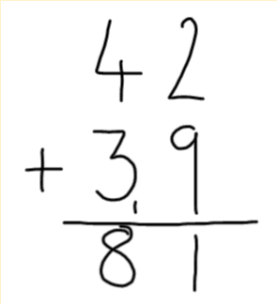
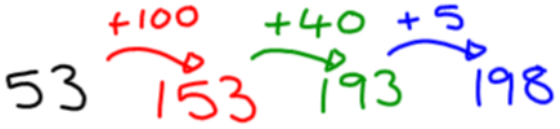
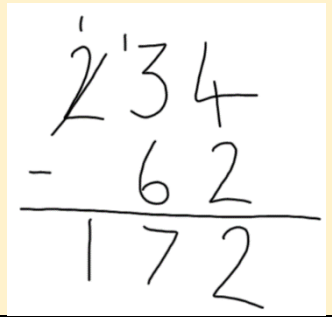
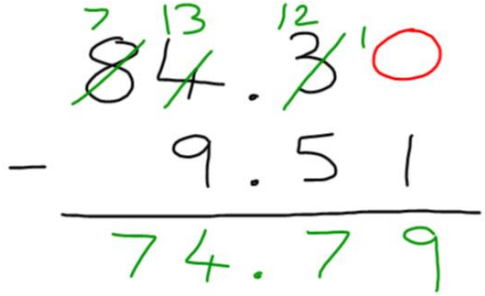
Pershore High School

Numeracy Booklet: Helpful hints and tips

Addition and Subtraction

Method	Example	Pershore suggested approach	Hints and Tips
Column Addition (preferred method)	**42 + 39 = 81**		**Line up your numbers into the correct place value columns** **Th H T U** **Add down, starting with the units' column and moving to the left.** **Remember to carry the tens, hundreds etc.**
Number line method	**53 + 145 = 198**		**Also known as chunking. Add on 'chunks' of the number that are easier to calculate with.**

Column Subtraction (preferred method)	**234 – 62 = 172**		**Remember you will need to borrow from the columns to the left if the bottom digit is larger than the top.**
With Decimals	**84.3 – 9.51**		**Line up decimal points when writing them in columns** **Fill in any gaps with zero place value holders** **Calculate as normal, putting the decimal point in your answer**

Outside of school:

Play board games that use addition or subtraction e.g with dice, uno cards

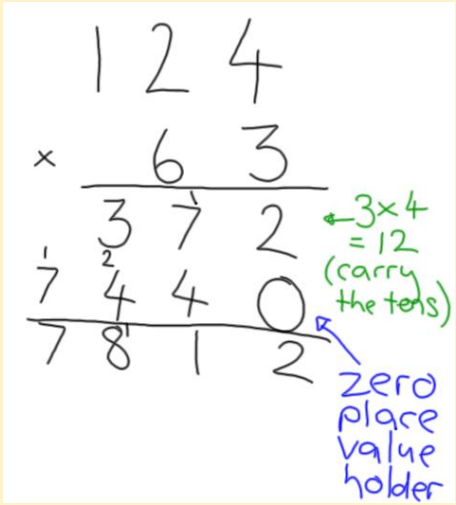
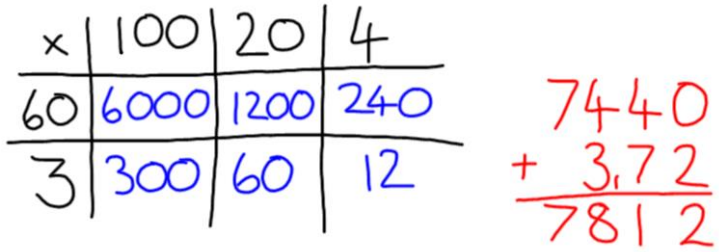
Add up the shopping as you go round the store to check you are within budget (round the prices to easier values e.g £3.98 say £4)

Have a competition to see who can come up with the most interesting calculation that gives the total of a particular number

Play Bingo where you say a maths question for the numbers they have to cross off

Play countdown

Multiplication

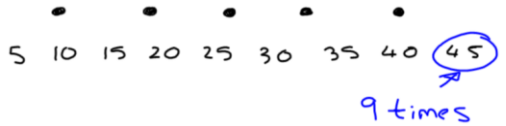
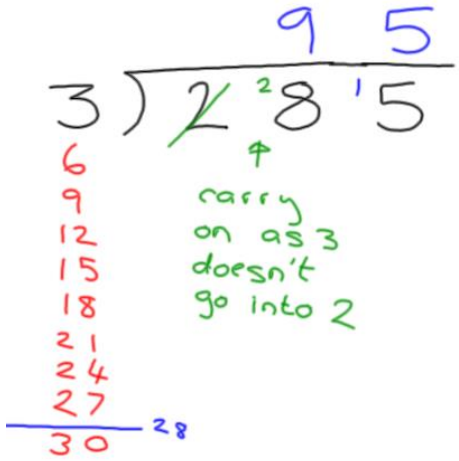
Method	Example	Pershore suggested approach	Hints and Tips
Column Method (preferred method)	**124 x 63 = 7812**		**Start by multiplying with the units then tens, then hundreds etc.** **When moving to the tens/hundreds make sure you write in the zero place value holders.**
Grid Method	**124 x 63 = 7812**		**'split' the numbers as you say them e.g. 124 = 100 20 4** **Add up all the multiplication answers at the end**

