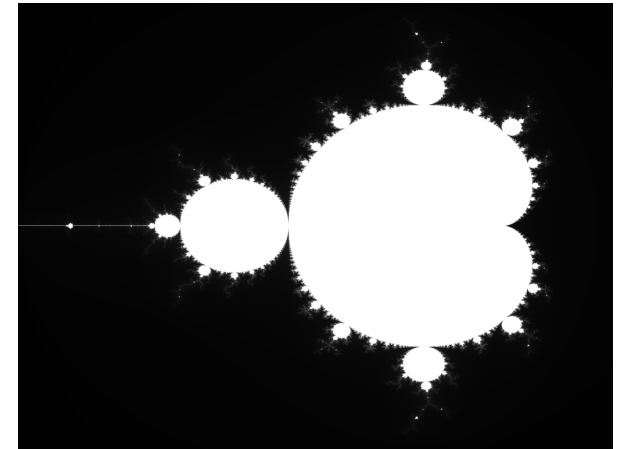# Basic Maths Workbook

Aimed at foundation GCSE mathematics

Name_____

Class_____

*"The only thing that stops you reaching
your full potential is a little sacrifice"*

S.A.Blades

Number work – Rounding and checking calculations

Order the decimals from smallest to largest:
2.1, 0.221, 20.01, 2.21 1.2022

State the value of the figure 3 in 42312

Round 28.7 to the nearest whole number

Round 2.34 to one decimal place

Round 343 to (a) 1 Significant Figure and (b) The nearest 10

There are 8721 people at a football game. Round this to (a) 1 Significant figure (b) the nearest 100

(a) Find the value of $\left(1+\dfrac{1}{7}\right)^4$ using your Calculator (write the full display).
(b) Round your answer to the nearest integer.

Use your calculator to find the value of $\dfrac{\sqrt{321}}{6}$. Write the full calculator display

Find 324 x 57 without a calculator

Find 224/7 without using a calculator

(a) Add £1.23 and 44p (b) Round your answer to the nearest 10p

Pencils are 12p each. Find how many you can buy for £1 and state the amount of change you will have left over.

Magazines are £3.25 and Newspapers are 87p. Find the difference between the cost of each.

James takes his family to the cinema. Adult tickets cost £6 and child tickets cost £5. Find the cost of 2 adult tickets and 5 child tickets

Sue is paid £31000 a year. £2920 is taken as tax and her other deductions total £1885. (a) Using a calculator, find her take home pay. (b) Round this to the nearest £100

Fred has a £20. He buys 8 bars of chocolate at 42p each and 6 bottles of drink for £1.12 each. Find out how much change he had.

Granddads will of £10000 was shared out equally between his 4 grandchildren who in turn shared it equally between their children. Each Grandchild has 2 Children. How much did each of the great grandchildren get?

Area and Perimeter of Rectangles

To find the area of a rectangle I

_____

To find the perimeter of a rectangle I

_____

Find (i) The area and (ii) The perimeter of each shape below. Make sure you use the correct units! (they are not drawn to scale)
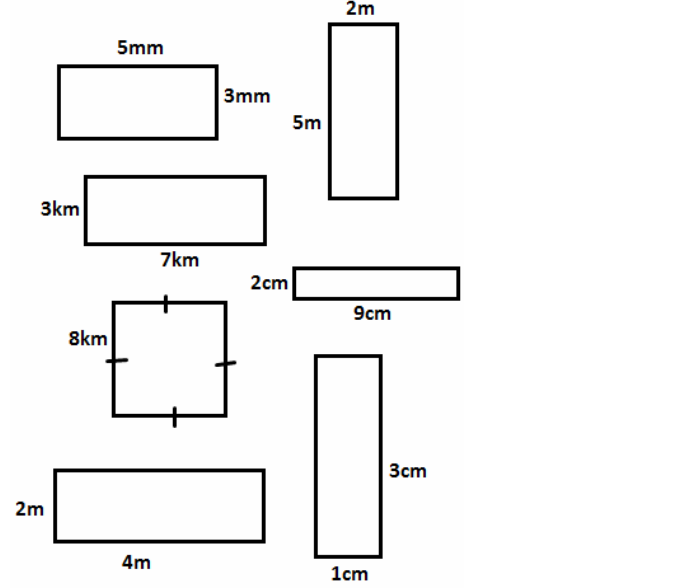
A square has side lengths of 5m. Find the area and perimeter of the square.

A football pitch measures 90yds by 120yds. Find the area and perimeter of the pitch.

A rectangle has an area of 56cm². One of the side lengths is 7cm. Find the other side length (draw it!!).

If the area of a rectangle is the length x the width what is the area of a triangle with the same dimensions? (draw it!)
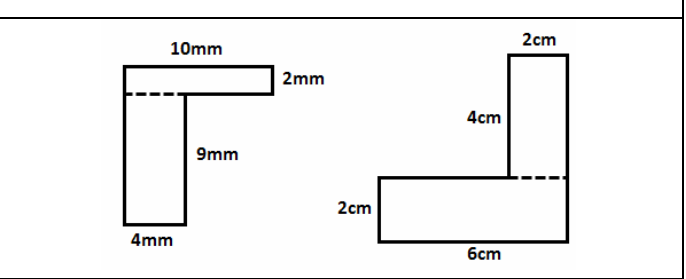
A square has an area of 36 cm². Find the perimeter of the square.

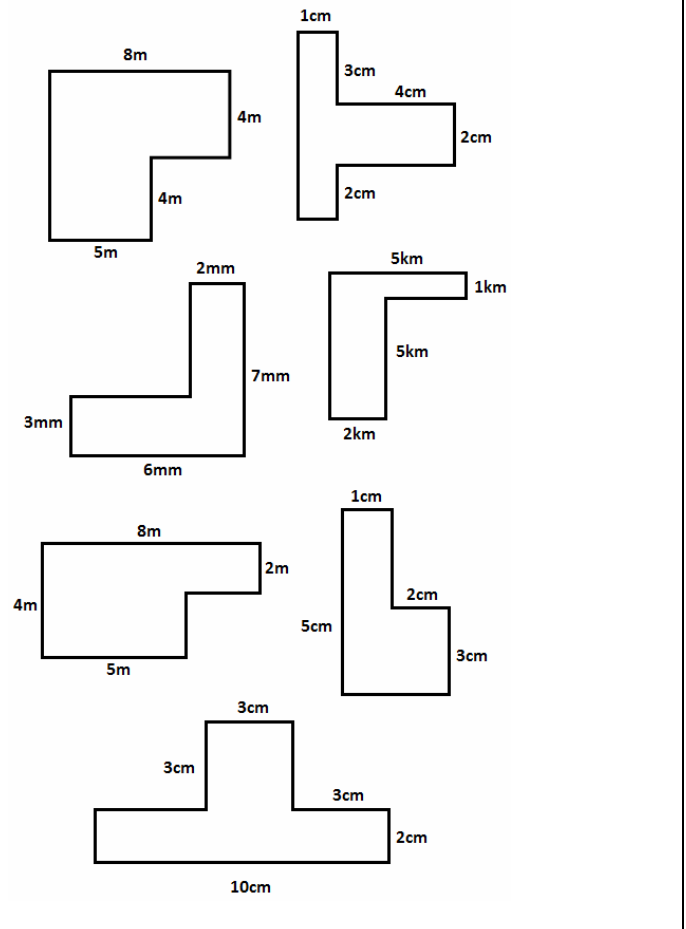Find the area and perimeter of the shape below. (not drawn to scale)
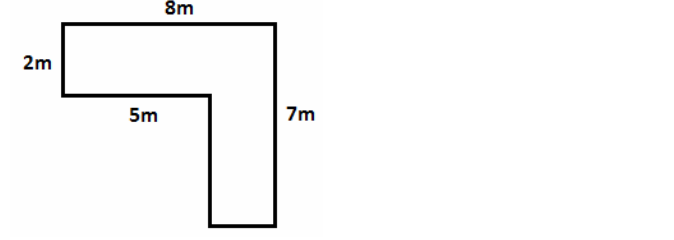
Area and Perimeter of Composite Shapes

By splitting the shapes below into two rectangles, find (i) The area and (ii) The perimeter of each composite shape. Make sure your answer has the correct units! They are NOT drawn to scale

Find (i) The area and (ii) The perimeter of the composite shapes below.

3 squares are put end to end. The length of the side of each square if 6cm. Find the perimeter of the new shape. (Drawing it may help).
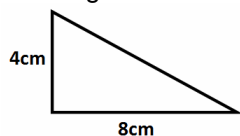
Area and Perimeter of 2D shapes

If the dimensions of a shape are measured in cm then the area is measured in _____ and the perimeter is measured in _____

Find the area and perimeter of the shape below. (giving your answer in the correct units)

10cm

2cm
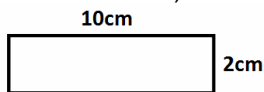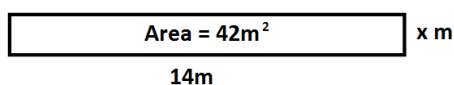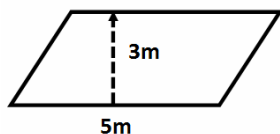
To find the area of a triangle you_____
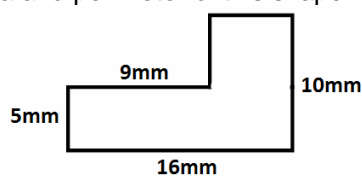
Find the area of the triangle below

4cm

8cm

Find (a) the value of x and (b) The perimeter of the shape.

Area = 42m²   x m

14m

(a) Name the shape below and (b) Find the area of the shape.

3m

5m

Find the area and perimeter of this shape.

9mm

10mm

5mm

16mm

Bob knows his garden has an area of 56m² and one of the lengths is 7m but can't remember the other. Given that the shape of the garden is a rectangle, find the missing length.

State the dimensions of **any** triangle that has an area of 24cm².

A piece of paper is 9" by 8". It's cut into 12 equal pieces. Find the area of each piece.

Find the area and perimeter of the rectangle below in terms of p and q.

p cm

q cm
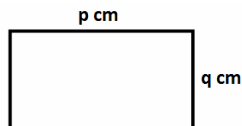
Area of a Triangle

To find the area of a triangle I

_____

Find the area of the triangles below.

3m

3cm

1m

3cm

10cm

8cm

9cm

6cm

10m

11m

3m

2m

3m

4mm

5mm

7cm

2m

6cm

6mm

6mm

5

5

4m

6.5cm

4.5cm

4cm

6mm

10mm
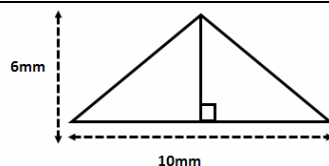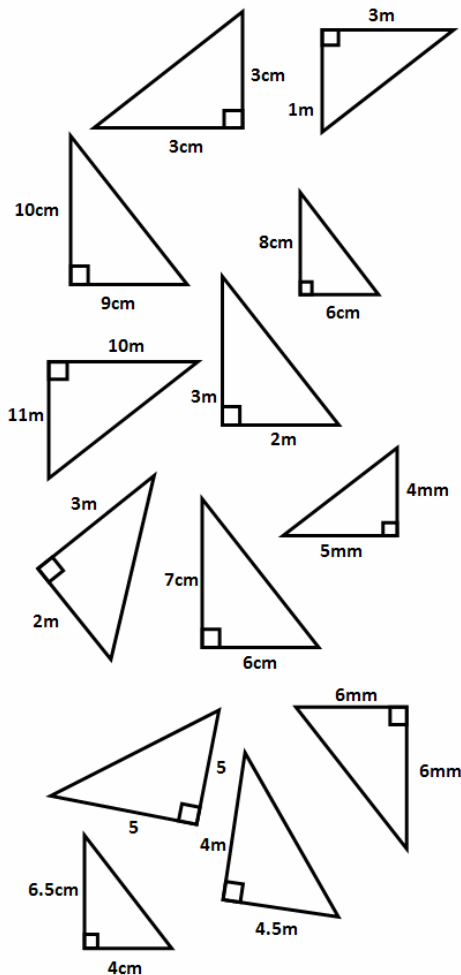
Find the area of a triangle with a base of 10cm and a height of 6cm

12mm

20mm

5cm

3cm

10m

6m

16mm

4cm

8m
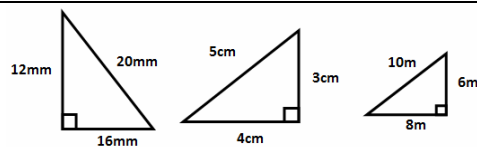
(3) Algebraic expression and simplification
Simplify the following

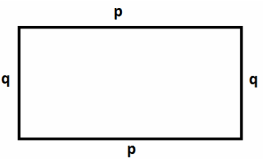| |
|---|
| $2a + 2b + a + 3b$ |
| $x + 3y - 2x - y$ |
| $3r - s - r - 2s$ |
| $p + p + p + p$ |
| $h \times h \times h \times h \times h$ |
| $p^2 \times p^3$ |
| $t^5 \div t^2$ |
| $\dfrac{k^6}{k^3}$ |
| $2p \times 3p^2$ |
| p^0 |

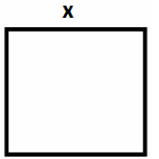| |
|---|
| Write an expression for "5 less than x" |
| Bob has y pens. John has 2 more pens than Bob. Write an expression for the number of pens John has in terms of y. |
| The rectangle below is measured in cm.
 Find an expression for (a) The perimeter and (b) The area of the rectangle in terns of p and q. |
| Sheila is x years old. Her daughter is 18 years younger. (a) Find an expression for her daughters age. (b) Given Sheila is 42, find the age of her daughter. |
| The square shown is measured in meters.
 (a) Find an expression for (a) The area of the square and (b) The perimeter of the square.
 (c) Given the area is 81m² find the value of x. |
| Wire costs £2 per meter. Sue needs x meters of wire for her garden. Write an expression for the amount she pays for the wire. |

(4) LO- Continue and write rules for number patterns and sequences

My Task - Find the next 2 numbers **or** symbols in each pattern and write a rule for the pattern **IF** the pattern includes numbers

(1) 3,6,9,12
(2)
(3) 10, 20, 30
(4) 1, 10, 100
(5) ☺   ☺ ☺   ☺ ☺ ☺
(6) 10,8,6,4
(7) ☺☹, ☹☺, ☺☹, ☹☺
(8) 5,10,15,20
(9) ▲►▼◄   ▲►
(10) ♠♣♥♦   ♦♥♣♠   ♠♣
(11) 1,2,4,8,16
(12) ↑↓   ↑↑↓↓   ↑↑↑↓↓↓
(13) 400, 200, 100, 50
(14)
(15) ®   ©®©   ©©®©©
(16) ■□□■■■□□□□■■■■■
(17) 1, 11, 111, 1111
(18) 5,4,3,2,1,0
(19) ☺ ☻, ☻ ☺, ☺ ☻, ☻ ☺
(20) 10, 01, 10, 01

(4b) LO- Extend my knowledge of sequences
Find the next two in the pattern **(if 2 exist)** and state the rule

0, 1, 3, 6, 10, 15, 21……
►▼◄, ►▼▼◄, ►▼▼▼◄…
A, E, I, O ……..
22, 44, 66, 88, 1010…..
6, 4, 2, 0, -2………
♪, ♫♫, ♪♪♪, ♫♫♫♫, ♪♪♪♪♪
10, 20, 40, 80……
1, 100, 2, 200, 3, 300, 4, 400…
10000,1000,100,10,1
3, 2, 1, 1, 2, 3, 3, 2………
Win, Lose, Draw, Draw, Lose, Win
0,1,1,2,3,5,8,13,21……
p, p², p³…..
a s d f g h
31, (28/29), 31, 30, 31, 30, 31
12, 11, 9, 6, 2, -3, -9………
A, z, B, y, C, x………
Cat, Crow, Camel, Cattle… (lots of different choices for this one)
0.1, 0.2, 0.3, 0.4…….

(5) LO- Continuing a sequence/number pattern.

