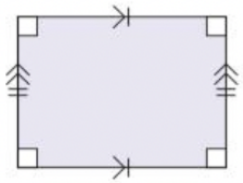
Vertically opposite angles are always equal
F – Corresponding angles are always equal
Z – Alternate angles are always equal
C – Co-Interior always add to 180

Square



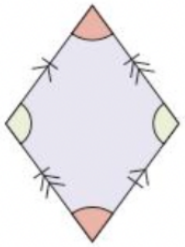
4 equal sides
4 angles of 90°
2 sets of parallel sides

Rectangle



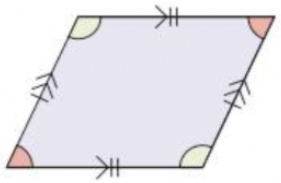
2 sets of equal sides
4 angles of 90°
2 sets of parallel sides

Rhombus



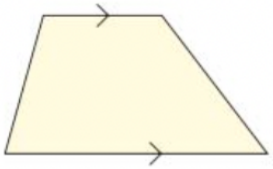
4 equal sides
2 pairs of equal angles
2 sets of parallel sides

Parallelogram



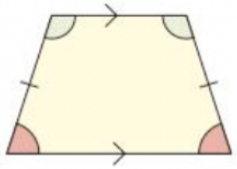
2 sets of equal sides
2 pairs of equal angles
2 sets of parallel sides

Trapezium



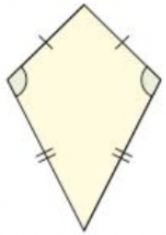
1 set of parallel sides

Isosceles trapezium



1 set of equal sides
2 pairs of equal angles
1 set of parallel sides

Kite



2 sets of equal sides
1 pair of equal angles
No parallel sides

Arrowhead

2 sets of equal sides
1 pair of equal angles
No parallel sides

Home

Chapter 6 - Graphs

Coordinates

Remember “along the corridor then up the stairs”
X and y values should be written on the axes
There are 4 quadrants

Horizontal and Vertical Lines

- An equation in the form y= always gives a horizontal line.
- An equation in the form x= always gives a vertical line.

Parallel lines

- Parallel lines have the same gradient

Plotting Straight Lines

- When plotting a linear graph always plot at least three coordinates.
- First create a table of values
- Substitute in values to form coordinate points
- Plot the coordinates one at a time

Home

Chapter 7 - Calculations

Getting to Know Your Calculator

x^2	Squared (e.g. $3^2 = 3 \times 3 = 9$)
SHIFT	Gets the second function of the key
$\sqrt{}$	Square Root (e.g. $\sqrt{9} = 3$)
S⇔D	Changes a fraction answer to a decimal
x^3	Cubed (e.g. $2^3 = 2 \times 2 \times 2 = 8$)
"(" and ")"	Brackets
$\sqrt[3]{}$	Cube Root (e.g. $\sqrt[3]{8} = 2$)
$\frac{\square}{\square}$	Fraction

Adding & Subtracting Decimals

Use the column method

Line up the decimal places

Multiplying Decimals

Ignore the decimal place and multiply the digits

Count how many numbers are after the decimal place in the question.

Make sure the answer has the same number

Dividing Decimals

Multiply both numbers by 10 or 100 to get the numbers from a decimal to a whole number.

Divide using the bus stop method

Negative Numbers

+ x + = +	+ ÷ + = +
+ x - = -	+ ÷ - = -
- x + = -	- ÷ + = -
- x - = +	- ÷ - = +

Home

Chapter 8 - Statistics

Mean, median, mode and range

You must be able to get measures from a list of values or values in a frequency table

MEAN = Total of values ÷ Number of values
MEDIAN – The middle value when written in size order
MODE – The value that occurs the most often
RANGE – Maximum value – Minimum value