Note: You need to learn your times tables up to 12 x 12

See the link below for great times tables tips

https://www.mathsisfun.com/multiplication-tips-tricks.html

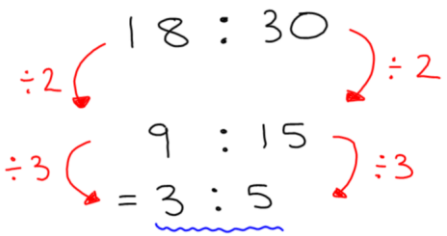
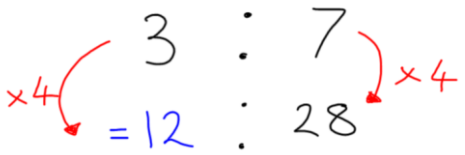
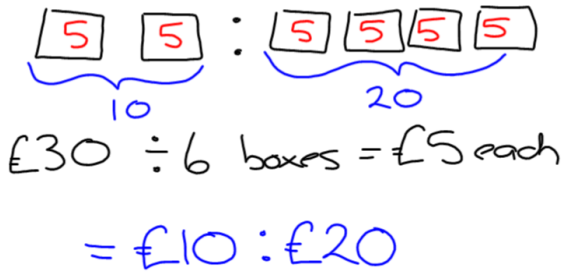
Division

Method	Example	Pershore suggested approach	Hints and Tips
Mental Division	**45 ÷ 5 = 9**	**Think about the calculation using multiplication instead** 	**It is really helpful for students to learn their times tables.** **If struggling with this, a helpful tip is to draw dots to keep adding on the amount multiplying by and use this to help write the times tables underneath**  **(here I have had to add 9 lots of 5 to get to 45)**
Bus Stop Method (preferred method)	**285 ÷ 3 = 95**		**Write out the times table down the side to help** **3 does not go into 2 so carry it over to the next digit** **3 goes into 28 9 times remainder 1 (carry the remainder over to the next column)**

Factors and Multiples

Topic	Example	Pershore suggested approach	Hints and Tips
Factors	**List the factors of 20**	20 1 × 20 2 × 10 4 × 5 = 1, 2, 4, 5, 10, 20	**Think of them in factor pairs (numbers that multiply together to make the required value) Start with 1 and the number itself (often a forgotten pair)**
Common Factors	**List the common factors of 12 and 20**	12 1 × 12 2 × 6 3 × 4 20 1 × 20 2 × 10 4 × 5 common factors = 1, 2 and 4	**Find all the factors of each number.** **Which numbers are factors of both?**
Highest common factor	**What is the highest common factor of 12 and 20**	**See working above** **HCF = 4**	**Largest number that is a factor of both**
Multiples	**List the first 5 multiples of 7**	**7, 14, 21, 28, 35**	**Times table**
Common Multiples	**What are the first 3 common multiples of 4 and 6?**	4 8 12 16 20 24 28 32 36 40 6 12 18 24 30 36 42 48 54 60 common factors = 12, 24, 36...	**Numbers that are in both times table**
Lowest common multiple	**What is the lowest common multiple of 4 and 6?**	**See working above** **LCM = 12**	**First number in both times tables**

Ratio

Topic	Example	Pershore suggested approach	Hints and Tips
Simplifying	**Simplify 18 : 30**		**Keep cancelling down by common factors (remember you can divide by numbers other than 2)**
Equivalent ratio	**3 : 7 = ? : 28**		**Write the ratios underneath each other. Whatever you multiply or divide one side by, do the same to the other.**
Dividing into a ratio	**Divide £30 into the ratio 2 : 4**		**Draw out boxes to help.** **Divide the amount by the number of boxes (this is the value of each box)** **What do you have on each side?** **You can check your answer by adding the numbers up and check they add to the total in the question** **(10 + 20 = 30)**

Top Tips:

You can find ratios all around (recipes, maps, squash bottles, food packets, newspapers etc)

Try making a recipe but scaling up how many it is for differently e.g. instead of 12 buns, make 18

Percentages

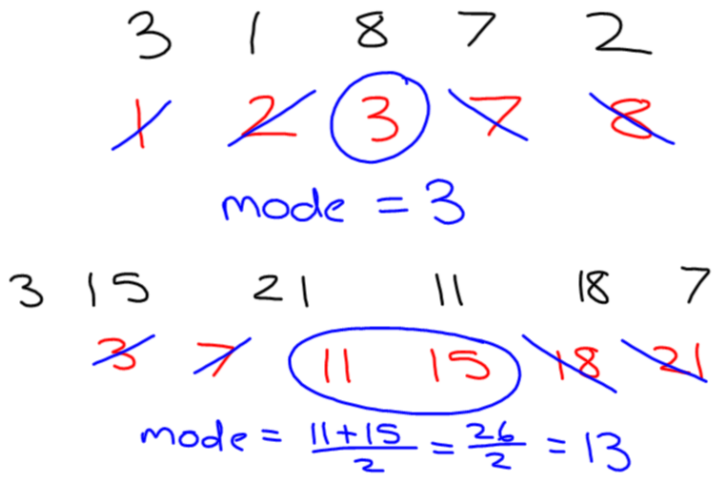
Topic	Example	Pershore suggested approach	Hints and Tips
Percentage of an amount (non-calculator)	**Calculate 27.5% of £60**	£60 10% = £6 ×2 → 20% = £12 ÷2 → 5% = £3 ÷2 → 2.5% = £1.50 + 27.5% = £16.50	**There are certain percentages you need to know how to find:** **1% -> ÷ 100** **10% -> ÷ 10** **50% -> ÷ 2** **Everything else we can find from these** **(e.g. 25% -> halve 50%)**
Percentage of an amount (calculator)	**Calculate 43.2% of £480**	$\frac{43.2}{100} \times 480 = £207.36$	$\frac{\%}{100} \times amount$
Percentage increase or decrease (non-calculator)	**Increase £80 by 35%**	£80 10% = £8 30% = £24 + 5% = £4 35% = £28 £80 + £28 = £108	**1. Find the percentage** **2. If increase -> add to original** **If decrease -> subtract from original** **3. Remember units**
Finding a percentage multiplier (key for calculator work with percentages)	**Increase by 12%** **Decrease by 63%**	100% 12% = 112% = 1.12 100% 63% = 37% = 0.37	**Start with 100%** **If increase -> + %** **If decrease -> - %** **÷ 100 to convert percentage to a decimal (multiplier)**