<u>My Task</u> – Draw a table like the one below and write each term of the sequence in the box. Just follow the rule of the sequence!

n	0	1	2	3	4	5
t						

He is an example: **2n + 1** is the 'term to term' rule.
I multiply n by 2 and **then** add 1.
Starting with n=0, n=1 and so on
2(0) + 1 = 1 ….so I write 1 in the box
2(1) + 1 = 3
2(2) + 1 = 5

n	0	1	2	3	4	5
t	1	3	5	7	9	11

Your Go. Write out the first 6 terms starting with 0 and finishing at 5

(1) n+1
(2) 2n -1
(3) n²
(4) 3n
(5) 2n+2
(6) 1-n
(7) 2n²
(8) 2+n
(9) ½ n
(10) n³
(11) 3n-5
(12) 4-5n
(13) n
(14) (n+1)²
(15) 5n
(16) 1-n²
(17) 4n-3
(18) n + n

Task 2:

Carry on the sequences for negative numbers:

n	-5	-4	-3	-2	-1
t					

LO- Find the nth terms of a sequence
Some Help!
(1) Find what the pattern is going up by each time. Is it going up by 1, 2, 3..?
(2) Multiply n by that number so if it goes up by 3 each time, start with 3n
(3) Start with n = 1, so 3n would be 3
(4) Find out what you have to add or subtract to get the number in the sequences
(5) Check it works for all the numbers in the sequence.
Example:
4, 7, 10, 13, 16
Put the numbers in a table

n	1	2	3	4	5
t	4	7	10	13	16

It's going **UP** by 3, so its 3n plus or minus something.
3(1) = 3, so to get 4 we need to add 1
3(2) = 6, to get to 7 we need to add 1
Therefore
The sequence 'nth term' is 3n+1

Try theses ones!

| |
|---|
| (1) 3, 7, 10, 13, 16 |
| (2) 5, 7, 9, 11, 13 |
| (3) 2, 6, 10, 14, 18 |
| (4) 5, 8, 11, 14, 17 |
| (5) 6, 8, 10, 12, 14 |
| (6) -1, 2, 5, 8, 11 |
| *(7) 12, 9, 6, 3, 0 |
| *(8) 6, 4, 2, 0 , -2 |
| (9) 1, 3, 5, 7, 9 |
| *(10) 15, 10, 5, 0, -5 |
| (11) 5, 6, 7, 8, 9, 10 |
| (12) 2, 7, 12, 17, 22 |
| (13) 1, 2, 3, 4, 5 |
| (14) 4, 6, 8, 10, 12 |
| *(15) -2, 0, 2, 4, 6 |
| (16) 3, 8, 13, 18, 23 |

Basic Probability

The probability of winning a game of pool is 0.35. What is the probability of not winning?
Study the word ALPHABET. What is the probability a letter chosen is (i) not a vowel (ii) a vowel (iii) the letter A (iv) not the letter b or h?
Use a word to describe the probability of it snowing in June in the UK
There are 8 sweets in a bag. 2 are mints, 3 are chocolates, 1 is a chew and the rest are toffees. If one is taken what is the probability is (i) not a chocolate (ii) a toffee (iii) a mint (iv) not a mint or toffee (v) a fudge
There are 8 bears and 3 lions in a cage at the zoo. If one animal is chosen from the cage what is the probability it's (i) a lion (ii) a wolf
There are 3 types of cat. Black cats, brown cats and blue cats. The probability of picking a black cat is 0.3 and the probability of picking a brown cat is 0.5. What is the probability of picking a blue cat?
Jeff was born in a month beginning with the letter J. What is the probability of this happening?
Use a word to describe the probability of it being xmas day in the 25th of December each year.
A Fair spinner has 5 sections, numbered 1-5. Find the probability of spinning (i) and odd number (ii) a multiple of 2 (iii) a square number (iii) not an even number
The probability of seeing a white dog is 1/10. If 100 dogs walked by how many would you expect to be (i) White (ii) Not white?
In a factory there are 100 people. 20 people are young, half are middle aged and the rest are old. What is the probability that a person chosen at random is (i) old (ii) not middle aged
Use words to describe the probability of the events below: (1) It will rain this week (2) It will snow every day for the next month
Study the list of numbers below: 2,5,6,8,9,11,16,23,32,36,40,42,50. A number is chosen. What is the probability it is (i) an even number (ii) an odd number (iii) a negative number (iv) a square number (v) a multiple of 3 (vi) a prime number
1 in 9 people have the chance to play for the school chess team. What is the probability someone chosen at random doesn't? is the chance of playing greater or less than 10%

(6) Probability and relative frequency

Draw a line to connect the words that best describe the probability of each event happening.

A man growing to 10m tall	Certain
It being sunny tomorrow	Evens
Flipping a head on a fair coin.	Possible
If today is Sunday, then tomorrow is Monday.	Impossible

Place 4 events on the probability scale below

0   1
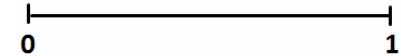
Find the probability of rolling the number 3 on a fair six sided die.

Complete the sentence *"The probability of something not happening is 1 ….."*

There are 5 sections on a spinner. 2 Blue, 1 Red and 2 Green. Find the probability (in its simplest form) if the spinner is spun once it lands on:
(i) Blue (ii) Not Red (iii) Black (iv) Green or Red.

Which is more likely to happen? Rolling a number 4 or 5 on a fair six sided die **OR** flipping a tail on a fair coin?

Study the word Mississippi. If a letter is selected at random, what is the probability the letter is (a) The letter 's' (b) A vowel (c) Not the letter 'i'

The two way table below shows information about 100 students at a local school.

	Left handed	Right handed	Total
Boy	50		
Girl			30
Total		40	

(a) Complete the 2 way table.
(b) Find the probability that if someone is chosen from the school at random they are right handed.

Jim counts the cars that pass his house one morning. There were 100 in total. 20 Black cars pass, 30 Red, 15 Blue and 25 Silver.
(a) What is the maximum number of green cars that could have passed?
(b) What is the probability a car chosen at random was red or blue?
(c) If 25 cars passed the next day how many would you expect to be Black?

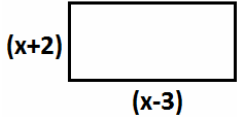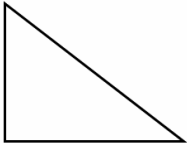Sue plays darts. The probability she wins a game is 0.3
(a) What is the probability that she doesn't win a game?
(b) If she plays 60 games how many would you expect her to win?

(7) Percentages

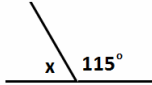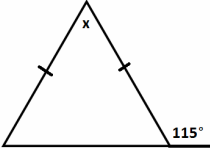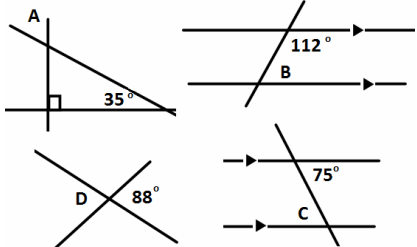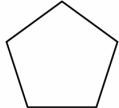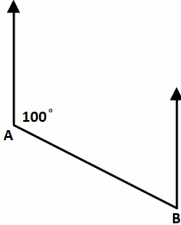| |
|---|
| What does 'percent' mean? |
| Find 10% of £50 |
| Find 15% of $40 |
| Use a calculator to find 28% of 120 |
| Use a calculator to find 7% of £620 |
| Write 15% as a fraction. |
| Write 29% as a decimal. |
| Write 0.3 as a percentage. |
| Increase £30 by 15% |
| Decrease £45 by 20% |
| What does depreciate mean? |
| If 10% of £40 is £4, what is 2.5% of £40? |
| John scored 3/10 in his test. Write this as a percentage. |
| Fred receives £45 for his birthday. He spends 10% of his money on chocolate. How much has he got left? |
| Which is more? 15% of £300 **or** £40 and by how much? |
| Jane said the number of hair cuts at her salon rose by 25% this year from last year. If she did 500 haircuts last year, how many did she do this year? |
| Bill had £1000 left to him by his granddad. He spent £500. He put 25% of the **remaining amount** in a bank account. How much did he put in the bank account? |
| What is the relationship between 10% and 5%? |
| Sue said ¾ of £600 is the same as 10% of £4500. Is she right? |
| A painting doubles in value. (a) What percentage increase is this? (b) If the painting is now worth £350 what was it worth before? |
| Bobs buys a car for £20000. It depreciates by 10% each year. Find the value of the car after 3 years. (Be careful!) |

(9) Factorising and Expanding

Factorise 4x + 8
Factorise 14p + 21
Factorise 20k + 30
Factorise 15x + 20
Factorise 2x² + 8x
Factorise 6p – 9
Factorise 5x + 10 + 20y
Expand and simplify 2(x+5)
Expand and simplify 3(x-10)
Multiply out 5(x+4)
Expand and simplify x(x+4)
Expand and simplify 3x(2+x)
Multiply out the brackets: 5x(1 – x)
Expand and simplify 2(x+1) + 3(x–1)
Expand and simplify 5(x–1) + 2(x+2)
Expand and simplify -6(x+3) - 2(x – 2)
Expand and simplify (x+1)(x+2)
Expand and simplify (x–3)(x+5)
Expand and simplify (2x+1)(x+4)
Expand and simplify x(y+2x)
Find a simplified expression for the area of the rectangle below in terms of x meters.
Find a simplified expression for the area of the square below in terms of x meters.
Find a simplified expression for the area of the triangle below in terms of x meters.
Extension – Using Pythagoras find the length of the hypotenuse of the triangle in a simplified form.

(x+2) rectangle with width (x-3)

(x-3) square

Triangle with height x and base (x+4)

(8) Angles and Bearings

State the size of angle x and give a reason for your answer.
Find the size of angle x.
Put these angles in order of size, smallest first. Justify each selection you have made.
Here is a regular pentagon: Find (a) The size of each exterior angle of the shape and (b) The size of each interior angle of the shape. (c) The sum of the interior angles.
Using angle facts and the information given, find (a) The bearing of B from A and (b) The bearing of A from B.
Fred has a garden that is in the shape of an irregular quadrilateral. One corner of the garden has an angle of 174°, another 84° and a third that is 42°. What is the size(s) of the other angle(s) in the garden? (A sketch may help).
Bob faces north. He turns clockwise 45° and walks 5 meters. Bob then stops and turns 180° anti clockwise and walks 10 meters. (a) How far away is Bob from where he started and (b) What bearing is he now on?

Angle diagram: x, 115°

Triangle with angle x at top, 115° at base, marked equal sides

Angles diagram: A, 112°, B, 35°, 75°, D, 88°, C

Regular pentagon

Bearing diagram: A, 100°, B

Angles and Bearings Overview

(1) Your home town of North Village is shown below
(i) Find the bearing of each of the 5 other places from North Village
(ii) Given the 1cm = 1km (or 10mm = 1km) find the distance to the nearest 0.1km of each place from North Village
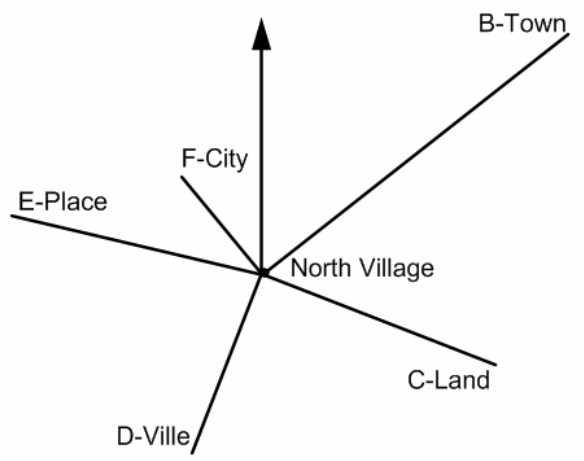

(2) A Ship is on a bearing of 140° from a lighthouse. A Dinghy is on a bearing of 045° from the ship. Find the Bearing of (i) The ship from the Dinghy and (ii) The bearing of the dinghy from the ship

(3) Without using a protractor, find the bearing of D from C (the picture is not to scale)
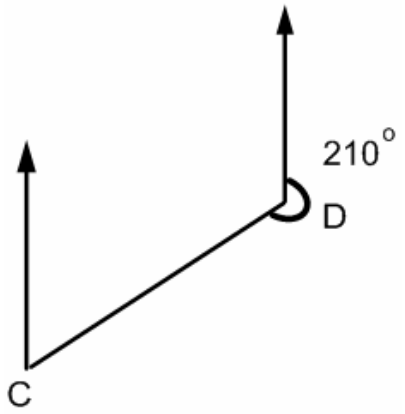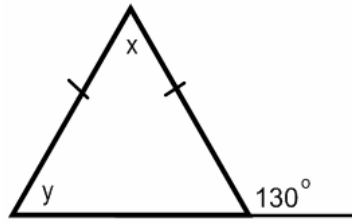

(4) Draw the following bearings and lengths using 1cm = to 1 mile
(a) 100° bearing and 4 miles in length
(b) 050° bearing and 3 miles in length
(c) 200° bearing and 6 miles in length
(d) 270° bearing and 2 miles in length
(e) 350° bearing and 4 miles in length

(5) Using angle facts find the missing values in each of the diagrams below
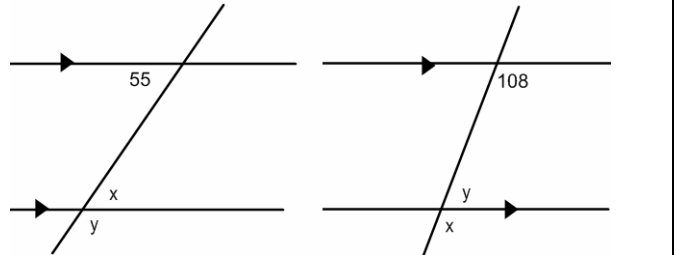
(6) Find x and y

(7) Draw a triangle with the following angles (using a protractor)
(a) 60°,60°,60°
(b) 30°,60°,90°
(c) 45°,45°,90°

(8)

Complete the table for the regular shapes above

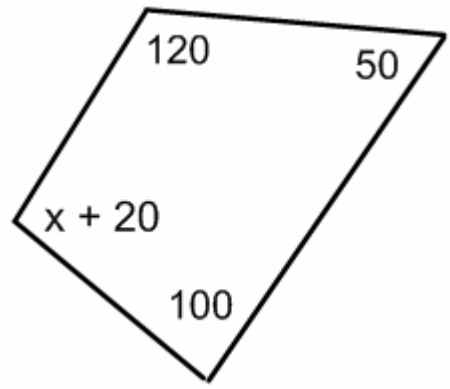| Name	Exterior Angle	Interior Angle	Sum of Interior Angles

(9) Find the value of x below (not drawn to scale)
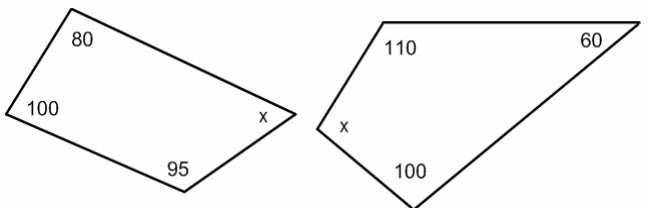
(10) Find the value of y below
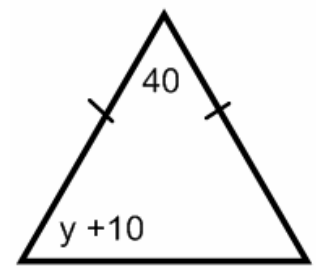
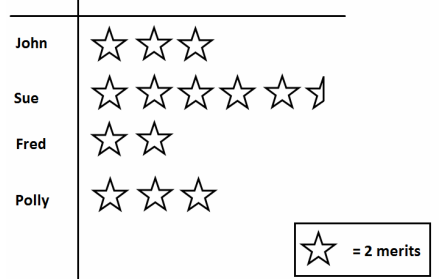**(11)** Find the value of x below (not drawn to scale)

(12) Construct and bisect 3 acute angles

(10) Pictograms and Stem & Leaf Diagrams

The pictogram shows the number of merits each student in class 9z got in a one week period.

John	☆ ☆ ☆
Sue	☆ ☆ ☆ ☆ ☆
Fred	☆ ☆
Polly	☆ ☆ ☆

☆ = 2 merits

(a) State the number of merits Sue had.
(b) Find the difference between the number of merits Fred and John had.
(c) Jaz had 3 merits. Add Jaz's information to the pictogram.

Peter has 28 Bounty bars, 12 Mars Bars, 8 Galaxy bars and 6 Milky Bars. Represent this information in a pictogram in your book. You must use a key.

The stem and leaf diagram below shows the number of people who visited the museum each day over an 18 day period.

0	3,5,7
1	2,8,8,9
2	0,3,3,5,7
3	4,5,6
4	0,0,1

key 3|4 = 34 people
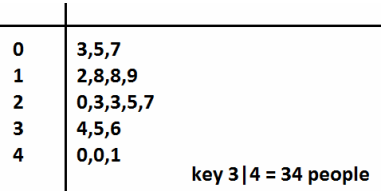
(1) State the (a) highest and (b) lowest number of people attending the museum in the period.
(2) Find the median, mode(s), mean and range from the stem and leaf diagram.
(3) How many days in total did more than 20 people attend the museum?