Displaying data

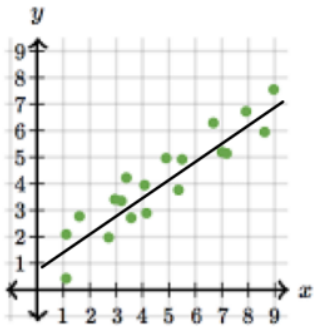
Bar Chart

Pie Chart

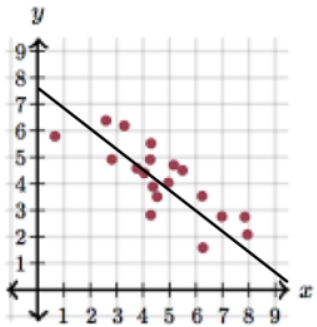
Pictogram

Stem and Leaf

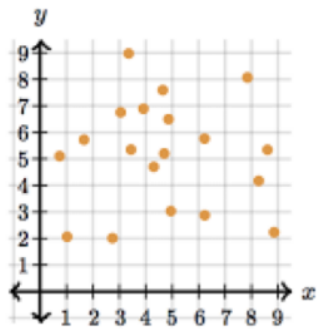
Stem	Leaf
1	2 3
2	1 7
3	3 4 5 7 7
4	0 0 1



Positive Correlation



Negative Correlation



No Correlation

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Chapter 10 - Equations

Solving equations

- To get a numerical answer for a letter
- We have to do the same to both sides of the equals sign
- If we move things across the equals sign we use the opposite operation

Solve $4y + 1 = 17$

Move +1 over to become -1

$4y = 17 - 1$ so $4y = 16$

Move x4 over to become ÷4 so $y = 16 \div 4$

$y = 4$

Solve $2(3y + 1) = 20$

Expand bracket

$2 \times 3y = 6y$ and $2 \times 1 = 2$ so

$6y + 2 = 20$ Move +2 over to become -2

$6y = 20 - 2$ so $6y = 18$

Move x6 over to become ÷6 so $y = 18 \div 6$

$y = 3$

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Chapter 11 – Powers and Roots

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Chapter 15 – Ratio and Proportion

Ratio as a measure

A ratio is a comparison of parts
Use a colon (:) to separate parts of a ratio
A colon is read as 'to'
2 or 3 parts
Understand the parts add up and stay in proportion

Recipe Scaling

Work out we have enough to complete
How much of something do we need

Example:
Q: A recipe uses 300g of flour and 150g of butter to make a cake for 4 people. How much of each ingredient is needed to bake a cake for 6 people.
A: 6 ÷ 4 = 1.5 (scale factor).
300g x 1.5 = 450g flour
150 x 1.5 = 225g butter

Dividing a given ratio

The question matches the order of items to the order of parts in the ratio. The first thing mentioned gets the first part of the ratio
Find the total number of parts in the ratio (+)
Divide the amount to be shared by the total parts (÷)
Multiply by each part of the ratio (x

Example
Q: Adam and Ben share £45 in the ratio 1:2. Who gets how much?
A: 1 + 2 = 3 parts in total
£45 ÷ 3 = £15 per part
1:2
x15 x15
15:30
Adam gets £15 and Ben gets £30

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Chapter 16 - Probability

Probability definition and scale

Outcome – A possible result of an experiment
Event – A set of outcomes
Impossible – An outcome that cannot happen
Certain – An event that must happen

Sample space diagrams

- A list of all possible outcomes from an event.
- We use this to help calculate probabilities

Probability and relative frequency

A list of all probabilities adds up to 1

Relative frequency = $\frac{Times\ occured}{Number\ of\ trials}$

Probability trees

- Used to show outcomes of multiple events
- All branches add up to 1
- Multiply along branches to find probabilities
- Add multiple routes through tree

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Chapter 7 - Calculations

Getting to Know Your Calculator

x^2	Squared (e.g. $3^2 = 3 \times 3 = 9$)
SHIFT	Gets the second function of the key
$\sqrt{}$	Square Root (e.g. $\sqrt{9} = 3$)
S⇔D	Changes a fraction answer to a decimal
x^3	Cubed (e.g. $2^3 = 2 \times 2 \times 2 = 8$)
"(" and ")"	Brackets
$\sqrt[3]{}$	Cube Root (e.g. $\sqrt[3]{8} = 2$)
$\frac{\square}{\square}$	Fraction

Adding & Subtracting Decimals

Use the column method

Line up the decimal places

Multiplying Decimals

Ignore the decimal place and multiply the digits

Count how many numbers are after the decimal place in the question.

Make sure the answer has the same number

Dividing Decimals

Multiply both numbers by 10 or 100 to get the numbers from a decimal to a whole number.