Percentage increase or decrease (calculator)	**Decrease 65kg by 21%**	Decrease 21% 100% − 21% = 79% = 0.79 65 × 0.79 = 51.35 km	**1. Find the multiplier** **2. Multiplier x amount** **3. Remember the units**
Reverse percentages	**A coat costs £64 in sale. It had 15% off.** **What did it cost originally?**	15% off 100% − 15% = 85% = 0.85 76.47 ×0.85→ £65 76.47 ←÷0.85 £65 = £76.47	**1. Find the multiplier** **2. Put the information into a function machine** **3. Divide to get back** **4. Remember the units**
Simple interest	**£4500 is put into a savings account offering 0.8% simple interest per annum.** **What would be in the account after 6 years?**	$\frac{0.8}{100} \times 4500 = 36$ 36 × 7 = 252 Total = 4500 + 252 = £4752	**1. Calculate the interest** **2. Multiply by the number of times the interest will go on** **3. Check if you need to add this to the original amount for the overall total or you just need the interest.** **4. Remember units**

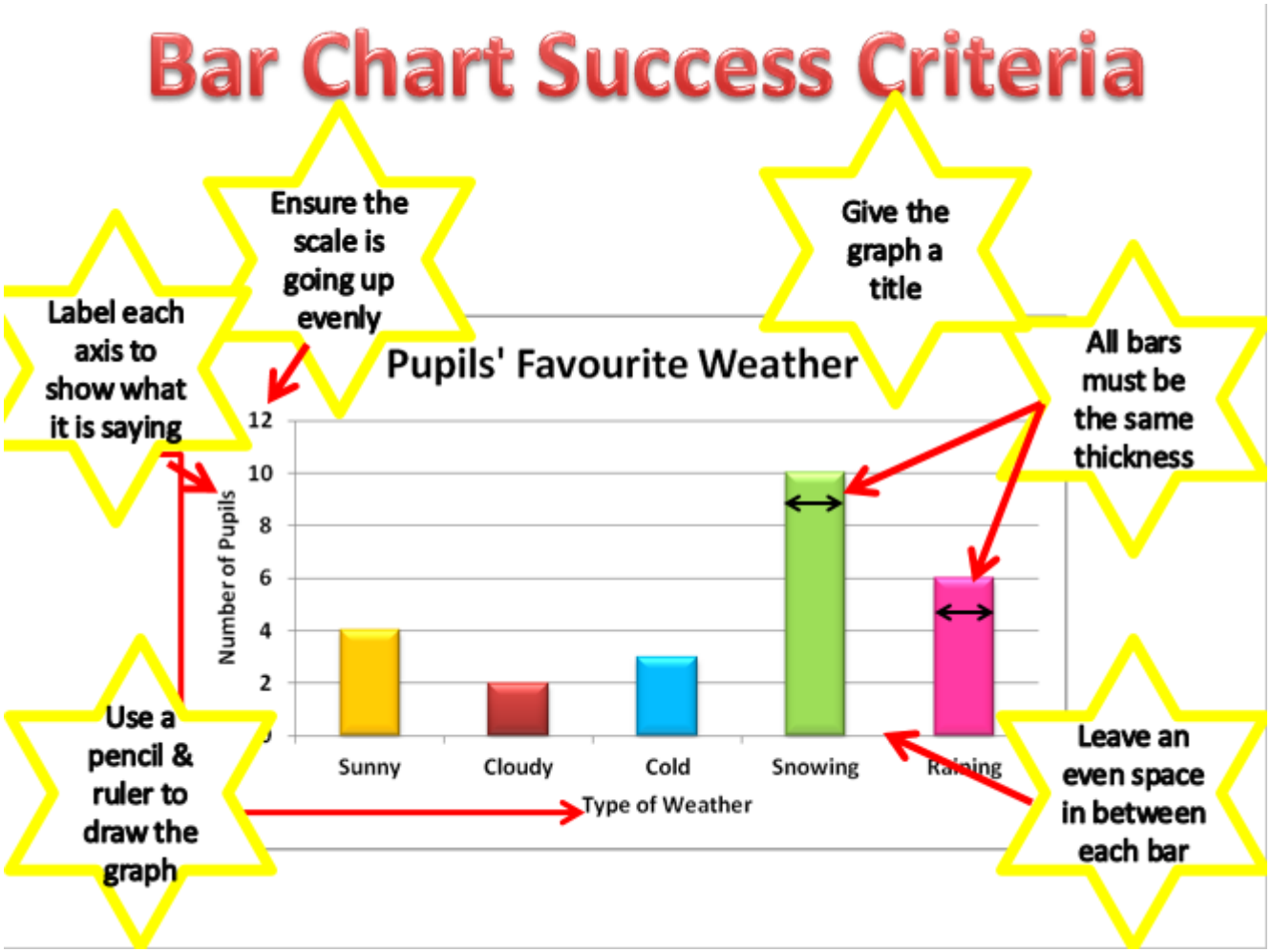
Compound interest	**£2600 is put into a savings account offering 0.23% compound interest per annum. What would be in the account after 4 years?**	$2600 \times 1.023^4 = £2847.58$	n = number times interest put on n Savings = original savings x (percentage) percentage must be written as multiplier eg. 6% interest = 1.06
Percentage profit/loss	**A baby weighs 3.5kg at birth. After 6 weeks its weight has increased to 4.2kg. What is the baby's percentage increase in weight?**	The actual increase = 4.2 kg - 3.5 kg = 0.7 kg The percentage increase = $\frac{0.7}{3.5} \times 100\%$ = 20%	Percentage increase = $\frac{\text{actual increase}}{\text{original amount}} \times 100\%$ Percentage decrease = $\frac{\text{actual decrease}}{\text{original amount}} \times 100\%$