Draw an ordered stem and leaf diagram with a key for the following numbers:
2, 43, 15, 23, 54, 9, 2, 13, 29, 31, 33, 25

Study the stem and leaf diagram below

1	3,5,4,7,2
2	1,0,44,5
3	9,9,7
4	1,1,1
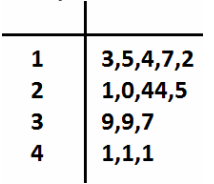
(a) State 3 things wrong with the diagram
(b) Draw your own stem and leaf diagram with the changes that need making.
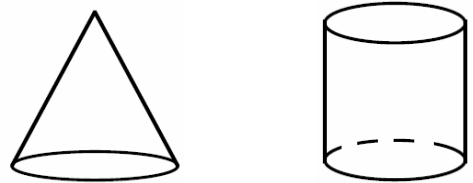(c) Find the mean, mode, range and median from the stem and leaf diagram.

(11) 3D Solids and Construction & Loci

	Name:		Name:
	Faces: Edges: Vertices:		Faces: Edges: Vertices:

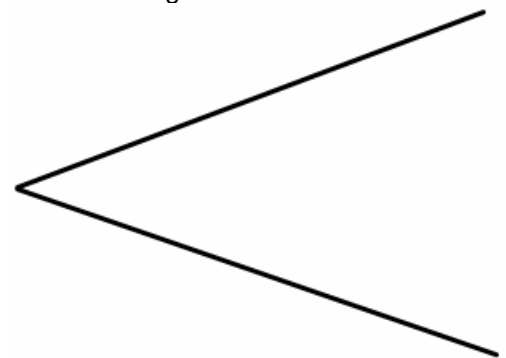|	Name:		Name:
	Faces: Edges: Vertices:		Faces: Edges: Vertices:

State the number of faces, edges & vertices of a cuboid.

Name a solid that has 8 edges

Name these two solids

Bisect the angle below

Draw a straight line of any length. Bisect the line. Measure the distance from the each end to the centre.

Draw 4 different acute angles. Use a compass to bisect them. Make sure you leave all construction marks on.

Draw a line of 8cm. Using a compass construct a triangle with side lengths 8cm, 7cm and 6cm

Mark an x on a page. Draw a locus of points that are 4cm from the x. Now draw a locus of points 5cm from x

Paul says there is a solid that has the same number of faces as vertices. He says the solid has 1.5 as many edges as vertices. Is he correct? If so which solid is it?

(12) Solving equations

Do all workings in your book and write the answer in the box provided

$2x = 4$	$3x = 9$
$x/3 = 10$	$4x = 10$
$2x - 1 = 9$	$3x + 2 = 8$
$5x - 2 = 18$	$7x + 1 = 22$
$4x + 6 = 30$	$2 + 6x = 14$
$3x - 6 = -3$	$1 - 5x = 11$

$2x + 4 = x + 10$
$3x + 3 = x + 11$
$4x - 5 = 3x + 2$
$5x - 10 = 4x - 3$
$3x + 5 = 2x - 3$

$2(x + 3) = 10$
$3(x - 4) = 6$
$5(x + 3) = 25$
$6(2 - x) = 12$

The perimeter of this rectangle is 18m. Find the value of x.

2x

x
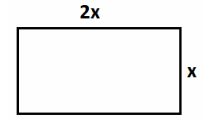
John buys 6 pens and 3 pencils. Pencils cost x pence and pens cost 3x pence. The bill came to 210p. How much did one pencil cost?

Jill is 5a years old and Bill is 10a years old. Their combined age is 75. How old is Jill?

The area of this square is 121cm². Find the value of y.

y

$x^2 = 36$
$2x^2 = 50$
$3x^2 = 300$
$x^3 = 27$

(13) Pie Charts, Line Graphs and Bar Charts

100 People were asked their favourite food.
State the number who chose burgers **and** estimate the number of people who chose each other option.

On another day 20 people were asked the same question with the same options. Half liked Burgers, 6 liked Pizza and 3 picked Chinese. Draw a bar chart to show this information

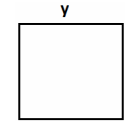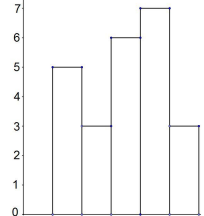
The bar chart shows information about the pets students kept in year 11. The modal class was dogs. Cats and fish had the same number and twice has many pupils had birds than cats. 5 pupils said 'other' when asked and 1 said Monkey. Complete the chart.

Draw (i) an accurate pie chart and (ii) and accurate bar chart for the information below. It shows peoples favourite car makes.

Favourite Car	Frequency
Porsche	9
Lamborghini	5
Ferrari	12
Aston Martin	10
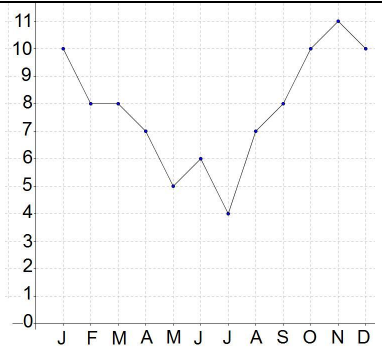
The graph above shows the sales (in 1000s) of item A.
(i) Find the range of the data (ii) work out the mean average of the data. (iii) Find the modal value. (iv) State with a reason whether you think item A is an ice cream or a knitted jumper.

(14) Decimals   **Non calculator throughout**

Order the decimals smallest to largest (ascending order).

0.21, 0.0222, 2.102, 21.01, 2.28
0.01, 0.888, 0.80, 10.08, 80.001

Find

1.32 + 21.23
15.63 – 2.97
0.32 + 0.123 + 11.7

Calculate

0.2 x 0.4
0.5 x 0.6
0.12 x 0.4

Work out the following

Convert 20% to a decimal
Convert 0.65 to a percentage
Write ¾ as a decimal
Which is bigger? 0.21 or 1/5
Put these in order of size, smallest first: 0.31, 33% and 3/10

Find 0.2 of £40
Find 0.1 of £55

Wordy questions

John does one lap of the track in 59.34 seconds. He does a second lap. His total time was 118.64 seconds. How long did his second lap take?

The price of cake fell one week from £3.24 to £1.80. The following week it was reduced by a further 67p. Find the total saving on the original price.

Sue wants to buy 0.8 meters of string. The string costs 40p a meter. Calculate what she has to pay for the string.

(15) HCF and LCM

HCF = Highest common factor. This is the largest number that will go into all the numbers you have in your list.
LCM = Lowest common multiple. This is the smallest number all the numbers in your list will fit into.

| Numbers	HCF	LCM
6 and 8		
8 and 12		
10 and 24		
10 and 12		
5 and 13		
6, 8 and 10		
12 and 18		
5, 10 and 25		
8 and 14		
4 and 14		
6 and 9		
3, 9 and 12		
6, 10 and 12		
24 and 56		
8 and 30		

(16) Volume & Surface Area

Please note: In an exam you are given the formula for the volume of a prism - see inside the front page!

If the dimensions of a shape are in cm then the surface are is measured in_____ and the volume is measured in_____.
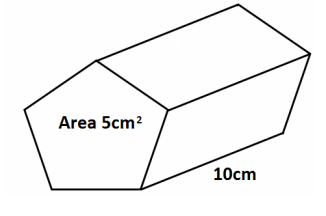
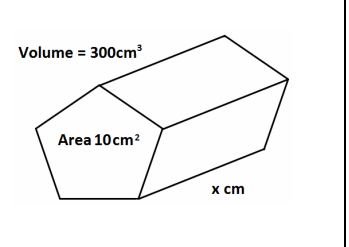Find (1) The surface area and (2) The volume of the cuboids below. (3) Explain why they are not cubes.

6cm 7cm 5cm

4mm 4mm 3mm
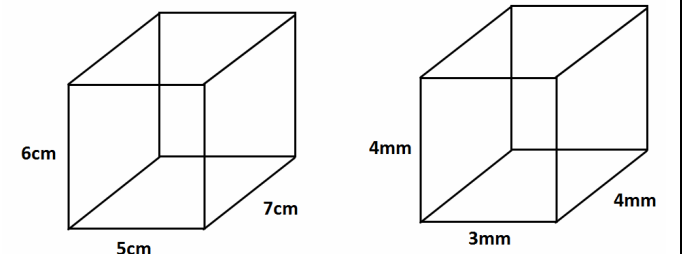
Find (1) The surface area and (2) The volume of the triangular prisms below: (Pictures are not to scale)

10cm 6cm 7cm 8cm

5m 4m 9m 3m
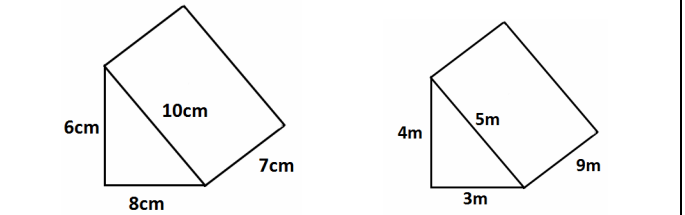
Find the volume of the shape below:

Area 5cm² 10cm

Find the value of x:

Volume = 300cm³

Area 10cm² x cm
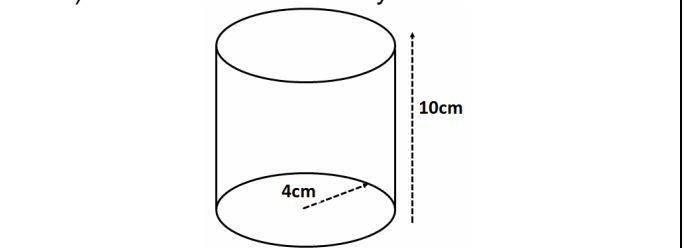
A cube has side lengths of 6cm. Find the surface area and the volume of the cube. (a sketch may help)

The area of a circle is $A = \pi r^2$ (A is the area, r is the radius) Find the volume of the cylinder below:

10cm 4cm

Repeat the last question. This time using 5mm for the radius and 8mm for the height.

(17) Inequalities

Fill in the blanks with either a >, < or =

123_____321

54_____65

0.1_____0.1

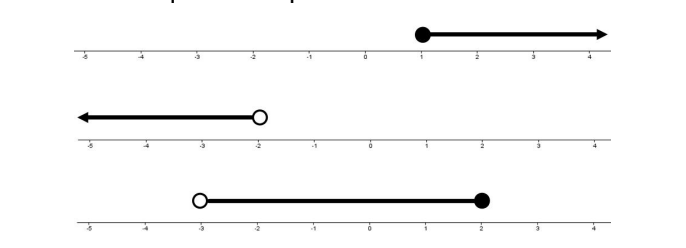List 3 integers that satisfy the following inequalities:

x > 5

3 < x

-5 ≤ x

5 < x < 10

-1 ≤ x < 5

List **all** the integers that satisfy the following inequalities:

4 < x < 8

-2 ≤ x < 4

-5 < x < 1

State the inequalities represented below:

Solve the following inequalities:

3x > 9

2x + 2 < 8

5x − 1 > 9

(18) Formulae

a = 2, b = 3 and c = 1

Find (1) 2a   (2) 3b − c   (3) b² - 2a

x = -1 y = 2 and z = 5

Find (1) 3x   (2) z − y   (3) y − x   (4) x² + y

p = 7, q = -2 and r = 0

Find (1) 2r   (2) p − q   (3) q² + 7   (4) pr

A taxi costs £3 per mile and a £10 fixed charge for each journey.

The cost is C and the number of miles is M.

(1) Write a formula to find the cost of a taxi journey. (2) Work out the cost of a 4 mile journey (3) find out how many miles a journey was if the charge was £40

Paul cleans windows. He charges a fixed call out fee of £5 and each window he cleans costs £2. Using 'C' to represent the cost and 'W' for the number of windows (i) Write a formula for the cost of having 'W' windows cleaned (ii) Find the cost of having 5 windows cleaned (iii) Find the number of windows cleaned if the bill was £37

(19) Measures and Scales

State a metric and imperial measure for the following:

Measure	Metric	Imperial
Height of an adult		
Weight of an ipod		
Glass of Coke		
Distance to London		

Here is an adult male and a dinosaur. (i) Estimate the man's height and hence (ii) Estimate the height **and** length of the dinosaur.
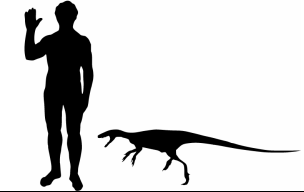
Using the conversion 1kg = 2.2lbs find (i) The weight in lbs of a dog weighing 20kg and (ii) The weight of a bag of sand in kg that weighs 6.6lbs.

5 miles = 8km. (i) Find the distance in km of a 5 mile journey and (ii) Find the distance of a 48km journey in miles.

The thermometer below gives the temperature in °c. (1) State the values of A, B and C. (2) Draw an arrow to -8°c and label it D. (3) State the range of values on the thermometer.
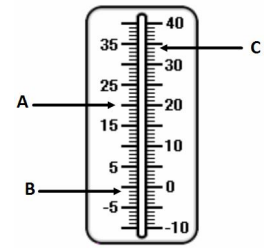
Below are two **different** scales measuring the weight of food. (i) State the value of A and B. (i) Using arrows place the following values on the appropriate scale: C = 1.1, D = 0.21, E = 0.32, F = 0.15
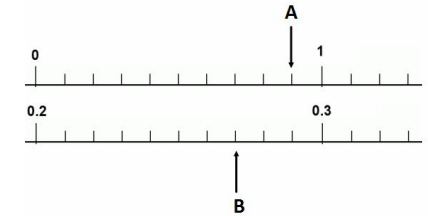
The temperature on a thermometer reads -12.6°c at 6am and 8.1°c at 3pm. Find the temperature change.

(20) Ratio and Proportion

Simplify the following ratios:

7:21	12:15:3
24:8:16	100:25

Write the ratios below in the form 1:n

15:8	24:77

Write the ratios below in the form n:1

18:7	32:13

Write an equivalent ratio for the each:

1:3	4:7

Share into the ratios given:

£120 in a 3:4:5 ratio
50kg in a 7:2:1 ratio
$45 in a 5:3:1 ratio
£72 in a 1:3:4 ratio

Wordy Questions!

Some money is shared out in a ratio of 5:4:3. Jim has £100, Fred has £80 and Bob is given the smallest share. How much does Bob get?
John and Fred share some cake. John has 3/8's and Fred 5/8's. Write this as a ratio.
Which is worth more, the smallest share of £300 when shared in a ratio of 3:5:7 **or** 10% of £650?
The ratio of boys to girls in a class is 3:5. There are 30 girls. How many boys are there?
5 pens cost £1.80. Find out how much 7 pens will cost.
In a recipe for 4 cakes there are 100g of flour, 50g of butter and 40g of sugar. Find out how much you would need of each to make 6 cakes.
For every £5 Pete earns, Bob earns £6.50. Find out how much Pete earns if Bob earns £65
A 250ml can of fizzy drink has 15g of sugar in. Find out how much sugar is in a glass with 400ml of fizzy drink in.
In a tin of paint, the ratio of red paint to yellow paint is 4:3. There is 1 litre of red paint in the tin. How much yellow paint is in the tin?
Some more money is shared out. Fred gets twice the amount Sue does. Sue gets ¼ of what Bob gets. Write this as a ratio.

(21) Speed Distance Time and Estimations

Round each of the following to 1 significant figure:
(1) 1.3   (2) 9.78   (3) 106.23   (4) 0.48
Estimate the answer to: 9.7×4.8
Estimate the answer to: 103.2×19.7
Estimate the answer to: $\dfrac{40.6}{7.9}$
Estimate the answer to: $\dfrac{2.1+11.3}{5.9}$
Estimate the answer to: $\dfrac{108+9.8}{0.49}$
Estimate the answer to: 5.32×1.98
John sees some rope in a shop. The rope is £1.08 a meter and he needs 9.7 meters. Suggest a suitable amount of money he should take to cover the cost, showing your calculations.
Helen works in a factory. She earns £5.98 an hour and works for 39 hours a week. Explain why her wages cannot be more than £240 per week.

Speed, Distance, Time   **Don't forget units!**

Often the questions just need common sense. If you are stuck you can use the triangle below. If you want Speed, put your finger over the S and you will do Distance ÷ Time. For Distance, its Speed x Time. For Time its Distance ÷ Speed.
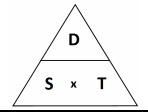
John Bikes at 10mph for 6 hours. What distance does he cover?
It takes Jenny 3 hours to travel 180 miles. What is her average speed?
Fred walks 10km at an average of 4 kph. How long does it take him to complete the 10km?
Peter Drives home from work. The 30 mile journey takes 45 minutes. What was his average speed? (Be careful!)
How long will it take to cover 180 meters if someone is walking at 6 meters per second?
Sue needs to drive to her friends. She can average 50mph and the journey is 150 miles. If she needs to be at her friends for 10am what time should she leave home?
Jimmy gets on a train. It travels from Town A to Town B which is 120km. The train sets out at 13:16 and arrives at 16:16. What was the average speed of the train?