Divide using the bus stop method

Negative Numbers

+ x + = +	+ ÷ + = +
+ x - = -	+ ÷ - = -
- x + = -	- ÷ + = -
- x - = +	- ÷ - = +

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Chapter 2 - Measures

Length	Area	Capacity and Volume	Mass	Time
1 cm = 10 mm	1 cm^2 = 100 mm^2	1 cl = 10 ml	1 kg = 1000 g	1 minute = 60 seconds
1 m = 100 cm	1 m^2 = 10 000 cm^2	1 litre = 100 cl	1 tonne = 1000 kg	1 hour = 60 minutes
1 km = 1000 m	1 ha = 10 000 m^2	1 litre = 1000 ml		1 day = 24 hours
	1 km^2 = 1 000 000 m^2	1 litre = 1000 cm^3		1 week = 7 days
		1 ml = 1 cm^3		1 year = 365 days

Area and perimeter

Perimeter is distance around shape

Area is space inside a shape (2D), measure in square units

Rectangle Area = *base x height*

Parallelogram Area = *base x height*

Triangle = Area = $1/2\ (base \times height)$

Trapezium Area = $1/2\ (a+b) \times height$

Circle Area = $\pi \times radius^2$

Circumference is the perimeter of a circle

Circumference = $2\pi \times radius$

Terminology of Shape

Height – Perpendicular height

Perpendicular – lines meet at 90 degrees

Parallel – always the same distance apart

Edge – Where 2 faces meet on a 3D shape

Vertices – The point where edges meet (corner) on a 3D shape

Face – side of a 3D shape

Quadrilateral – a 4-sided polygon

Polygon – a 2d shape with straight sides

Scalene – all sides and angles are different

Isosceles – 2 sides and angles are the same

Equilateral – 3 sides and angles are the same

Right – contains a right angle

Acute – an angle less than 90^o

Obtuse – an angle between 90^o and 180^o

Reflex – an angle more than 180^o

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Chapter 3 - Expressions

Multiplying out single brackets

Bracket create an order (BIDMAS)

Brackets are also an invisible multiply

$6(a + 3) = 6 \times a + 6 \times 3 = 6a + 18$

$5(2b - a) = 5 \times 2b + 5 \times -a = 10b - 5a$

$2m(3m - 5) = 2m \times 3m + 2m \times -5 = 6m^2 - 10m$

Powers

If we multiply the powers, we add.

$y^3 \times y^4 = y^{(3+4)} = y^7$

If we divide the powers, we subtract.

$y^{10} \div y^6 = y^{(10-6)} = y^4$

Anything to the power zero is always 1

Substitution

We can replace letters with numbers to create an answer. We are normally given a formula and values to put in, but sometimes we have to create the expression and then put values in. You are told $E = \frac{1}{2} mv2$

Calculate E when $m = 10$ and $v = 2.5$

$E = \frac{1}{2} \times 10 \times 2.5^2$

$E = 31.25$

Factorising

The process of putting things into brackets

Factorise $10a + 5b$

The highest common factor of $10a$ and $5b$ is 5

$2a + b$ in brackets because when these are multiplied by 5 you get your $10a$ and $5b$

$5(2a + b)$ is answer

Factorise $20a^2 + 4a$

The highest common factor of $20a^2 + 4a$ is $4a$

$5a + 1$ in brackets because when these are multiplied by $4a$ you get your $20a^2$ and $4a$

So $4a(5a + 1)$ is answer

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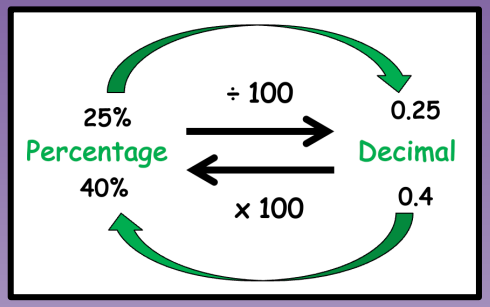
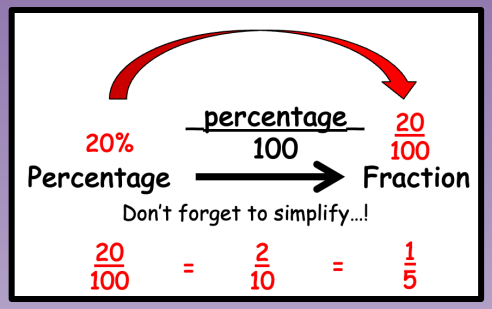
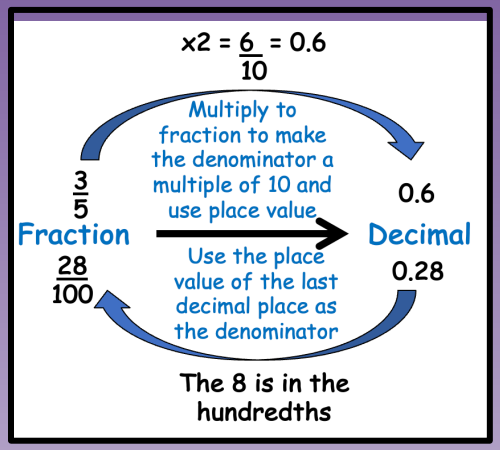
Chapter 4 - FDP