Averages and Range

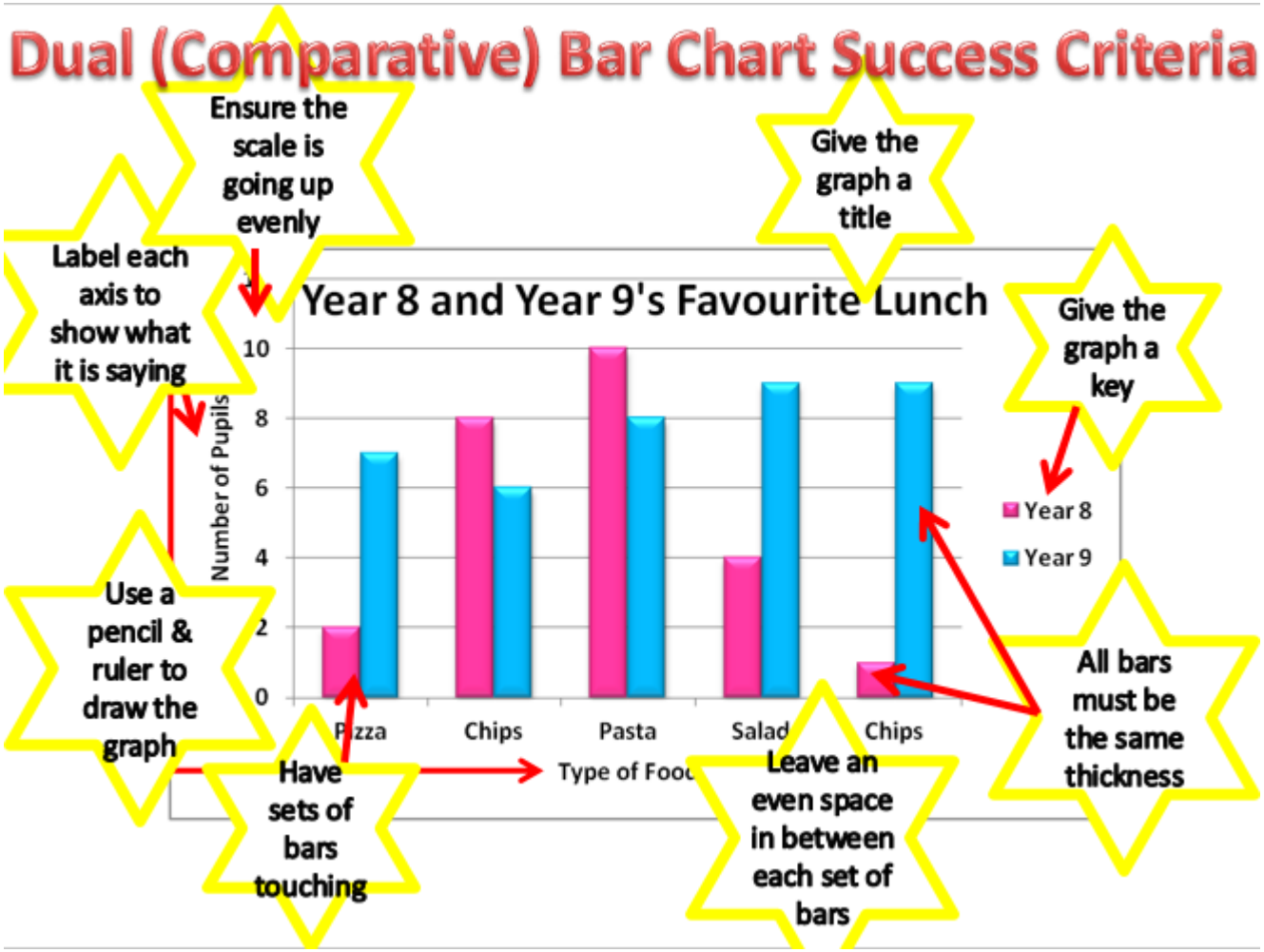
Topic	Example	Pershore suggested approach	Hints and Tips
Mean	**9 2 3 5 1**	$\frac{9+2+3+5+1}{5} = 20 \div 5 = 4$	**The mean nasty one- it takes the longest** **1. Add all the numbers up** **2. divide by how many numbers**