(22) Transformations:

Translate: This means you move the shape.
Rotate: You state the centre of rotation, angle and direction.
Reflect: Put a mirror on the line and redraw the shape
Enlarge: Make it bigger! You will be given the scale factor.
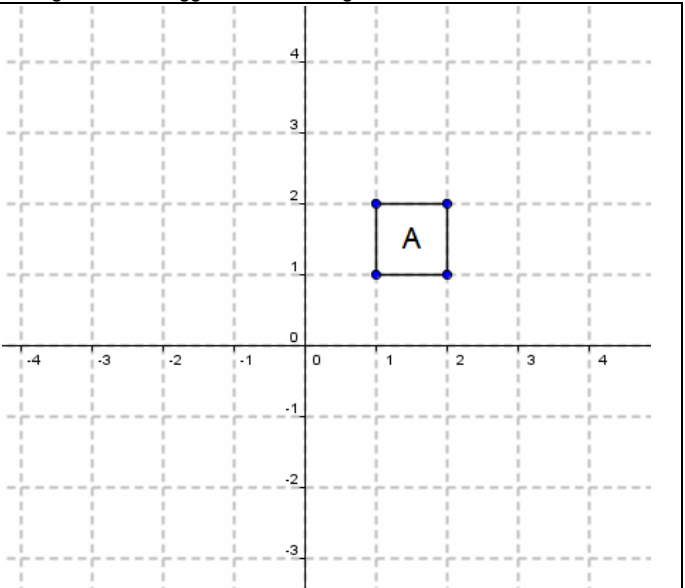
Rotate Shape A 90° Clockwise about 0,0. Label it B
Translate Shape A by 1, 2 and label it Shape C
Reflect shape A in the x axis and label it shape D

State **fully**:
(a) The single transformation that maps shape A to shape B
(b) The single transformation that maps shape A to shape C
(c) The single transformation that maps shape C to shape A

Be Very Careful with this example. You have been warned!
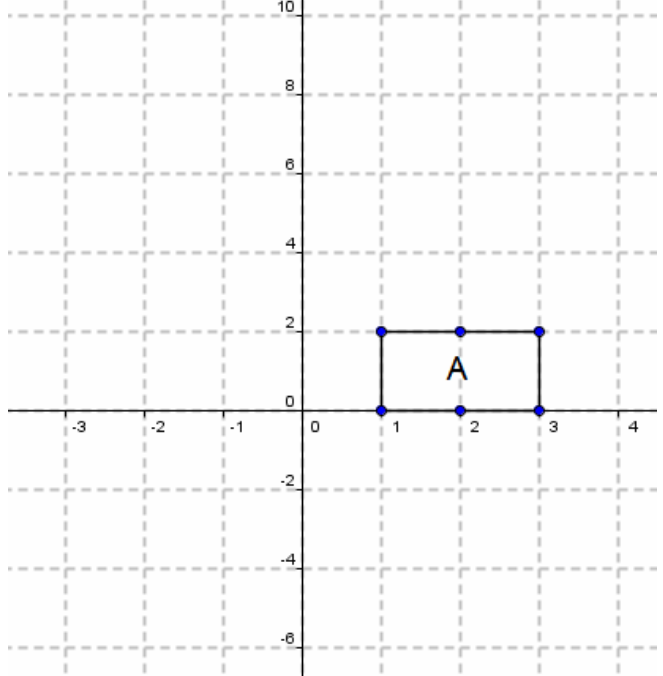
Translate Shape A by -2, 2 and label it Shape B
Reflect shape A in the line x = -1 and label it shape C
Rotate Shape A 90° anticlockwise about 0,0 label it D

Rotate Shape A 90° anticlockwise about 1,0 label it B
Reflect shape A in the y axis and label it shape C
Translate Shape A by -1, -2 and label it Shape D

Rotate Shape A 90° Clockwise about 1,1 label it B
Translate Shape A by -1, 1 and label it Shape C
Reflect shape A in the line y = 3 and label it shape D
Enlarge Shape A by a scale factor 2, centre 1,1. Label it E
Find the difference in the perimeter & area of shape A and E

Plot the points with coordinates (1,2) (1,3) (2,2) and (2,3)
Reflect the shape in the line y = x
Translate the shape 2, -1

(23a) Fractions

Simplify the following fractions:

(a) $\dfrac{5}{10}$ (b) $\dfrac{12}{18}$ (c) $\dfrac{7}{21}$

Write the following improper fraction (top heavy) as a mixed number: $\dfrac{8}{5}$

Write the following as an improper (top heavy fraction):

$2\dfrac{1}{7}$

Find $\dfrac{1}{5}$ of £60

Find the following: (a) $\dfrac{1}{3}+\dfrac{1}{5}$ (b) $\dfrac{3}{8}-\dfrac{1}{4}$

Find the following: (a) $\dfrac{5}{7}\times\dfrac{2}{3}$ (b) $\dfrac{3}{5}\div\dfrac{2}{3}$

Which is larger?: 0.24 or $\dfrac{1}{4}$
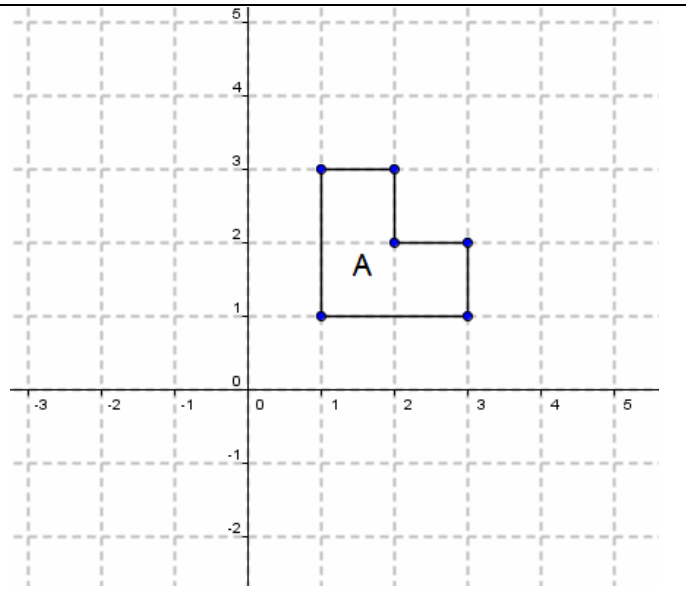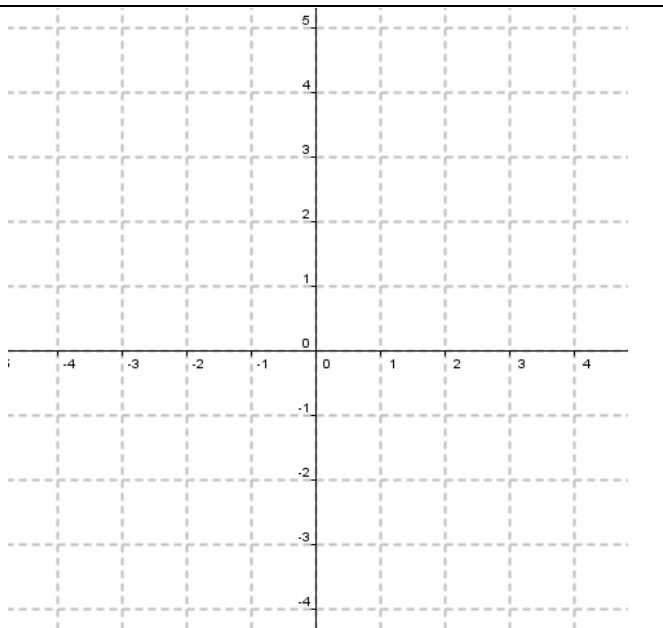

Write $\dfrac{2}{5}$ as a percentage

Put the following in order of size, smallest first:

$\dfrac{3}{4},\dfrac{7}{12},\dfrac{2}{3},\dfrac{1}{2},\dfrac{5}{6}$

James buys tickets for the cinema. Each ticket is £20.

An advert at the cinema says "Buy 6 and get $\dfrac{1}{3}$ off the total cost". How much would James pay for 6 tickets

---

Sue eats $\dfrac{1}{4}$ of half of a cake that is left in the fridge.

What fraction of the **whole** cake has she eaten?

Prices are set to rise by $\dfrac{1}{5}$ on a local train. A standard ticket usually costs £35. What is the new cost?

Which has a higher value? $\dfrac{2}{3}$ of £60 **or** 10% of £450

and by how much?

$\dfrac{1}{4}$ of the spectators at a football match are children, $\dfrac{1}{2}$ are adults and the remaining amount are OAPs. If there are 12'000 people at the match, how many are OAPS?

(23b) Fractions

$\dfrac{1}{5}+\dfrac{1}{5}=$	$\dfrac{3}{7}-\dfrac{2}{7}=$
$\dfrac{1}{3}+\dfrac{1}{2}=$	$\dfrac{3}{2}\times\dfrac{1}{4}=$
$\dfrac{1}{2}-\dfrac{1}{3}=$	$\dfrac{1}{4}+\dfrac{2}{3}=$
$\dfrac{2}{9}+\dfrac{1}{2}=$	$\dfrac{1}{3}\div\dfrac{1}{2}=$
$\dfrac{1}{3}\times\dfrac{2}{5}=$	$\dfrac{3}{4}\times\dfrac{5}{9}=$
$\dfrac{1}{5}\times\dfrac{2}{3}=$	$\dfrac{3}{4}-\dfrac{5}{7}=$
$\dfrac{6}{7}-\dfrac{2}{3}=$	$\dfrac{4}{5}\div\dfrac{1}{3}=$
$\dfrac{4}{7}\div\dfrac{3}{5}=$	$\dfrac{3}{5}\times\dfrac{5}{7}=$
$\dfrac{3}{5}-\dfrac{1}{4}=$	$\dfrac{2}{3}-\dfrac{1}{5}=$
$\dfrac{1}{4}\times\dfrac{6}{13}=$	$\dfrac{8}{9}\div\dfrac{2}{3}=$

(24) Powers and roots

Find the following **WITHOUT A CALCULATOR**

$5^2=25$ so $\sqrt{25}=$ ___
$6^2=36$ so $\sqrt{36}=$ ___
$7^2=49$ so $\sqrt{\underline{}}=7$
$\underline{}^2=81$ so $\sqrt{\underline{}}=9$

Find the following **WITHOUT A CALCULATOR**

$3^3=$
The square of 9
$\sqrt[3]{8}=$
$\sqrt{64}=$
$2^5=$
6 cubed
$\sqrt{49}=$
$6^2+2^2=$
$3^3+12=$
$10^3=$
$4^3=$
The square root of 144
$2\times2\times2\times2=$ ___ or ___
The cube of 4
$\sqrt[3]{27}=$
$\sqrt{121}=$
The cube root of 125
$3^2\times3^2=$
$\sqrt{16}=$
$4^4=$
3 squared
$\sqrt[3]{1000}=$
Write $2\times2\times2$ using index notation
Write $3\times3\times3\times3$ using index notation
Write $5\times5\times5$ using index notation
Write in $6\times6\times6\times6\times6\times6$ using index notation
Write in $p\times p\times p\times p\times p$ using index notation

(25) Averages: Mean, Mode, Median and Range
Non Calculator

Find the mean, mode, median and range of the following numbers:
3,5,1,2,4,3
Mean=   Mode=   Median=   Range=

Find the mean, mode, median and range of the following numbers:
3,7,5,4,6,1,9,5,5
Mean=   Mode=   Median=   Range=

Find the mean, mode, median and range of the following numbers:
11,9,8,12,10,13,7,10,15,5
Mean=   Mode=   Median=   Range=

Calculator

Find the mean, mode, median and range of the following numbers Round all answers to one decimal place where appropriate:
7,4,1,8,5,2,9,8
Mean=   Mode=   Median=   Range=

Find the mean, mode, median and range of the following numbers Round all answers to one decimal place where appropriate:
13,12,16,11,3,2,13
Mean=   Mode=   Median=   Range=

Bob works for a 7 day period. His hours total to 56 for the week. Work out the average number of hours he worked a day.

Bob realised the hours he had worked were actually, 7,9,11,5,8,8 and 8 for the week. Find the modal number of hours he worked and the range.

In a shop, handbags cost £57, £43 and £67. (i) Work out the range in the cost. (ii) Find the median price

Holly plays a game. Her scores are, 3,6,4,5 and 8. She tries to calculate the mean and has an answer of 9.4 (i) Why is this answer wrong? (ii) Work out the mean for her.

A local football team record the number of people attending their matches over a 4 week period. They were 896, 1320, 1102 and 907. Find the mean and range of the attendances.

Jess needs to average 65 on 3 tests to get into College. She has scored 55 on the first. What must she average on the final two tests?

(26) Negative Numbers

2 - -3
24 ÷ -4
-3 × 5
-5 - + 7
4 - -3
-12 ÷ -4
-2 - + 9
18 ÷ -6
-4 × -5
2 - -5
12 ÷ -4
-2 - -7
30 ÷ -3
-2 × 5
-2 - + 7
12 ÷ -4
-2 × 15
-5 - 6
-2 - + 7
32 - -1
12 ÷ -1
8 - -3
12 ÷ -4
-7 × 3
-6 + -1
-2 × -10
21 - -31
20 ÷ -4
2 - + 17
-2 + 15
-22 ÷ -2

Ken has £3 in his bank account and withdraws £9. How much does he now have in his account?

The temperature in Moscow is currently -3°C. What is the temperature if (a) it rises by 8°C and (b) if it falls by 7°C?

A bird flies 3 metes above sea level. A dolphin swims 8m below sea level. What is the distance between them?

Town United end the football season with a goal difference of -3. If they scored 38 goals how many did the let in?

(27) Finding the mean from frequency tables

The frequency table below shows the number of weeks a song stays at number one in the charts.

Weeks	Frequency	F x W
1	8	
2	9	
3	7	
4	6	
5	4	
6	2	

(i) Find the mean number of weeks a song spends at number 1.
(ii) Draw a Pie chart to represent the information.

The table below shows the length of people's feet in a survey (in cm)

Length in cm	Frequency	F x M
15 ≤ l < 20	120	
20 ≤ l < 25	80	
25 ≤ l < 30	90	
30 ≤ l < 40	70	

(i) Find and estimate for the mean for the length of someone's foot.
(ii) Draw a Pie chart to represent the information.
(iii) Draw a Frequency Polygon to represent the information.
(iv) Find the probability that if someone is chosen from random their (i) feet are less than 25cm long and (ii) feet at more than 40cm long.
(v) State why it's an estimated mean.

The frequency tables below shows the temperatures recorded in an office. (In degrees C)

Temperature	Frequency	F x M
0 ≤ t < 5	40	
5 ≤ t < 15	30	
15 ≤ t < 20	10	
20 ≤ t < 40	10	

(i) Find and estimate for the mean temperature of the office.
(ii) Draw a Pie chart to represent the information.
(iii) Draw a Frequency Polygon to represent the information.
(v) Find (a) the maximum and (b) the minimum possible range of temperatures.

(28) Venn Diagrams
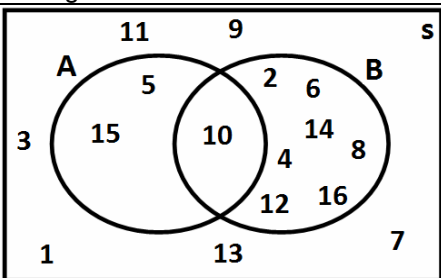
(a) Write down the members of sets A, B and S.
(b) What do the sets A, B and S represent?

Represent the following sets on a Venn diagram:
$$A = \{2,4,6,8,10\}$$
$$B = \{2,3,5,7,11\}$$
Which set is missing? Show it on your diagram

Use a Venn diagram to show the information below
$$A = \{\text{Multiples of 5}\}$$
$$B = \{\text{Even numbers}\}$$
$$\xi = \{\text{Intgers from 1-20}\}$$

Write down the members (elements) of **each** set in using set notation.

Draw a Venn Diagram to show the following information. Multiples of 3, even numbers and the integers from 20-30.

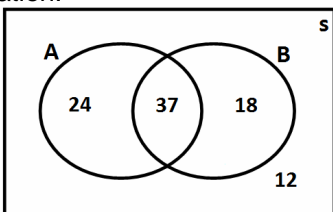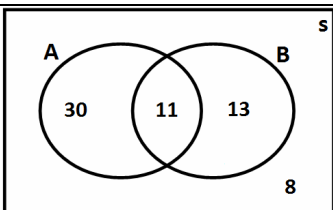The Venn Diagram shows information about people in class 11y. People in set A play football. People in Set B play Tennis. (a) How many people play football? (b) How many people play tennis? (c) How many play neither?