Percentages

- An amount out of 100

- **With a calculator:**

What is 40% of £50

Percentage ÷ 100 x amount

- **Changing to a percentage:**

Amount ÷ total x 100

- **Without a calculator:**

1% = divide by 100
10% = divide by 10
25% = divide by 4
50% = divide by 2

Fraction Arithmetic

Multiplying – Multiply top by top and bottom by bottom.
Dividing - **'Keep Change Flip'.**
Addition or Subtraction – You need same bottom number **(denominator).** Add or subtract the numerator, keep the denominator the same.

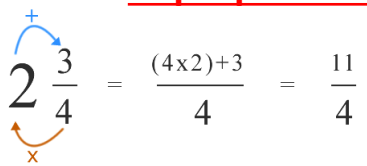
Recurring Decimals

A decimal with repeating values
We indicate the repeating numbers with a dot above

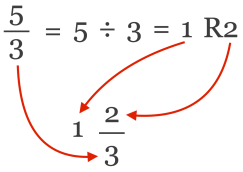
$$0.\dot{6} = 0.666666\ldots$$
$$0.\dot{6}5\dot{6} = 0.656656656\ldots$$

Improper and Mixed Fractions

Improper to mixed:



Mixed fractions to improper



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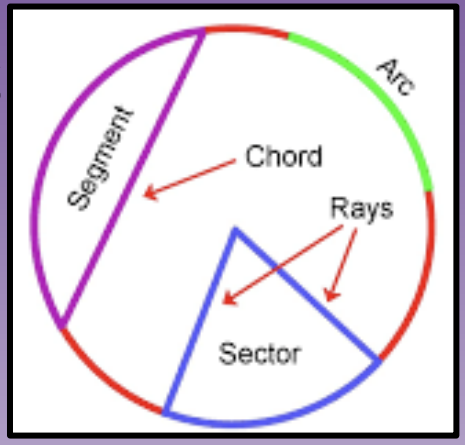
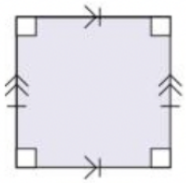
Chapter 5 – Angles and 2D Shapes



Polygons

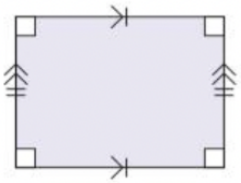
A shape with 3 or more straight sides
Total Interior Angles = (n-2) x 180
Interior + Exterior = 180°
Sum of Exterior = 360°

Square



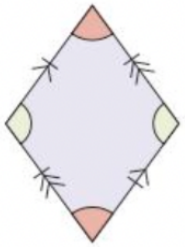
4 equal sides
4 angles of 90°
2 sets of parallel sides

Rectangle



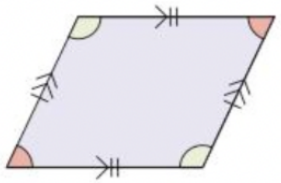
2 sets of equal sides
4 angles of 90°
2 sets of parallel sides

Rhombus



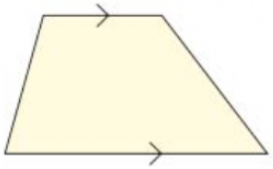
4 equal sides
2 pairs of equal angles
2 sets of parallel sides

Parallelogram



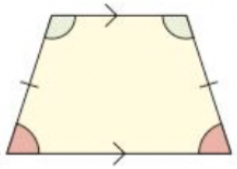
2 sets of equal sides
2 pairs of equal angles
2 sets of parallel sides

Trapezium



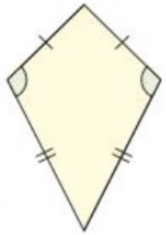
1 set of parallel sides

Isosceles trapezium



1 set of equal sides
2 pairs of equal angles
1 set of parallel sides

Kite



2 sets of equal sides
1 pair of equal angles
No parallel sides

Arrowhead

2 sets of equal sides
1 pair of equal angles
No parallel sides

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Chapter 6 - Graphs

Coordinates

Remember “along the corridor then up the stairs”
X and y values should be written on the axes
There are 4 quadrants

Horizontal and Vertical Lines

- An equation in the form y= always gives a horizontal line.
- An equation in the form x= always gives a vertical line.