Median	**3, 1, 8, 7, 2** **3, 15, 21, 11, 18, 7**		**Median is the middle** **-Remember to order them first** **-If 2 numbers are left in the middle, add them together and divide by 2 (mean)**
Mode	**6, 5, 2, 1, 1, 3, 6**	**Mode = 1 and 6**	**<u>Mo</u>de = <u>Mo</u>st common** **You can have more than 1 mode and you can have no modes**
Range	**5, 2, 1, 6, 8, 5**	**Range = 8 – 1 = 7**	**Biggest – smallest number**

Graphs

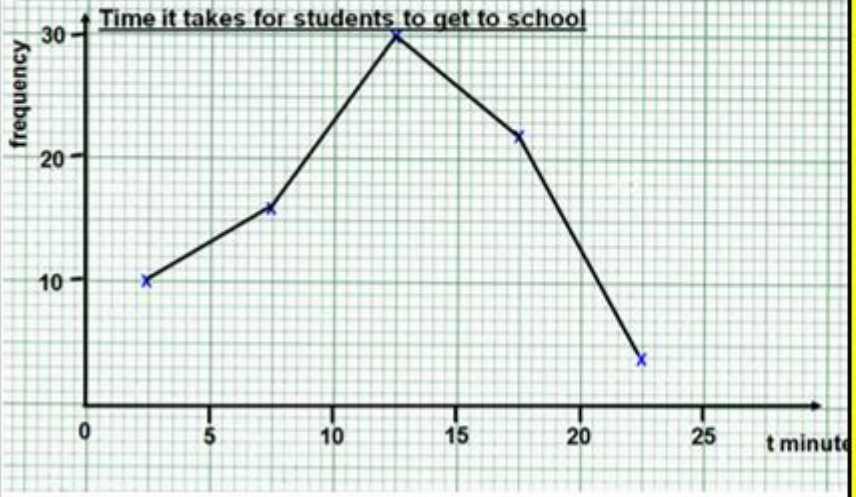

Bar Chart Success Criteria
Ensure the scale is going up evenly
Give the graph a title
Label each axis to show what it is saying
All bars must be the same thickness
Pupils' Favourite Weather
Number of Pupils
12
10
8
6
4
2
Sunny
Cloudy
Cold
Snowing
Raining
Type of Weather
Use a pencil & ruler to draw the graph
Leave an even space in between each bar

Dual (Comparative) Bar Chart Success Criteria



Frequency Polygon Success Criteria

Time t minutes	$0 \le t < 5$	$5 \le t < 10$	$10 \le t < 15$	$15 \le t < 20$	$20 \le t < 25$
Number of students	10	16	30	22	4



- **Ensure the axis are numbered (evenly spaced) & labelled**
- **Calculate the midpoint of each interval (i.e. What is in the middle of 0 and 5?-> 2.5 (you could use the mean to calculate this-add together and divide by 2)**
- **Plot the midpoint against the frequency**
- **Join up the dots with a pencil and ruler**
- **Do not join the ends or extend them down**

Pie Chart Success Criteria

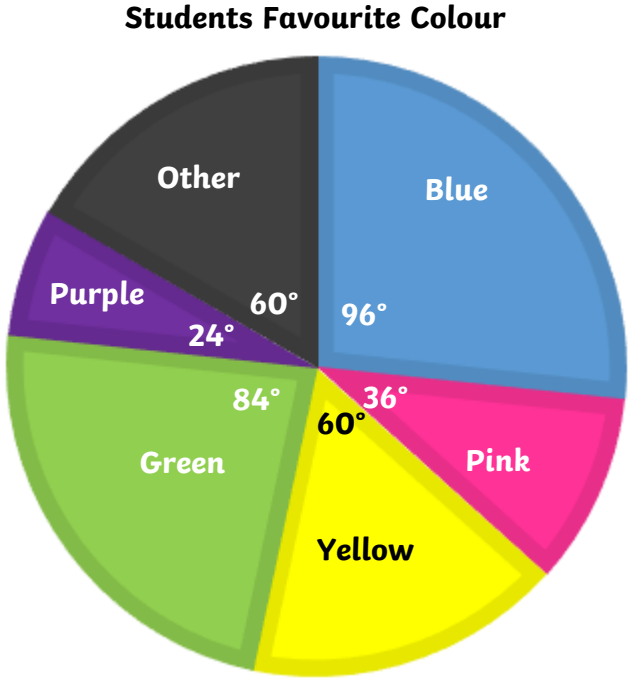
Step 1: Find the total for the frequencies listed

Step 2: Angle = $\frac{\text{Frequency}}{\text{Total}}$ x 360

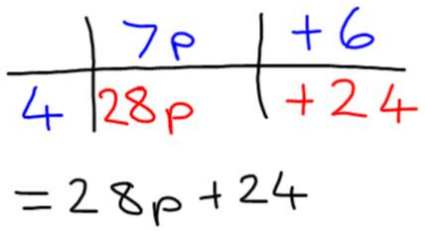
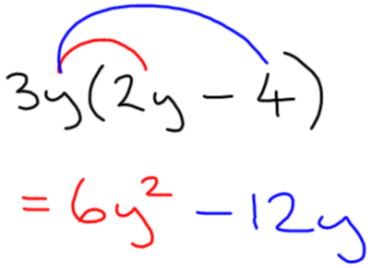
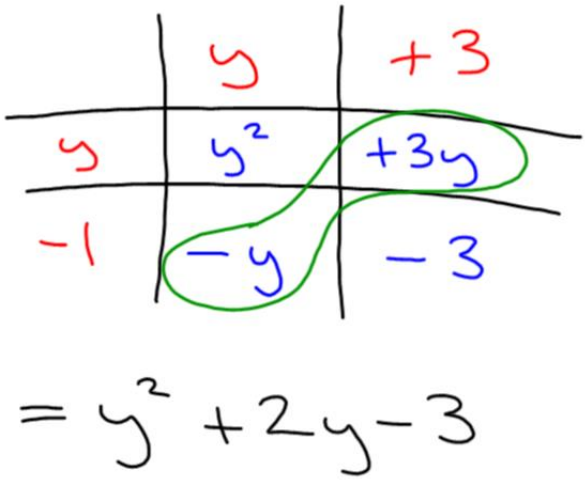
Step 3: Check the angles add up to 360°