There are 40 people in a local club. 10 have both Laptops **and** MP3's, 15 have MP3's and 21 have Laptops. How many have neither?

Venn Diagrams 2

60 people go to a sports club. 18 play hockey, 53 play snooker and 6 don't play either. Show this on a Venn diagram and find the probability of (i) someone playing hockey only (ii) someone playing both hockey and snooker

At a party 12 people only eat cake, 18 people only drink coke and 30 people eat cake **and** drink coke. Given 3 people don't eat cake or drink coke, find the probability somebody chosen at random eats cake at the party.

Draw a Venn diagram to show (i) the multiples of 3 and (ii) the multiples of 4 using the numbers 1-25.
From your diagram find the probability of picking a multiple of 3 only from the list.

There are 120 people in a school. 9/10 of them play in the band. **All** members of the band play woodwind and/or brass instruments. Of those in the band 67 play brass and 63 play woodwind. Find the number who play both instruments.

The Venn diagram shows Albinos and people with blond hair.
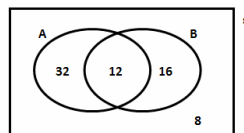
     50 How many Albinos were there?
(ii) What is the probability of picking someone with blond hair only?
(iii) What does the '8' represent?

There are 100 people at a meeting. 32 are male, 37 are old and 12 are old and male. How many young women were at the meeting?

In a survey18 people said they liked fish and chips. 28 liked chips and 32 liked fish. 30 liked neither. How many people were there altogether?

100 people were asked about the brand of washing powder the bought. How many people bought brand x?
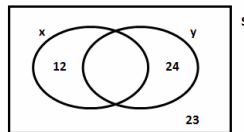
50 people are in a class. 15 have black hair and are right handed. There are the same number of right handed people as people who have black hair. 9 don't have either black hair nor are right handed. How many people have black hair?

(29) Prime Factorisation

List the factors of 48
Find the HCF of 18 and 24
Find the LCM of 15 and 9
Find the HCF of 12, 16 and 40

When asked to 'prime factorise' or write as a 'product of prime factors' just think 'factor tree'. 24 is shown below.

24

2

12

2

6

2   3

2 x 2 x 2 x 3

or 2^3 x 3

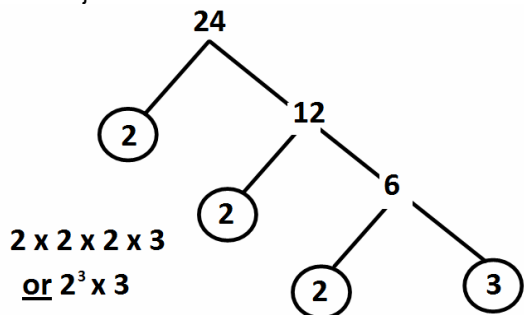| |
|---|
| List the first 10 prime numbers: |
| Prime factorise 12 |
| Prime factorise 16 |
| Prime factorise 27 |
| Prime factorise 36 |
| Prime factorise 42 |
| Write 18 as a product of its prime factors |
| Write 54 as a product of its prime factors |
| Write 32 as a product of its prime factors |
| Write 25 as a product of its prime factors |
| Write 12 as a product of its prime factors |
| Use a Venn Diagram to find the HCF and LCM of 12 and 18 |
| Use a Venn Diagram to find the HCF and LCM of 12 and 18 |

(30) Standard Index Form (This is all non calculator)

Write the following in standard index form:
3000
125000
29000
373000000
10 (be careful)
Five Million

Write the following in standard index form:
0.003
0.0008
0.000567
0.1

Write these as ordinary numbers:

3×10^2

2.8×10^5

3.64×10^{-2}

1.4×10^{-1}

(31) The Equation of a Straight line (Linear Graphs)

Complete the table below and draw the graph for:
y = x - 3

x	-4	-3	-2	-1	0	1	2	3	4	5
y										

Complete the table below and draw the graph for y = 4x

x	-4	-3	-2	-1	0	1	2	3	4	5
y										

Complete the table below and draw the graph for:
y = 1 + 3x

x	-4	-3	-2	-1	0	1	2	3	4	5
y										

Complete the table below and draw the graph for y = -x

x	-4	-3	-2	-1	0	1	2	3	4	5
y										

Complete the table below and draw the graph for:
y - x = 2

x	-4	-3	-2	-1	0	1	2	3	4	5
y										

Complete the table below and draw the graph for:
y = ¼ x + 1

x	-4	-3	-2	-1	0	1	2	3	4	5
y										

(32) Loci and Construction 2

| |
|---|
| (1) Draw an acute angle. Bisect the angle and write down the size of the 2 angles created. |
| (2) Repeat question 1 twice more with different sized acute angles. |
| (3) Draw the line AB and AC. Mark the locus of points that are equidistant from the two lines. (They meet at the point A). |
| (4) Draw a line AB. Bisect the line. Measure the two sections and write down the length of each. |
| (5) Repeat question 2 twice more with different seized lines. |
| (6) Construct and equilateral triangle using a compass and pencil. (You can use a ruler to measure the base) |
| (7) Draw a point x on the page. Show the locus of points 5cm from x. |
| (8) Below is the rectangle ABCD. Copy the rectangle in your book with 1cm = 1m |

A   B

5m

C   8m   D
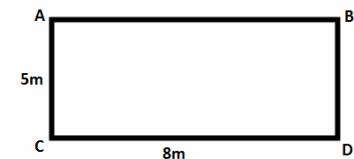
Find the locus of points that are at least 2m from A **and** closer to AC than BD.

(9) Part of a map is shown below.

Town A

12km
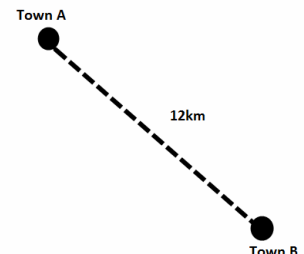
Town B

Copy the map using an appropriate scale. Find the locus of points that are equidistant from Town A and Town B.

(10) Using the map above show the locus of points that are more than 8km from A **and** 6km from B
(11) Draw a line XY. Show the locus of points that are exactly 3cm away from the line XY.
(12) Construct a regular pentagon using a compass.
(13) A dog is on a rope that is 5m long. He can reach the back door of the house **and** the garden gate. Show the locus of points where the house and garden gate **could** be and find the maximum distance between the back door of the house and garden gate.

(33) Multiplication (x) and Division (÷) (non calculator)
YOU MUST SHOW FULL WORKINGS!

(1) 7 x 8
(2) 9 x 7
(3) 6 x 5
(4) 7 x 6
(5) 56 ÷ 7
(6) 48 ÷ 6
(7) 39 ÷ 13
(8) 26 x 34
(9) 18 x 45
(10) 87 x 52
(11) 12 x 63
(12) 43 x 72
(13) 65 x 90
(14) 123 x 17
(15) 243 x 27
(16) 512 x 76
(17) 498 x 21
(18) 169 ÷ 13
(19) 221 ÷ 7
(20) 289 ÷ 17
(21) 132 ÷ 11
(22) 96 ÷ 3
(23) 432 ÷ 6
(24) 91 ÷ 4

(25) Bob earns £12 and hour and works 112 hours a month. How much does he earn in total for the month?

(26) Sue has 84 biscuits to last her a week (7 days). How many can she have each day is she shares them equally?

(27) Cakes are sold in boxes of 6. John needs 72 cakes. How many boxes does he need to buy?

(28) There are 24 hours in a day. How many hours are there in a week?

(29) Peter wants to buy an I-thingy. The I-thingy is £420. He earns £14 a week. How many weeks will he have to save for to afford it?

(30) 17 holes need digging. Each hole takes 7 hours to dig. How long will it take to dig all 17 holes?

(31) Jane wins £248. She shares it equally between her 8 friends. How much do they get each?

(34) Distance Time graphs

Jim sets off from home at 9am and an hour later he is at A-town which is 20 miles away. He stays in A-town until 12pm before driving for 2hrs to B-town which is 40 miles away. After stopping at B-town for 30 minutes he drives directly home on the same route and arrives there at 5pm. Draw a time distance graph to represent his journey. (The distance he is away from home). Use the x axis for time and the y axis for the distance.
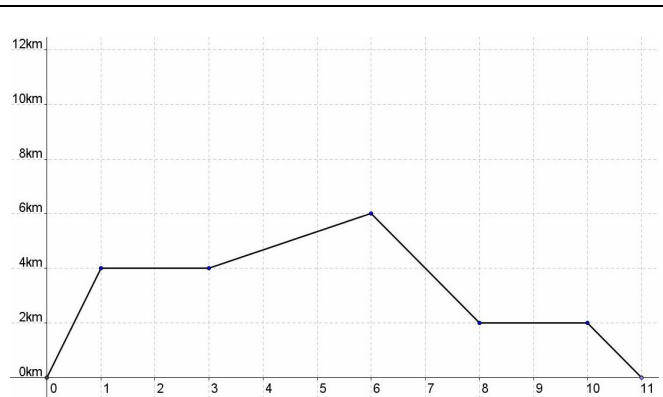
The graph above shows a distance/time graph for Sue's day out. The y axis shows the distance she is from home and the x axis shows the number of hours that have passed since she left. Use the graph to answer the following questions.

(a) What was she doing between 1 and 3 hours?
(b) How far did she travel in the first 3 hours?
(c) What was her average speed in the first hour?
(d) How far did she travel altogether?
(e) How long did she spend resting?
(f) What was the maximum distance she was from her home
(g) What fraction of the total time was spent moving?
(h) What was her average speed in the last hour?
(i) What was her average speed overall? (excluding stops)
(j) Which section was she travelling the slowest on? How can you tell?
(k) Do you think Sue enjoyed her day out?

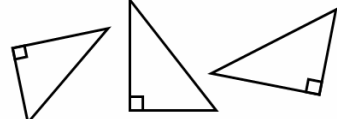## Multiplying and Dividing Decimals

NON CALCULATOR

Multiplication	Division
0.2 x 0.6	0.4 ÷ 0.2
1.2 x 0.3	0.6 ÷ 0.03
0.05 x 1.2	1.2 ÷ 0.4
0.3 x 2.1	18 ÷ 0.003
0.06 x 0.03	1.8 ÷ 0.18
0.6^2	0.08 ÷ 0.4
0.01^3	2.4 ÷ 0.06
0.3 x 0.1 x 0.04	15 ÷ 0.5
1.3 x 1.3	35 ÷ 0.07
12.3 x 0.2	0.2 ÷ 0.2 ÷ 0.2
0.076 x .02	3.3 ÷ 1.1
1.1 x 1.1	6 ÷ 0.012
0.003 x 0.1	6.4 ÷ 0.04
4 x 0.07	2 ÷ 0
64 x 0.01	2 ÷ ½
0.1^2 x 0.1^2	4 ÷ 1.6
0.00006 x 0.0	0.01 ÷ 0.002
9.0 x 0.09	16 ÷ 1.6
-0.1 x -0.1	0 ÷ 5
2.5 x 2.5	5 ÷ 5 ÷ 0.5
0.001 x 0.98	0.1 ÷ 0.001
1.4 x 1.2	14 ÷ 14

John thinks of a number and divides it by a half. The answer is 24. What number did he thing of?

Pete says 0.2 of a number is 0.084. What was the number?

Sue has half of a third of a cake. How much is left?

0.2 of 0.4kg of metal is rusty. How much is not rusty?

What is 2 divided by ¼ ?

Jane thinks if she multiplies a number by another positive number it will either stay the same or get bigger. Give examples of scenarios to show she is not true

It takes a man half a day to dig a hole. He has 20 days to dig holes. How many holes can he dig in this time?

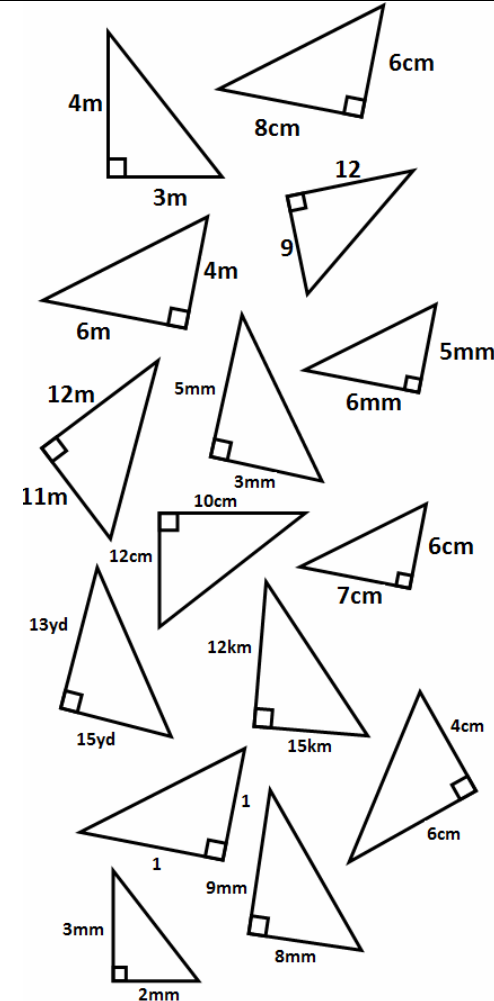How many times do you have to divide 0.1 by itself to get 1000?

Pythagoras Theorem 1

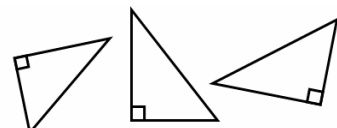| Find the following:	Find the following:
$2^2 =$	$\sqrt{25} =$
$3^2 =$	$\sqrt{16} =$
$7^2 =$	$\sqrt{30} =$
$9^2 =$	$\sqrt{50} =$
$12^2 =$	$\sqrt{73} =$

Label the hypotenuse on each triangle below

Find the length of the hypotenuse on each triangle below. Remember the units if the triangle has them! **They are not drawn to scale**
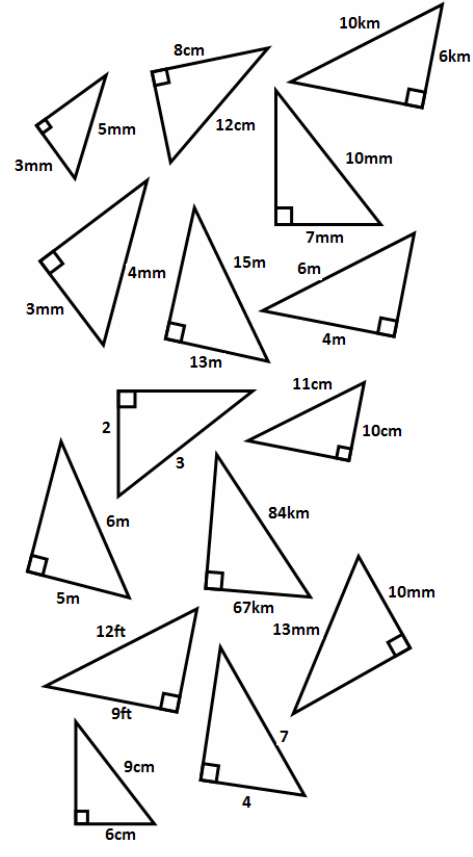
6cm
4m
8cm
3m
12
9
4m
6m
5mm
12m
5mm
6mm
3mm
11m
10cm
12cm
6cm
7cm
13yd
12km
15yd
15km
4cm
1
6cm
1
9mm
3mm
8mm
2mm

Pythagoras Theorem 2

Label the 2 shorter sides a and b on each triangle below

Find the length of the one missing shorter side on each triangle below. Remember the units if the triangle has them! **They are not drawn to scale!**

10km
8cm
6km
5mm
12cm
3mm
10mm
7mm
4mm
15m
6m
3mm
4m
13m
11cm
2
10cm
3
6m
84km
5m
10mm
12ft
67km
13mm
9ft
7
9cm
4
6cm

Two men start off at the same cross roads. One walks 4 miles north and the other walks 3 miles east. What is the distance between them when they stop walking?

The length of a car park is 100m wide by 120m long. How long is the diagonal from one corner to the other?

A square has side length 4cm. What are the lengths of the diagonals of the square?

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Basic Real life multiplication and division!