Parallel lines

- Parallel lines have the same gradient

Plotting Straight Lines

- When plotting a linear graph always plot at least three coordinates.
- First create a table of values
- Substitute in values to form coordinate points
- Plot the coordinates one at a time

Home

Chapter 8 - Statistics

Mean, median, mode and range

You must be able to get measures from a list of values or values in a frequency table

MEAN = Total of values ÷ Number of values

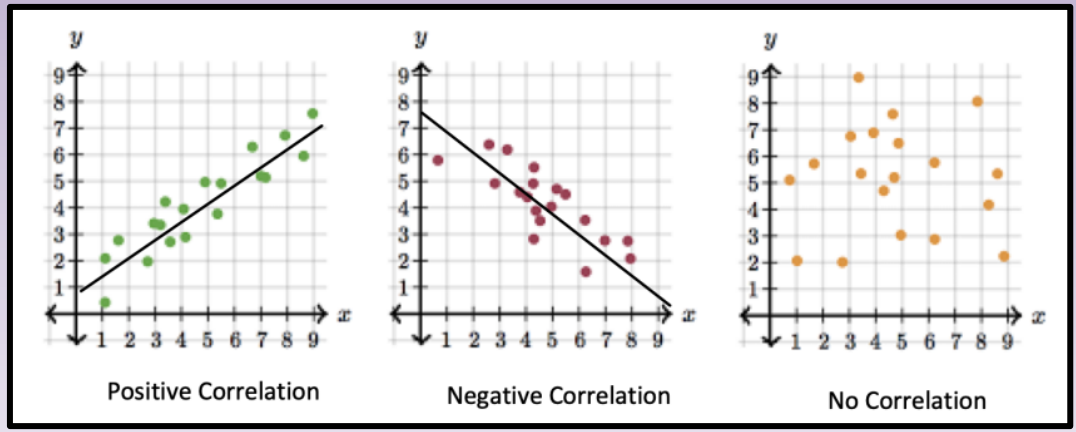
MEDIAN – The middle value when written in size order

MODE – The value that occurs the most often

RANGE – Maximum value subtract minimum value

Grouped data

- As there is no original data, the mean is an estimate. Use the midpoint of each group.
- You can only find the modal class which is the group with the highest frequency.



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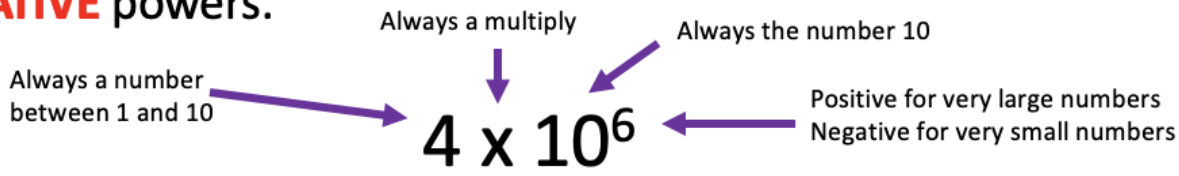
Chapter 11 – Powers and Roots

Standard Form

- A way of writing very **BIG** or very **SMALL** numbers
- Think **BIG** numbers – distance between planets and **SMALL** numbers – sizes of atoms.
- **BIG** numbers have **POSITIVE** powers and **SMALL** number have **NEGATIVE** powers.



Powers

If we multiply powers we add. $y^3 \times y^4 = y^{(3+4)} = y^7$

If we divide powers we subtract. $y^{10} \div y^6 = y^{(10-6)} = y^4$

Anything to the power zero is always 1

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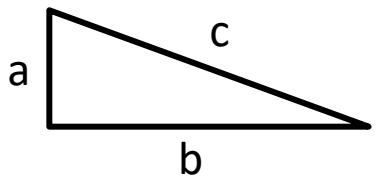
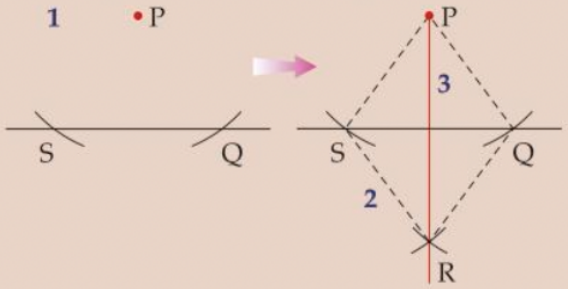
Chapter 12 – Constructions and Triangles