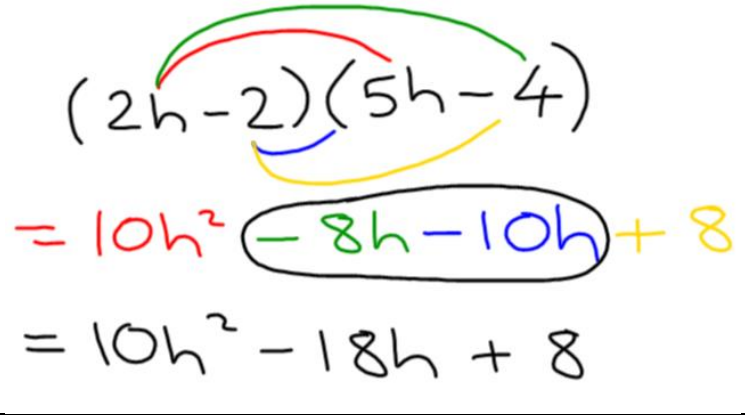
Step 4: Measure each angle on the pie chart
Hint: Keep moving the paper round after each angle

Step 5: Label each section & give a title



Expanding brackets

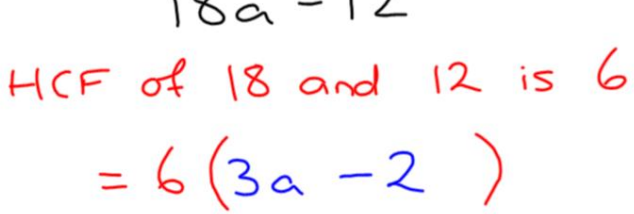
Method	Example	Pershore suggested approach	Hints and Tips
Single brackets-Grid	**Expand 4(7p + 6)**		1. Set up the grid 2. Multiply the terms linked 3. Write it out
Single brackets-Bird beak	**Expand 3y(2y – 4)**		1. Multiply the outside term by the 1st term in the brackets 2. Multiply the outside term by the 2nd term
Double brackets-Grid	**Expand and simplify (y + 3)(y – 1)**		1. Set up the grid, keep the signs infront (+ or -) 2. Multiply the terms linked 3. Collect like terms for the diagonal

Double bracket-Moon	**Expand and simplify** **(2h – 2)(5h – 4)**		**Multiply FOIL** **First terms in each bracket** **Outside terms** **Inside terms** **Last terms in each bracket** **Collet like terms at the end**

Top Tip:

Remember $(p + 5)^2 = (p + 5)(p + 5)$

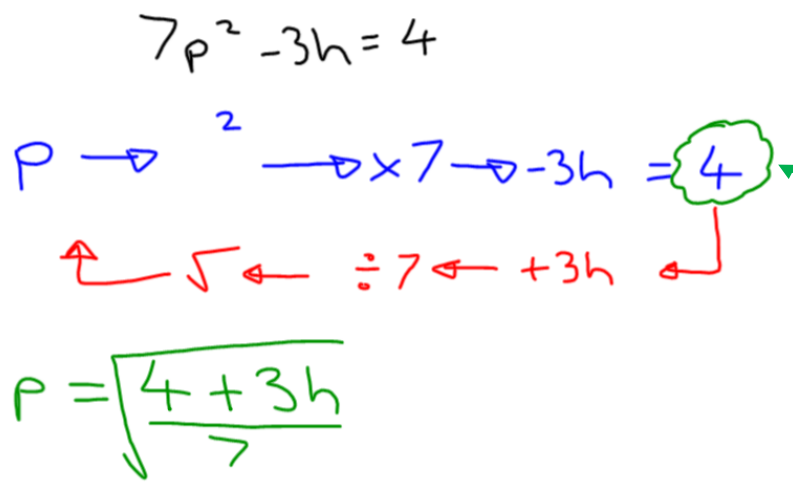
Factorising into brackets

Method	Example	Pershore suggested approach	Hints and Tips
Single brackets	1. **Factorise** **18a – 12**		**The highest common factor goes outside the brackets** **What do you need to multiply this by to get the expression in the question? (This goes in the brackets)**

	2. **Factorise** $25f^3g + 15fg^2$	$25f^3g + 15fg^2$ HCF = $5fg$ $fffg + fggg$ $= 5fg(5f^2 + 3g)$	**Write out the powers fully to spot common factors with the letters**
Double brackets	1. **Factorise** $b^2 + 7b + 10$ 2. **Factorise** $d^2 - d - 6$	$b^2 + 7b + 10$ (A, M) 1 10 2 5 $= (b+2)(b+5)$ $d^2 - d - 6$ (A, M) -1 6 1 -6 -2 3 2 -3 $= (d+2)(d-3)$	**Find two terms that Multiply to the end number and add to the middle number.** **Top Tips:** **-look at the sign infront** **-if there is no number infront of the letter it has the invisible number 1** **e.g. a = 1a**