NON CALCULATOR
ALL WORKINGS MUST BE SHOWN

Sue earns £5 an hour and works for 143 hours. How much does she earn in total?
John buys 8 bags of sweets for £4.80. How much is one bag?
Fred wins $940 on the lottery. He shares the money equally between 4 people. How much do they get each
Pete pays £348 a year for gas. How much is this each month?
Every day Jane spends £126 on handbags. How much does she spend in 2 weeks?
Each cake needs 120g of sugar. I want to make 37 cakes. How much sugar do I need?
I have £512 in my savings and want to spend £4 each day. How long will the money last me?
6 men have 72 holes to dig. If they share the work equally how many will they each dig?
James works for 12 hours a week for 36 weeks. How many hours does he work in total?
Each time Jessie does her homework her mum gives her £4. She completes 112 pieces of homework in a year. How much does she earn?
Sally buys 20 bags of sweets. Each bag has 40 sweets in. She shares them equally between 16 people. How many sweets do they each have?
There are 36 people on each coach and 21 coaches in total. How many people is there altogether on the coaches?
It costs £337 per person to go on holiday. How much will it cost for 13 people to go?
John has 112 minutes left on his phone before he needs to top it up. He makes 4 minutes of calls every day. How many days will it be until he has to top the phone up?
A magazine subscription costs £5.80 a month. How much would this be for one year?

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LO – Decimals – "Real life problems"
NON CALCULATOR -You must show workings

Jane does the high jump at school. She jumps 7 times. Her heights are 1.73m, 1.78m, 1.74m, 1.68m, 1.79m, 1.08m, 1.81m Put them in order of height, lowest first.
Bob collects worms and measures them. Here are the lengths: 2.02cm, 12.02cm, 2.22cm, 1.2722cm and 2.0772cm. Put them in order of size, smallest first.
John is a racing drive. He does 4 laps of a track. The laps are timed at 1 minute 39.82 seconds, 1 minute 28.99 seconds, 1 minute 39.94 seconds and 1 minute 39.45 seconds. Put them in order, quickest to slowest.
Pete saves some money over 3 weeks. He saves £27.84, £36.54 and £122.65. How much does he have in total?
Sue bought 3 handbags from a shop. They cost £75.32, £231.65 and £1112.98. What did the bill come to?
James sees a T shirt he likes. It costs £23.65. His mum gives him £8.97. How much does he need to add to the money to afford it?
The temperature drops from 23.06ºC to 12.25ºC. By how much did the temperature drop?
Sheila cuts 4 pieces of string. The lengths are 23cm, 1.46 meters, 39cm and 2 meters and 8cm. How much did she cut altogether?
Fred cycles 2.24 miles one day, 3.67 miles the next and finally 4.87 miles on the last day. How many miles did he cycle in total?
Sue weighed 67.43kg one week. The next week she weighed 64.35kg. How much weight did she lose?
Sweets come in bags weighing 38.6g. Frank buys 8 bags. How much do they weigh in total?
Jenny has a piece of wood that is 1.82 meters long. She cuts one piece off that is 0.89m and one piece that is 0.36m. How much is left?
A meal deal has a drink for 89p, a sandwich for £2.12 and a bar of chocolate for 6p. Find the total cost in pounds and pence.
Under a microscope the lengths of insects are 0.077mm, 7.077mm, 1.77mm, 0.707mm Put them in order of size, smallest first

(34) Plotting Quadratic Graphs

(a) Complete the table for $y = x^2 - 3x - 10$

x	-2	-1	0	1	2	3	4	5
y								

(b) Plot the curve
(c) Use the graph to state the values of x when y = 0

(a) Complete the table for $y = x^2 - x - 12$

x	-4	-3	-2	-1	0	1	2	3	4	5
y										

(b) Plot the curve
(c) Use the graph to state the values of x when y = 0

(a) Complete the table for $y = 2x^2 - 2x + 3$

x	-4	-3	-2	-1	0	1	2	3	4	5
y										

(b) Plot the curve
(c) Use the graph to state the values of x when y = 0

(35) Extension Materials

5 harder questions 1

Find the value of x and y:
Find the circumference and area of the circle below:
Use trial and improvement to find the answer to $x^2 + x = 10$ to one decimal place. The solution is between 2 and 3. (show full workings in your book)

5 harder questions 2

Find (i) The shaded area of the triangle and (ii) The unshaded area of the triangle:
Find the nth term formula for the sequences below: (a) 5, 9, 13, 17 (b) 10, 7, 4, 1, -2
Solve the equation: 2x² = 72
Express 56 as a product of prime factors:

5 harder questions 3

| |
|---|
| Find (i) The value of x and y (ii) The perimeter and (iii) The area of the shape below (all lengths are in meters):
 |
| Fred wins £500 on the lottery. He spent 20% on food and ¼ of the remaining amount on clothes. (i) How much has he got left? And (ii) What fraction of the original amount is this? |
| Write down 3 integers that satisfy both of these inequalities:
5 > x and -1< x ≤ 10 |
| For every 3 blue marbles Henry has, he has 2 red marbles. (i) If Henry has 24 red marbles how many blue does he have? (ii) Explain why Henry can't have 9 red marbles. |

All Topics NON CALCULATOR questions 1

Find the HCF (highest common factor) and LCM (lowest common multiple) of 8 and 12.

Write 0.37 as a percentage.

Jane works for 30 hours a week and earns £4.50 an hour. What are her total earnings for the week?

Simplify the ratio 21:7

Below is a Circle and a Semicircle with the same radius:

Circle   Semicircle

3mm

3mm
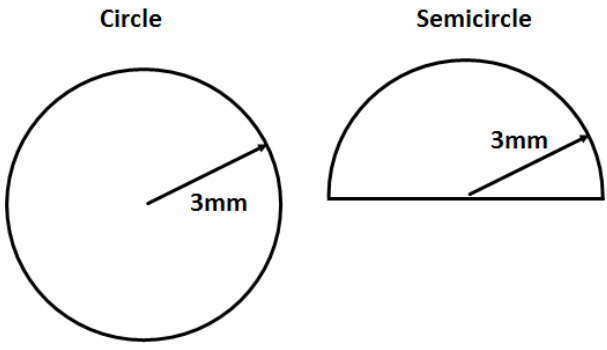
Taking π (pi) to be 3, Find:
(a) The area of the circle
(b) The circumference of the circle
(c) The area of the semicircle
BONUS QUESTION
(d) Find the perimeter of the semicircle.

Solve $2x - 3 = x + 10$

The probability that Fred wins a game of pool is 0.6. (a) What is the probability he doesn't win? and (b) If Fred plays 100 games how many would you expect him to win?
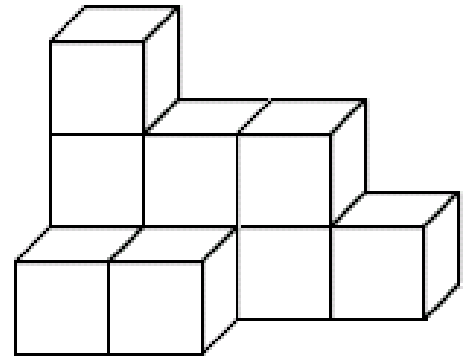
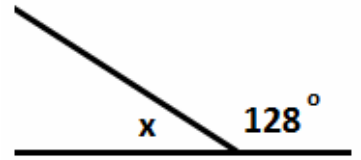State the size of angle x and angle y below. Give a reason for each.

108°

y   x
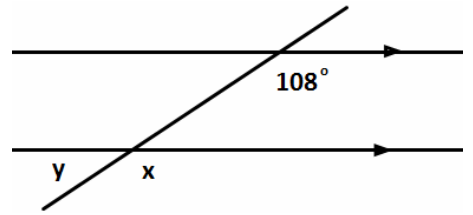
Jane spends 2/5 of her £60 savings on food. How much has she got left?

3 pens cost £1.23. Find the cost of 2 pens.

Each block below is 1cm³. (i) State the volume of the shape (ii) Mark an x on 60% of the blocks.

Explain why angle x is not 72°

x   128°

A Bus starts off with 38 passengers. At the first stop it drops half the passengers off and continues to the next stop. At the stop it picks up double the amount that was already on the bus. It then drives to the station. How many passengers are on the bus as it arrives at the station?

State 3 integers that satisfy the inequality:
 $3 > x$

Find 15% of £40

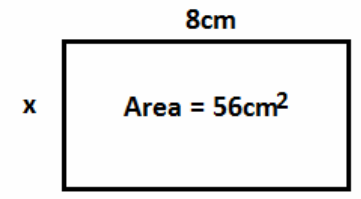Find the difference between the mean and range of the following numbers: 1,9,3,7,4,6,5,5

Simplify $3(x+2)$

John runs in a race. He can run at 6kph. The race is 30km. If he starts at 15:30 what time will he finish?

Find (a) the value of x and (b) the perimeter of the rectangle below: (Not drawn to scale)

8cm

x   Area = 56cm²

$2 + 3 \times 4 =$

Pete scored 3 out of 20 in a test. What is this as a percentage?

All Topics NON CALCULATOR questions 2

Multiply 0.2 x 0.4

John works from 09:30 to 18:00 each day with a 45 minute break for lunch. Find the amount of time he works in a day.

If John earns £5 an hour, how much would he earn for working 5 days? (he is not paid for lunch)

Simplify $p^2 \times p^3$

Express 28 as a product of prime factors. (think factor tree)

Harry goes on Holiday. The exchange rate is £1 = $1.60

(i) How many $ would he get for £5?

(ii) How many £ would he get for $32?

There are 40 people in a sailing club. Some of the information about the members is below.

	Budget Member	Premium Member	Total
Male	6		
Female			16
Total		27	

(i) Complete the two way table

(ii) Find the probability that if someone is chosen at random they are male.

Plan View

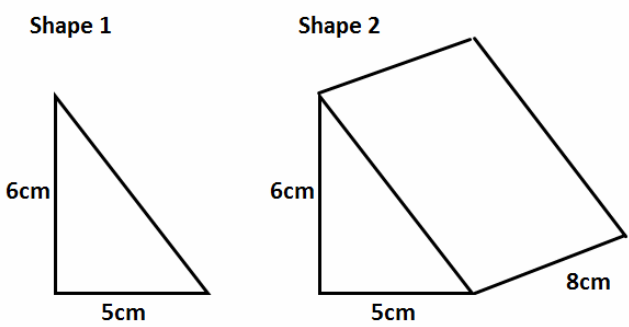**Front Elevation**   **Side Elevation**
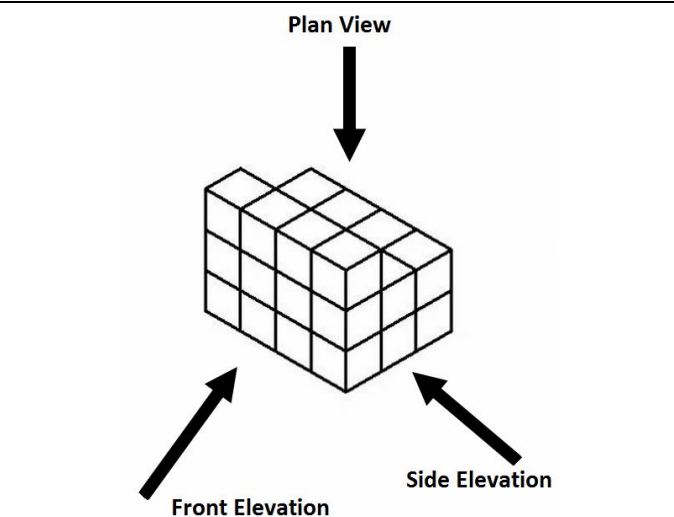
Draw the plan, front and side elevation of the shape using squared paper

---

Find 0.2 of £40

Solve the equation: 3(x-1) = 12

Find the area of shape 1 and as a result find the volume of shape 2.

Shape 1   Shape 2

6cm   6cm   8cm

5cm   5cm

John has a 1 kilogram bar of chocolate. He eats ½ on Monday and 60% of what is left on Tuesday. How many grams does he have at the end of Tuesday?

Mr Jones takes his family to the cinema. There are 2 children and 2 adults. Adult tickets cost £6 and children's tickets cost £4.50. He thinks £20 will cover the bill. Is he correct? You must show your workings and state the amount her needs.

(i) List the factors of 8

(ii) State 3 multiples of 8

(iii) Find 8^2

Increase $30 by 15%

Write an effective questionnaire to find out about how much time people spend on the internet. Write it in your book.

State the value of the 4 in 34675

Jenny earns £7 a week from her part time job. Find how many weeks she will have to save to buy a phone that costs £85. (be careful with your answer)

Round 342.7 to:

(i) 1 significant figure

(ii) 2 significant figures

(iii) The nearest integer.

---

160 people are surveyed about their favourite food: 40 said burgers, 20 said pizza, 30 said Chinese and the rest said Indian. (a) Which is the modal group? (b) How many degrees on a pie chart would the section for burgers be?

All topics CALCULATOR questions 3

Write 0.24 as a fraction in its simplest form.

State all the integers that satisfy the inequality:
$3 < x \leq 6$

Trains run every half an hour. The first one leaves the Station A at 9.00am. The journey the train makes is 1 hour 30 minutes long and finishes at Station B. What is the last train Peter can catch from Station A to ensure he arrives at Station B by 4:15pm?

Calculate: $\dfrac{\sqrt{543} - 3.5}{4.2}$

(i) Write the fully calculator display

(ii) Round your answer to 1 D.P
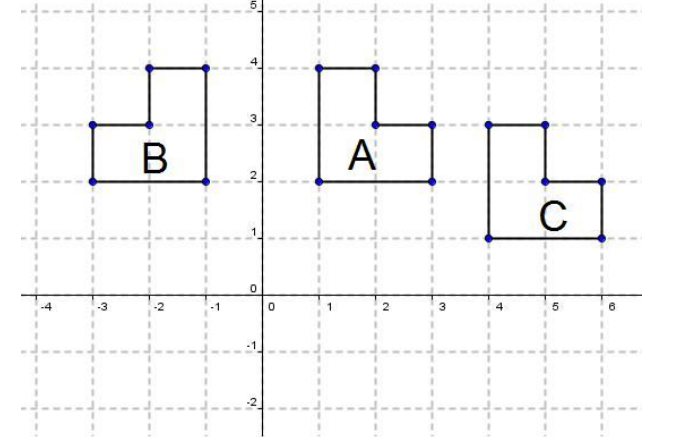
(i) State FULLY (that means fully) the single transformation that takes Shape A to Shape B.

(ii) State FULLY (that means fully) the single transformation that takes Shape A to Shape C.
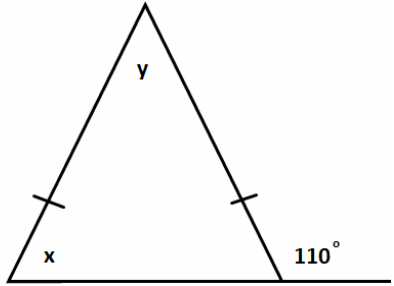
Simplify:
(i) $p + p + p + p$

(ii) $m \times m \times m$

Phil leaves £1000 to his children. There are 3 children. One gets 60% and the other two share the remaining amount. How much does each child get?

Below is a triangle:
(i) Name the triangle

(ii) Find the size of angle x and angle y

ps. When I say name it, I mean 'state the correct name for the triangle' rather than calling it Kevin.

Pat runs 3 miles in 30 minutes. What is her average speed in miles per hour?

Use trial and improvement to find the solution of the equation below to 1 DECIMAL PLACE:
$x^2 - x = 24$

Use the back of this sheet and clearly show all steps of your workings. You are told the answer is between 5 and 6.

1,3,6,8,24,29,36
From the list above find:

(i) A prime number

(ii) A square number

(iii) A multiple of 12

Name a metric **and** an imperial measure for the following:

(1) Height of a man

(2) Weight of a baby

(3) Amount of coke in small glass

Find the nth term for the sequences below:

(a) 3,7,11,15,19

(b) 2,5,8,11,14

Simplify $a + b + 2a - 3b$

A Concert is held each night for 3 nights. On the first night there were 13,543 people. On the second night 16,123 and the final night 14,287. Find the mean number of people who attended the concert each night.

Pavel buys some fencing for his garden. He knows his garden is in the shape of a square. He buys 4 fences that are each 5 meters long to enclose his garden. What is the area of his garden?

There are 12 counters in a bag. 3 are Blue, 2 are Red and the rest are Green. What is the probability of pulling a Green out of the bag?

The temperature in Helsinki is -6°C at 3am. At 1pm the temperature is 9°C.

(i) How many hours passed between the readings

(ii) By how much has the temperature increased?