Pythagoras



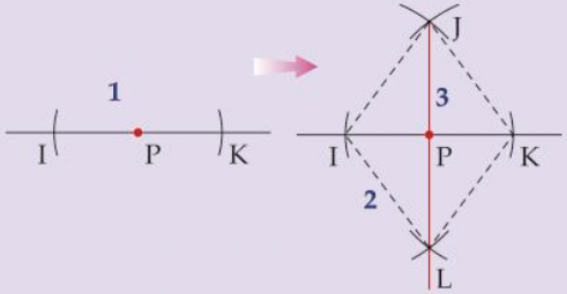
- $a^2 + b^2 = c^2$
  Square root c^2 to find Hypotenuse
- $c^2 + a^2 = b^2$
  Square root b^2 to find shorter side

A perpendicular from a point to a line



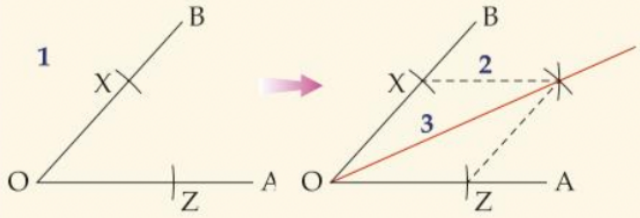
1. Draw arcs equidistant from P cutting the line at Q and S.
2. Using Q and S as centres, draw arcs below the line that cross at R.
3. Draw the line PR.

A perpendicular from a point on a line



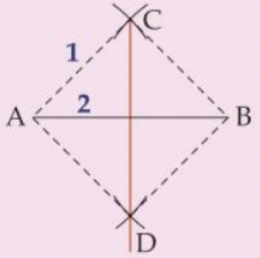
1. Draw arcs equidistant from P cutting the line at I and K.
2. Using I and K as centres, draw arcs above and below the line that cross at J and L.
3. Draw the line JL.

An angle bisector



1. Draw arcs equidistant from O cutting OA and OB at Z and X.
2. Using X and Z as centres, draw arcs that cross at Y.
3. Draw the line OY.

A perpendicular bisector of a line



1. Using A and B as centres, draw arcs above and below the line that cross at C and D.
2. Draw the line CD.

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Chapter 14 – 3D shapes and Trigonometry

Right angled trig

- Identify Hypotenuse, Adjacent and Opposite
- Identify Sin, Cos or Tan function
- $Sin\theta = \frac{opp}{hyp}$
- $Cos\theta = \frac{adj}{hyp}$
- $Tan\theta = \frac{opp}{adj}$
- Use the normal function for sides
- Use the inverse function (Sin^{-1}) etc for angles

Terminology Shape

- Edge – Where 2 faces meet
- Vertices – Where 3 faces meet
- Face – side of a 3d shape
- Quadrilateral – a 4 sided polygon
- Polygon – a 2d shape with straight sides
- Acute – an angle less than 90^o
- Obtuse – an angle between 90^o and 180^o
- Reflex – an angle more than 180^o

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Chapter 15 – Ratio and proportion

Direct Proportionality

- Values that have a relationship with each other, as goes up so does the other at the same rate
- Y = kx
- *y* is **directly proportional** to x.

Q: If y=24, then x=8
Work out the value of *y* when x=2.
A: y = kx 24 = kx8 k=3 and so y = 3x
So when x = 2 y = 3 x 2 = 6

Ratio as a measure

A ratio is a comparison of parts
Use a colon (:) to separate parts of a ratio
A colon is read as 'to'
2 or 3 parts
Understand the parts add up and stay in proportion

Inverse Proportionality

- Values that have a relationship with each other, as one goes up the other goes down, at the same rate
- $y = \frac{k}{x}$
- *y* is **inversely proportional** to x.

Q: When y=2, x=3. Work out the value of *y* when x=18
A: $y = \frac{k}{x}$ $2 = \frac{k}{3}$ k = 6 and so $y = \frac{6}{k}$
When x = 18 y = 6 ÷ 18 = 1/3

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