Changing the subject of a formula

Method	Example	Pershore suggested approach	Hints and Tips
Rearranging where the unknown appears once (Preferred method)	**Make p the subject of the formula $7p^2 - 3h = 4$**	$7p^2 - 3h = 4$ $+3h \quad +3h$ $7p^2 = 4 + 3h$ $\div 7 \quad \div 7$ $p^2 = \frac{4+3h}{7}$ $\surd \quad \surd$ $p = \sqrt{\frac{4+3h}{7}}$	**Use inverse operations to get the subject on its own**

Journey method where the unknown appears once	**Make p the subject of the formula** **$7p^2 - 3h = 4$**		**1. Write out the journey of the letter** **2. Write the inverse operations for the way back** **3. Follow the arrows from right to left**
EXTENSION **If the unknown appears twice**	**Make x the subject of the formula** **$wx - 3 = 5x + y$**	$wx - 3 = 5x + y$ $+3 \quad -5x$ $wx - 5x = y + 3$ $x(w-5) = y+3$ $\div (w-5)$ $x = \frac{y+3}{w-5}$	**1. Rearrange so everything involving the subject is on one side of the equals sign and everything without is on the other.** **2. Factorise so the subject is outside the brackets** **3. Divide by the brackets on both sides**

Key Words:

+	-	x	÷
Addition	Subtraction	Multiplication	Division
Add	Subtract	Multiply	Divide
Sum	Minus	Product	Divisible
Total	Difference	Times	Share
Plus	Decrease	Lots of	
Increase	Reduce	Groups of	
More	Fewer		
Together	Take away		

Integer-whole numbers (can be negative or positive) e.g. -23, 7

Even numbers- 2, 4, 6, 8, 10, 12, ……

Odd numbers- 1, 3, 5, 7, 9, 11, …..

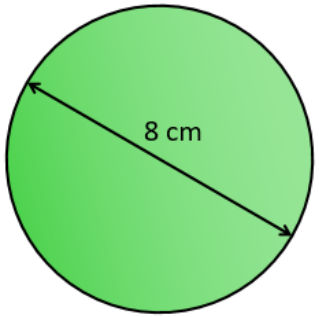
Key Formulae

Circles

Circumference (perimeter of a circle)

Cherry pie's delicious

$C = \pi \times d$



$C = \pi d$

$= 3.14 \times 8$

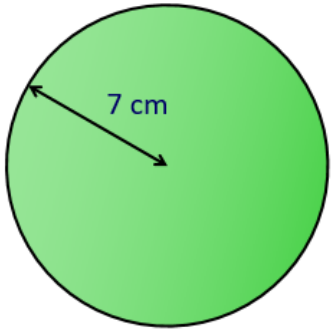
$= \mathbf{25.12\ cm}$

d = diameter (length all the way across the centre of a circle)

Area

Apple pies r 2

$A = \pi \times r^2$



$A = \pi r^2$

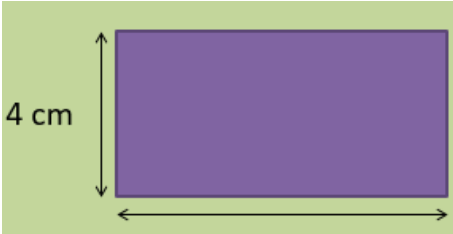
$= 3.14 \times 7^2$

$= \mathbf{153.86\ cm^2}$

r = radius (length from the centre to the edge of the circle)

Area of other shapes

Rectangle/square

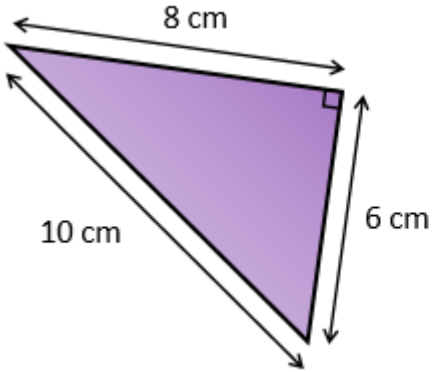


AREA = Base × Height

= 8 cm × 4 cm

= **32 cm²**

Triangle

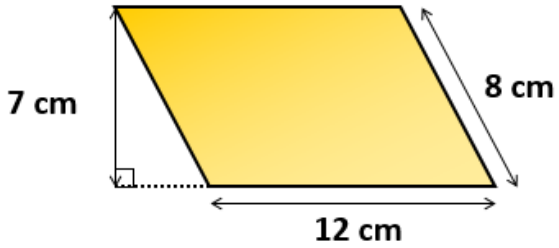


$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times 8 \times 6 \qquad = 24 \text{ cm}^2$$