All topics NON CALCULATOR questions 4
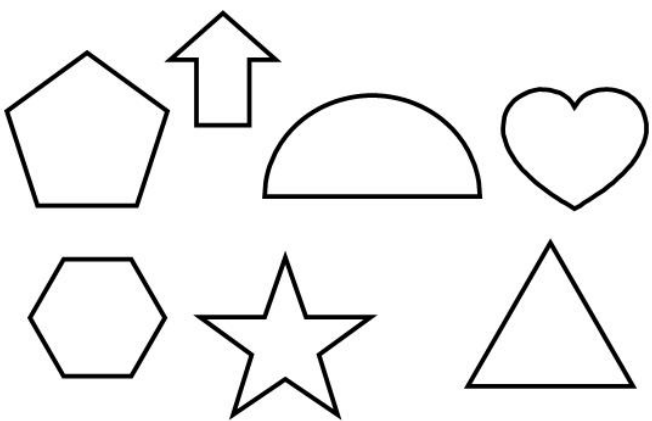
Find the value of $3^3 - 2^3$

Fred buys a new car for £10000. It loses 10% of its value every year. How much is it worth:

(i) After 1 year?

(ii) After 2 years?

Find (i) The surface area and (2) The volume of a cube with side length 5cm. (A sketch may help)
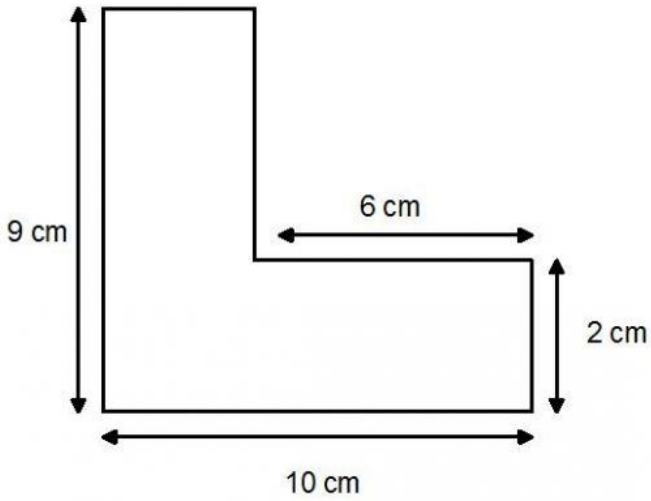
(i) Draw the Lines of Symmetry on the following shapes:

(ii) State which shape has rotational order symmetry of 3.
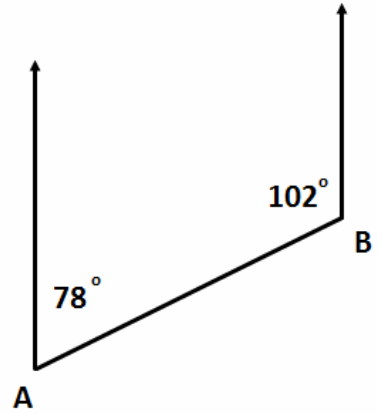
Solve the equation $3x - 1 = -10$

(a) Find the Area **and** Perimeter of the shape below (its not drawn to scale):

9 cm

6 cm

2 cm

10 cm

(b) One side is 1/3 the length of another. Mark the two sides with an x

$2 - 3 \times 1 =$

State:
(1) The bearing of B from A
(2) The bearing of A from B.

102°

B

78°

A

Tim buys a Laptop on finance. The laptop costs £380. He pays a £20 deposit and then pays the rest monthly over a one year period. Each monthly payment is equal. How much does he pay monthly?

Jeff spends the day playing scrabble. The probability that Jeff wins a game of scrabble is 0.4.

(i) What is the probability he doesn't win a game?

(ii) If he plays 100 games how many would you expect him to win?

Decrease 20 by 15%

Write 0.21 as a percentage

(a) -2 x -4   (b) 2- -3   (c) -3 + 5

Pool tables cost a £5 fixed charge to hire and £2 per game.

(a) Write a formula for the cost 'C' of playing 'G' games.

(b) Find the cost for playing 6 games.

(c) Find the number of games played if the bill was £27.

Peter travels 30km in 4 hours. Find his average speed.

Jane thinks of a number, She adds 4 and then multiplies her answer by 3. Her answer is 45. What number was she thinking about?

(i) Write 4 features of an effective question.

(ii) In your book, write design an effective questionnaire to find out what people eat for breakfast.
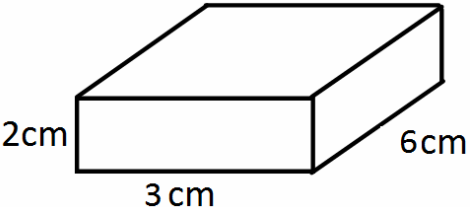
All topics CALCULATOR questions 5

Expand and simplify 5(2x-3)

Using your calculator, find 77% of £34.62. Round your answer to the nearest penny.

Write down the reciprocal of 5

Sketch the net of the cuboid (with the lengths)

2cm
6cm
3 cm

Answer the following questions using the bus timetable shown below:

(a) Fred leaves work at 2pm in Kings Lynn. He catches the next possible bus. What time will he arrive home in Peterborough?
(b) This timetable is for one day. If the bus runs 6 days a week how many busses will run altogether in a one week period?

Kings Lynn,Bus Station	750	850	950	1050	1150	1250	1350	1450	1550	1650
Terrington St John,Bus Shelter	805	905	1005	1105	1205	1305	1405	1505	1605	1705
Walton Highway,Highwayman	810	910	1010	1110	1210	1310	1410	1510	1610	1710
Wisbech,Bus Station	822	922	1022	1122	1222	1322	1422	1522	1622	1722
Guyhirn,Little Chef	832	932	1032	1132	1232	1332	1432	1532	1632	1732
Thorney,opp.Fish and Chip Shop	843	943	1043	1143	1243	1343	1443	1543	1643	1743
Peterborough, Bus Station	901	1001	1101	1201	1301	1401	1501	1601	1701	1801

Find the cube of 3.

It takes 2 people 8 days to paint a wall. Find how long it would take:
(a) 1 person

(b) 4 people.

Add together the first 4 prime numbers.

Solve the equation 3x – 1 = 2x + 11

Mikes cat eats ¼ of a tin of cat food twice a day. Mike leaves the cat at home for a week. How many tins of cat food should he buy to ensure the cat has enough food for the week? (someone will be feeding the cat)

Use your calculator to find the value of $5^3 - \sqrt{34}$
(i) Write the full calculator display
(ii) Round your answer to one decimal place

Find the mean of the following numbers:
3.2, 5.6, 5.2, 12.7, 8.6

Sue has £287.77 to last her a week. Find how much she will be able to spend on average each day.

Find the LCM (lowest common multiple) of 5 and 7

On a map the scale is 1:100. The distance between two points on a map is 4.5cm. What is the actual distance?

Divide 18 biscuits in a ratio of 6:2:1

Using your calculator find the square root of 27. Round your answer to the nearest integer.

A swimming pool is open for 5.5 hours a day, 6 days a week. How many hours in total is the swimming pool open in one week?

Kelly bought 3 of the same chocolate bar from a shop. She paid with a £10 note and received £7:24 change. How much does each chocolate bar cost?

Use Pythagoras theorem to find the missing lengths of the triangles below:
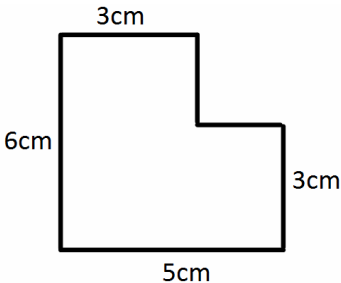

10cm
8cm
y
3m
4m
x

www.m4ths.com
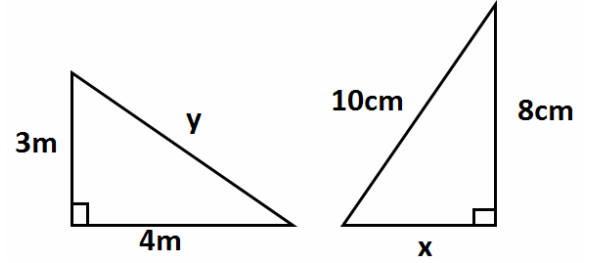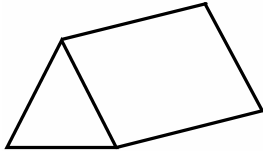
Initial GCSE Foundation test

A quick test to establish where pupils are with their foundation knowledge.

Find the nth term formula for the following sequence: 5,8,11,14,17	
Share £70 in a ratio of 1:1:2:3	
Find the HCF and LCM of 16 and 24	HCF= LCM=
The line AB has the point A (3,5) and B (5,1) at either end. Find the midpoint of the line	
Solve 2x + 3 = 4x – 7	
Write 31/50 as a percentage	
Write 34% as a decimal	
Add ½ and ¼	
Find the median of the following numbers: 3,5,6,1,2,9,7,8,1,4	
State the size of the exterior angle of a regular hexagon	
Taking pi to be 3 find the area of a circle with a radius of 4cm	
Expand (x+2)(x+3)	
Factorise 5x – 10	
Find 15% of £150	
Jane travels at 30mph for 3.5 hours. How far did she travel?	
Work out 224/7 (224 divided by 7)	
6 bananas cost £2.10. Find out the cost of 4 bananas	
Write the reciprocal of 4	
Find the next number in the number pattern 1,8,27,64	
Simplify 3p – 2q + p + 5q	

Score_____/20

Mini Exam 1 (Non Calculator) – 45 minutes
You must show workings to gain full marks

Q1	(a) Find the HCF (highest common factor) of 8 and 12 (b) Find the LCM (Lowest common multiple) of 8 and 12	a(1 mark) b(1 mark)

Q2	A bias spinner has 4 sections. Red, Blue, Green and Black. The probability of landing on a red is 0.2 (a) What is the probability of not landing on a red? (b) If 100 spins are carried out, how many would you expect to land on red?	a(1 mark) b(2 marks)

Q3	Find the answers to (a) 2 + 3 x 7 = (b) 2(3+2) =	a(1 mark) b(2 marks)

Q4 — Find:
(a) The area and

(b) The perimeter of the shape below giving your answer in the correct units.
a(3 marks)
b(3 marks)

3cm
6cm
3cm
5cm

Q5 — A shape has been translated by (2,3). Explain fully what this means. (2 marks)

Q6 — Jim buys 2 bars of chocolate for 40p each and 1 can of drink for 58p. He pays with a £2 coin. What is the least number of coins he can receive in his change and what are they? (3 marks)

Q7 — (a) Name the shape shown

(b) State the number of:
(i) vertices
(ii) faces
(iii) edges
a(1 mark)
b(3 marks)

Q8 — Find the difference between the median and the mode of the following numbers:
4,6,2,3,7,3,1,7,3,2,15,7 (4 marks)

Q9 — 8 bananas cost £3.20. How much would it cost to buy 13? (3 marks)

Q10 — You are told 256 x 198 = 50688. Find the value of:

(a) 256 x 19.8

(b) 2.56 x 198

(c) 50688 ÷ 19.8 (50688 divided by 19.8)
a(1 mark)
b(1 mark)
c(2 marks)

Q11 — Solve the following equation:
2(x+1) = 18 (3 marks)

Q12 — 100 pupils attend a local school. The table below shows information about the students.

	Right Handed	Left Handed	Total
Boys	34		64
Girls			
Total		42	

(a) Complete the two way table

(b) find the probability that if a pupil is chosen at random they are (i) a boy (ii) a left handed girl
a(4 marks)
b(i)(1 mark)
(ii)(1 mark)

Q13 — Find 15% of £60 (2 marks)

Mini Exam 2 (Non Calculator) – 45 minutes
You must show workings to gain full marks

Q1	Express 56 as a product of prime factors	(2 marks)
Q2	Each scale measures the mass of objects in kg from 0 to 1kg . **Estimate**, in grams, the difference between the two readings. Show all workings.	(3 marks)
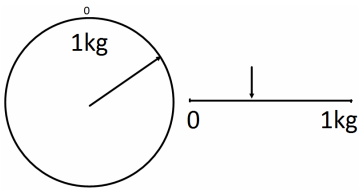
Q3	Simplify the following: (a) p x p x p x p x p (b) h + h + h + h (c) k² x k³ x k² (d) x(2x-8)	a (1 mark) b (1 mark) c (1 mark) d (2 marks)
Q4	Fred carried out a survey to find where students at his school preferred to do their homework. The pie chart below shows the results. Fred knew 40 people said they liked to do their homework at school, 23 said the library but he forgot how many said they preferred to work at home.	i(4marks) ii(1 marks) iii(1 marks)

(i) Find the **exact number** of pupils who preferred to work at home showing your full workings.

(ii) Find the probability that if a pupil is chosen at random from the study they chose "school" as their answer.
(iii) State the % of students who didn't chose "school" as their answer.

Q5	Put these decimals in ascending order: 0.201, 2.0220, 1.2011, 0.2221, 2.102	(2 marks)
Q6	State 3 integers that satisfy each inequality below: (i) x > 4 (ii) x ≤ 3 (iii) -5 < x ≤ 0	i (1 mark) ii (1 mark) iii (1 mark)
Q7	The diagram below shows a closed top box (cuboid) where the dimensions are given in cm as 5cm, 4cm and 2cm.	a(3 marks) b(3 marks)

(a) Sketch a net of the cuboid showing all dimensions

(b) Find the surface area of the cuboid (state clearly the units used).

Q8	The table below shows the distances between 4 different towns (measured in kilometres)	a(2 marks) b(2 marks) c(3 marks)

	Town A	Town B	Town C	Town D
Town A	x	13	6	14
Town B	13	x	14	18
Town C	6	14	x	25
Town D	14	18	25	x
Town E	22	10	4	7

Using the table:
(a) Find the two towns furthest away from each other and state

the distance between them.
(b) Find the length of the journey from Town A **to** Town D **via** Town B.
(c) A high speed train takes 20 minutes to travel from Town C to Town D. What is the average speed of the train? (state the units used)

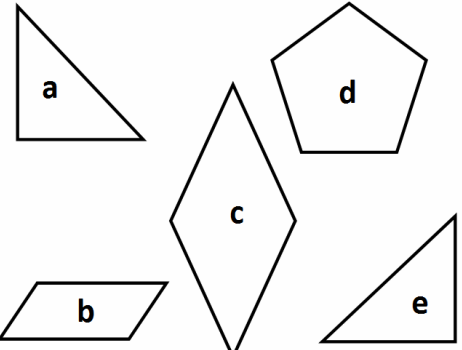| Q9	T shirts normally cost £60. In a sale they have 1/5ᵗʰ knocked off the original price. What is the new price of the T shirt?	(2 marks)
Q10	From the diagram below (a) Find the size of angle x and (b) state the reason for your choice. (c) Find the size of the angle y and (d) state the reason for your choice.	a(1 mark) b(1 mark) c(1 marks) d(1 marks)

Q11	When rotating a shape, state the 3 pieces of information you must show in your answer.	(3 marks)
Q12	Fred saves £2.01 a month for 3 years. How much does he have in total after 3 years?	(2 marks)

Mini Exam 3 (Calculator) – 45 minutes
You must show workings to gain full marks

| Q1 | Given a= 2 and b= -3 find:
  (i) 2b
  (ii) b² - a
  (iii) -b - 3 | (1 mark)
(2 mark)
(1 mark) |

Q1 Given a= 2 and b= -3 find:
(i) 2b
(ii) $b^2 - a$
(iii) $-b - 3$
(1 mark)
(2 mark)
(1 mark)

Q2 Find 27% of £143. Give your answer in pounds (£) and pence.
(3 marks)

Q3 Study the shapes below:
a (2 mark)
b (1 mark)
c (1 mark)
d (1 mark)

(a) Which two shapes are congruent?

(b) Name shape b

Given shape d is regular
(c) Name shape d

(d) State the order of rotational symmetry of shape d

Q4
$$\frac{\sqrt{274}}{5}$$
a(1 mark)
b(1 mark)
c(1 mark)

(a) Use your calculator to find the value of the number above. Write the <u>full</u> calculator display down.

(b) Round the answer on your calculator to one decimal place.

(c) Round the answer on your calculator to one significant figure.

Q4 A professional football team record the attendances of their home games for a 5 week period one season. They were:
15'320, 9'829, 13'391, 6'399 and 12'705
a(3marks)
b(2 marks)

(a)Find the mean number of supporters attending a game, giving your answer to the nearest whole person.

(b)Find the range in the number of supporters who attended games for the 5 week period.