Remember the base and height must be at right angles to each other

Parallelogram



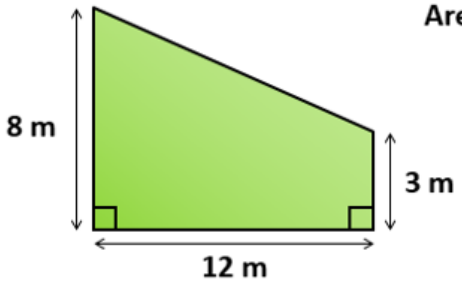
Area = *base* x *height*

= 7 × 12

= 84 cm²

Remember the base and height must be at right angles to each other

Trapezium



Area of a trapezium = $\frac{1}{2}(a + b)h$

$= \frac{1}{2}(8 + 3) \times 12$

$= \frac{1}{2} \times 11 \times 12$

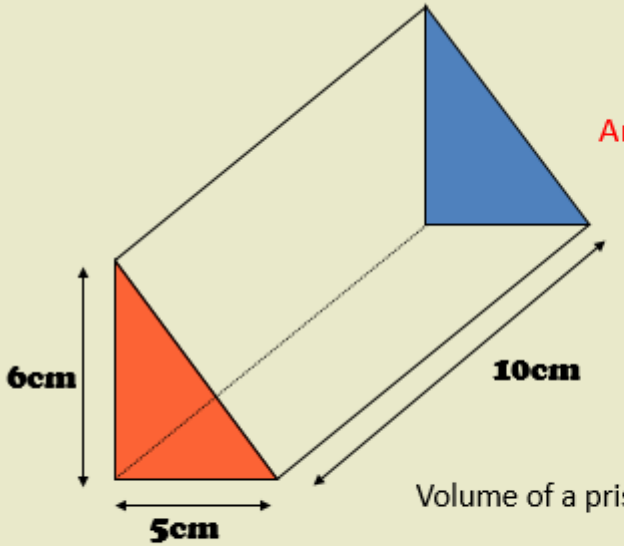
$= 66\ m^2$

a and b are the parallel sides

h is the height

Volume

Volume of a prism = cross sectional area x depth



Area of cross section = ½ x *base x height*

= ½ x 5 x 6

= ½ x 30

= 15cm²

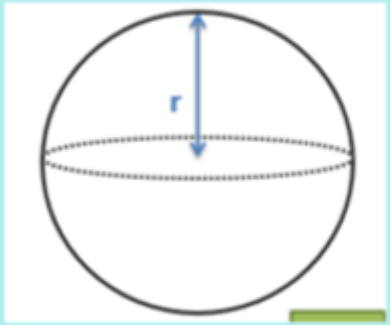
Volume of a prism = Area of cross section x depth

Volume of a prism = 15 x 10

= 150cm³

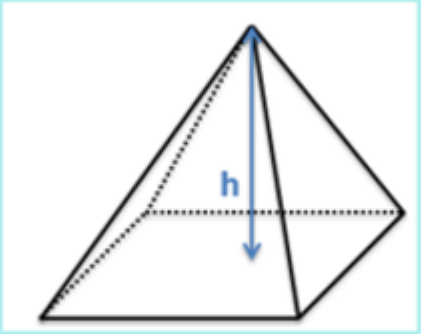
Cross sectional area is the area of the shape that is the same all the way through the shape (in this example it is the triangle)

Spheres



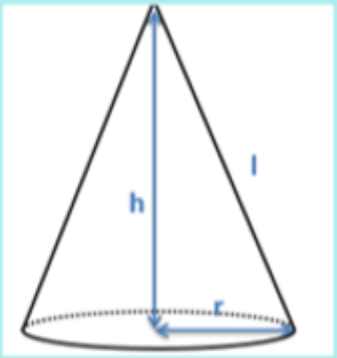
$$Volume = \frac{4}{3}\pi r^3$$

Pyramids



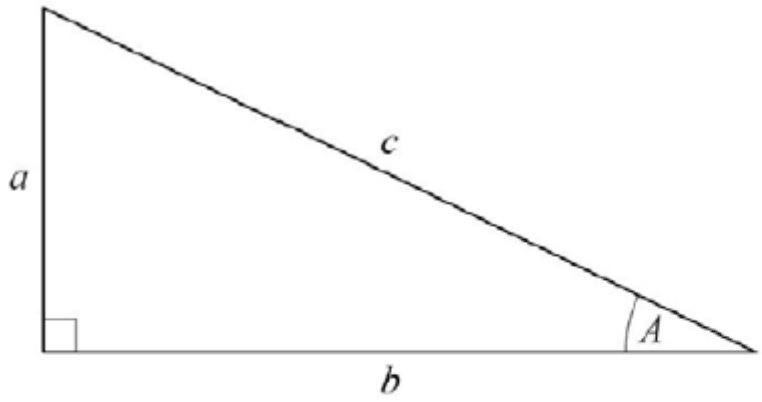
$$Volume = \frac{1}{3} \times base\ area \times height$$

Cones



$$Volume = \frac{1}{3}\pi r^2 h$$

Pythagoras and Trigonometry

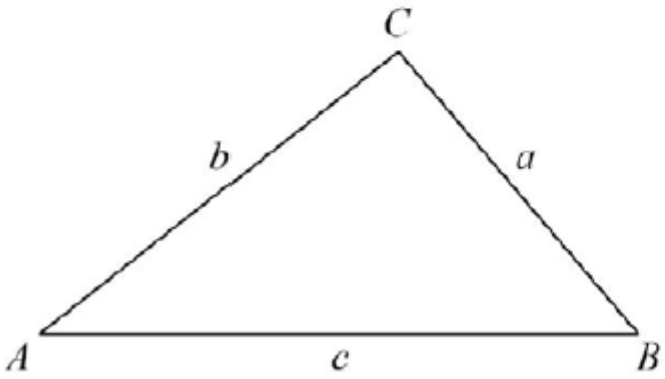


In any right-angled triangle where a, b and c are the length of the sides and c is the hypotenuse:

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

In any right-angled triangle ABC where a, b and c are the length of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c} \qquad \cos A = \frac{b}{c} \qquad \tan A = \frac{a}{b}$$



In any triangle ABC where a, b and c are the length of the sides:

sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \dfrac{1}{2}ab\sin C$