Q5 Solve the equation:
(4 marks)

$3x - 7 = x + 3$
You must show full workings

Q6 Here is a list of numbers: 1, 8, 16, 23, 30. From the list, state:
a (1 mark)
b(1 mark)
c (1 mark)

(a) A cube number

(b) A prime number

(c) A multiple of 6

Q7 The local bus time table is shown for one specific route. The bus covers the route twice a day once leaving at 7:00 and then at 8:30.
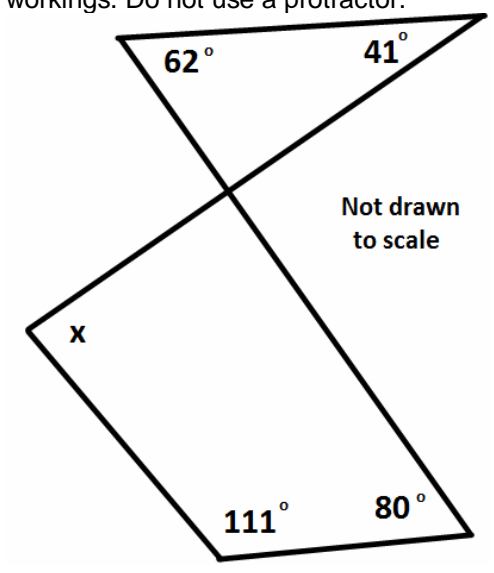(3 marks)

(i) The expected speed of the bus for both journeys is the same. Find the two missing values from the table below.
(3 marks)

	Depart	Depart
Bus station	7:00	8:30
New Town	7:12	8:42
Old Town		9:08
East Town		9:22
West Town	8:16	9:46

(ii) Adult tickets cost £1.20 and child tickets cost 80p for the entire journey. Find the cost of 2 adult tickets & 3 child tickets.

Q8 There are 60 minutes in a lesson, 5 lessons a day and 5 days in a school week. Given there are 38 school weeks a year, calculate the number of minutes in total that are spent in lessons by any pupil.
(3 marks)

Q9 Find the size of angle x. You must workings. Do not use a protractor.
(4 marks)

Not drawn to scale

Q10 Use trial and improvement to find the answer to x² - 2x = 32
The answer is between 6 and 7.
You must show full workings.
(5 marks)

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Help sheet

This help sheet is designed to give a rough overview of basic topics in school maths.
Some of the techniques are watered down in an attempt to make them accessible and to some extent lack mathematic rigour.
The sheet was first designed to enable pupils who were aiming for a C Grade at GCSE maths to have a one stop sheet to help them.
If you are taking your maths on beyond this level you may wish to look at more formal definitions and approaches to ensure a good base to take forward.

Number

Topic/Skill	Tips	Example
Adding Fractions	The denominators must be the same. When they are just add the numerators. You can use equivalent fractions to find the common denominator.	1/3 + 1/4 = 4/12 + 3/12 = 7/12 1/5+ 2/3= 3/15 + 10/15 =13/15
Subtracting Fractions	The denominators must be the same (as with addition). When it is just subtract the numerators.	4/7 - ½ = 8/14 - 7/14 = 1/14 1/3 -1/5 = 5/15 – 3/15 = 2/15
Multiplying Fractions	Multiply the numerators, multiply the denominators and simplify if possible. Top times top, bottom times bottom.	2/7 x 3/5 = 6/35 4/5 x 3/4 = 12/20 or 3/5
Dividing fractions	TNT, turn and times. Turn the second fraction upside-down and multiply as shown in the method above for multiplying.	1/4 ÷ 3/5 is the same as 1/4 x 5/3 Now just use the method above and simplify.
Finding a fraction of a quantity	Divide by the bottom, times by the top. If you need 3/8 of a number, divide by 8 and then multiply by 3.	2/5 of £60 £60 ÷ 5 = £12 2 x 12 = £24
Ordering fractions	Get a common denominator and find equivalent fractions. At this point see which has the largest numerator when you list them out. 9 times out of 10 the denominator you want is in the question!	1/2, 2/3, 5/6 and 7/12 All of these can be made into 12th s. 6/12, 8/12, 10/12 and 7/12. Now just put them in order of size. Make sure you answer using the original values.
Finding 10%,5%,1% of a quantity	To find 10% just divide the original number by 10, to find 1% divide it by 10 again. 5% is half of 10%	£36 10% = £3.60 5% = £1.80 and 1% = £0.36 or 36p
Increase/decrease a number by a %	Find the % required and add it on (increase) or take it off (decrease)	Increase £30 by 10% 10% = £3 so 30+3 = £33
HCF (Highest Common Factor)	The largest number that goes into 2 different numbers. List the factors of the smaller number and see which is the largest one which will go into the 2nd number.	"Find the HCF of 8 and 28" Factors of 8 = 1,2,4 and 8 Factors of 28 = 1,2,4,7,14 and 28 Largest number in both = 4
LCM (Lowest Common Multiple)	The lowest number 2 different numbers will both go in to. Just list out the times tables of each and see which is the smallest number that appears in both lists.	LCM of 4 and 6 4TTs = 4,8,**12**,16,20,24,28 6TTs = 6,**12**,18,24,30,36 first number they both go in to = 12 = LCM
Fractions to decimals	Some are obvious such as ¾ is 0.75 For those that are not simply divide the numerator by the denominator.	Some others to note: 1/8 = 0.125 3/10 = 0.3 7/100 = 0.07 43/100 = 0.43
Decimals to fractions	Some are obvious 0.1 = 1/10 If not obvious write it over 10, 100 or 1000 and simplify.	0.7 = 7/10 0.23 = 23/100 0.46 = 46/100 or 23/50
Percent to decimals	Simply divide by 100 and vice versa when converting decimals to percents.	0.23 x 100 = 23% 47% ÷ 100 – 0.47
Fractions to percentages	Percentage is just a fraction out of 100	2/25 multiply by 4 = 8/100 or 8%
Rounding to 1 DP	If the number after the decimal place is 5 or more, round up. If 4 or less keep the value the same.	2.43 = 2.4 (3 is less than 5) 5.67 = 5.7 (7 is more than 5) 1.09 = 1.1 (9 is more than 5)
Rounding to 1 SF	When reading a number from left to right the 1st value that is not 0 is the 1st significant figure. Round like decimals.	243 to 1 SF = 200 5.6 to 1 SF = 6 47 to 1 SF = 50
A square number	A number multiplied by itself – NOT 2 times a number. 1,4,9,16,25,36…..	3² = 3 x 3 = 9 (and NOT 6) 5² = 5 x 5 = 25 (NOT 10)
Square root	This is the reverse of squaring a number.	6² = 36 so √36 = 6 9² = 81 so √81 = 9
A cube number	A number multiplied by itself twice (The cube root is the inverse).	4³= 4x4x4 = 64 (NOT 12) …….2³ = 8 (NOT 6)
Multiplying and dividing negative numbers	If the signs are the same the answer is positive, if they are different the answer is negative.	-2 x 4 = -8 -3 x -5 = 15 3 ÷ -3 = -1 -16 ÷ -4 = 4
Adding and subtracting negative numbers	If the signs between the numbers are the same then add, if not subtract.	2 – 4 = -2 3 - - 5 = 8 -2 + - 5 = -7 -4 - - 5 = 1
Ratio	Simplify them like fractions	A ratio of 5:10 is = 1:2
Ratio Sharing	Add the total parts. A ratio of 4:2:1 has 7 parts (not 3) Divide the amount to be shared	£60 in a 3:2:1 ratio 6 total parts so £60 divided by 6 = £10. Each part is

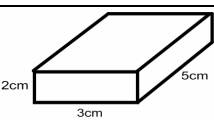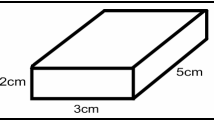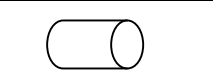|	Multiply by each part (making sure you use the correct units (£s here))	worth £10 3 x £10 = £30 2 x £10 = £20 1 x £10 = £10
Proportion	Find out the value of one item and then multiply it by the number you need.	3 cakes need 450g of sugar. Find how much sugar 5 cakes needs. 450 ÷ 3 = 150g per cake. Now multiply this by 5 to give 750g needed for 5 cakes.
Estimations and approximations	Round to one significant figure and estimate. Find the answers to the ones on the right.	98 x 51.2 becomes 100 x 50 4.6 + 104.7 becomes 5+100
BODMAS (order of operations)	Brackets first, then powers. Multiplication or division THEN finally any addition or subtraction left to do.	3 + 4 x 2 = 11 (do the multiplication first) **Another one** 3 + (4+ 1)² Brackets first (5) ² = 25 and then add 3 = 28
Multiplying decimals	Count the total digits after the decimal place. Get rid of the decimals and multiply the two numbers. However many digits you started with after the decimals is the number you finish with.	0.4 x 0.2 (2 digits after the decimals in total) 4 x 2 = 8 so my answer is 0.08 as I need to finish with 2 digits after the decimals. 0.3 x 0.15 = 0.045
Integer	Whole number	1,4 & 2 are integers ½ is not
Reciprocal	The reciprocal is 1/the number	The reciprocal of 5 is 1/5

Algebra

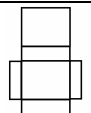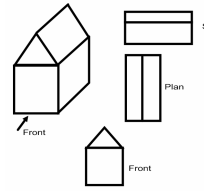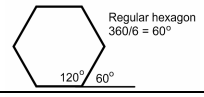| Topic/Skill	Tips	Example
Simplifying expressions	Just collect the 'like terms' such as all the x's, all the y's and any numbers.	2x + 3y – 3 –y + 2x + 9 becomes 4x + 2y + 36
Solving equations	When there is an unknown on one side simply undo the equation be using the inverse operations. If one side has +2 you need to subtract it. Id it had -3 add it.	3x -2 = 13 (add 2 to 13) 3x = 15 (divide by 3) x = 5 **OR** 4x + 3 = 19 (minus 3 from 19) 4x = 16 (divide by 4) x = 4
Equations	x/2 = 4 etc just multiply 4 by 2 so x = 8	p/5 = 6 then p = 5x6 so p = 30
Equations with an unknown on both sides	Get the x's on one side and the numbers on the other. Use either the balance method or change sides change signs.	2x – 1 = x + 4 take an x off both sides x – 1 = 4 add 1 to both sides x = 5
Factoring	HCF of letters and numbers outside, the rest inside. Expand to check if its right when you finish.	6x – 3 becomes 3(2x-1) 15x + 10 becomes 5(x+2) 4x² - 6x becomes 2x(2x-3)
Expanding	Single brackets – multiply everything on the outside by the inside – careful with negative signs!	5(3x+2) 15x+10 **OR** 2x(3x-4) 6x² - 8x
Expanding double brackets	(x+3)(x+2) Multiply each term by one another using F.O.I.L and then simplify. First, Outer, Inner, Last (Be careful with negatives)	(x+2)(x+3) x times x = **x²** 2 times x is **2x**, 3 times x is **3x** and finally 2 times 3 = **6** Now simplify by collecting up: x² + 5x + 6
Inequalities	2 < x "x is bigger than 2" so 3,4, etc x < 3 "x is less than 3" so 2,1,0, -1 etc x ≤ 5 "x is 5 or less" so 5,4,2,,0,-1 etc 4 ≤ x "x is 4 or more" so 4,6,10 etc	You may have to show these on a number line. If so use an open dot ○ for < and a closed dot ● for ≤
Powers	When multiplying numbers with powers you just add the powers. When dividing you subtract to powers. Careful with 'p' when here is no power (the power is 1)	$$p^5 \times p^3 = p^8$$ $$p^7 \div p^4 = p^3$$
x times x	The answer is x² and not 2x	
p + p + p	This 3p not p³	
m x m x m	This is m³ and not 3m	
Sequences	Look out for (i) A common difference (is it going up or down by 2 or 3 each time?) (ii) Square numbers 1,4,9,16,25… (iii) Cube numbers 1,8,27,64…	Rules such as "Add 2 each time" or "Square numbers" If asked for the 'nth term sequence' use the method below.
Nth term formula of a sequence	Find the difference. Multiply that by n and see what you need to add to find t The example is going up by 4 each time. 4 x 1 = 4 so we need to subtract 1 to get 3. the nth term is 4n -1	3,7,11,15 <table><tr><td>n</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>t</td><td>3</td><td>7</td><td>11</td><td>15</td></tr></table>
Formulae	If you get a formula solve it like an equation. Just put the information into the formula to find the missing value.	"bob charges £3 per window and a £5 call out charge" C = 3x + 5 with x being the
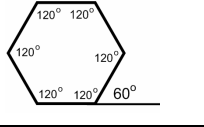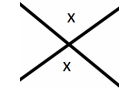
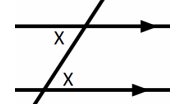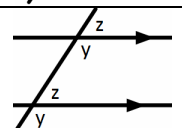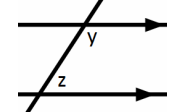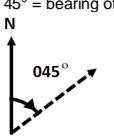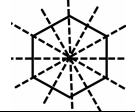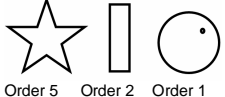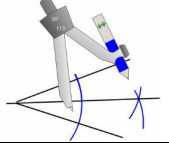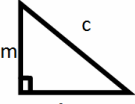| Topic/Skill	Tips	Example
	The example to the right could have x = 4 so C = 3(4) + 5 which is £17	number of windows cleaned and C being the cost.
Substituting into a formulae	Just follow the rules and put the numbers in. Be careful on the order if x = 3 and you need 2x² square 3 first and then multiply by 2	a = 3, b = 2 and c = 5 Find: (i)2a which is just 2(3) = 6 (ii) 3a – 2b so 3(3) – 2(2) = 5 (iii) b² - 5 which is (2)² - 5 = -1
Plotting straight line graphs	Just fill out the table using substitution as above y = 2x + 1 x | 0 | 1 | 2 | 3 y | Complete the table in the exam with the information from the box on the right.	When x = 0 y = 2(0) + 1 = 1 When x = 1 y = 2(1) + 1 = 3 When x = 2 y = 2(2) + 1 = 5 When x = 3 y = 2(3) + 1 = 7 Now just plot (0,1) (1,3) (2,5) and (3,7) and draw a straight line through the points.
Midpoint of a line	Add the x coordinates and divide by 2, add y coordinates and divide by 2	Find the midpoint of a line through 1,2 and 5,8 (1+5)/2, (2+8)/2 = 3,5

Statistics/Handling Data

Topic/Skill	Tips	Example
Mean (simple average)	Add the values up, divide by how many values there are. Find the mean of 3,4,7,6,4,6	$\frac{3+4+7+6+4+6}{6} = 5$
Median	Middle number. Put them in order and find the middle one. If there are two find half way between the two numbers.	4,5,2,3,6,7,6 in order 2,3,4,5,6,6,7 Median = 5
Mode or Modal	The number that appear most times in a list (there can be more than one mode)	4,5,2,3,6,4,7,8,4,5 Mode = 4
Range	Highest take lowest. Find the smallest value and subtract it from the largest.	3,15,26,37,97 range = 94
Pie Charts	A pie chart is a circle which means there are 360°. Look out for right angles as they show ¼ of the data.	If there are 40 people in a survey then each person will be worth 9° of the pie chart as 360/40 = 9
Simple Probability (Theoretical)	The number of things you want to happen divided by the number of things that could happen. 1 Head on a coin, two sides so the probability of head = ½	Probability of rolling a 4 on a fair 6 sided die is 1/6 There is one 4 and 6 different things it can be
Relative frequency	Just multiply the probability by the number of trials. It's often called experimental probability.	The probability of a football team wins a game is 1/5. How many games will they win out of 40? 1/5 x 40 = 8
Stem and Leaf diagrams	Arrange the data in ascending order (smallest to largest). Pick a stem, usually 10's, and then add the leaves in order of size. Include a key! For example 3|4 = 34 Example 9,12,13,13,18,23,27,34	0|9 1|2,3,3,8 2|3,7 3|4 Key 1|8 = 18 (3 appears twice!)
Questionnaires	How many times do you visit the cinema on average per month? 0 □ 1-2 □ 3-4 □ 5 or more □	Features: (i) Include other and none (ii) Time frame (iii) no overlapping answers (iv) not subjective

Shape, Space and Measures

Topic/Skill	Tips	Example
Area of rectangle	Multiply the two side lengths. Answer should be cm², m² etc etc	Area is the space trapped inside a shape
Perimeter (rectangle)	Add ALL side lengths and the answer should be cm, m,km etc and NOT cm²	"walk around the outside of the shape"
Area of a triangle	Multiply the base by the height and half your answer. Answer in cm², m² etc etc	
Circles	Area = πr^2 (answers in cm² etc) Circumference = $2\pi r$ (cm, mm etc)	Area = space inside Circumference = distance around the outside. r = radius Note: r² is just r x r
Volume of a cuboid	Length x width x height. Your answer will be cm³,m³,km³ etc…anything 'cubed' In this example it would be 2 x 3 x 5 = 30cm³ Volume is always 'cubed'	2cm 5cm 3cm
Surface area of a cuboid	Find the area of each panel and add them. Drawing a net may help OR you can see there will be 3 different size panels. Find the area of each one and add two lots of each together. Area is always 'squared'	2cm 5cm 3cm
Volume of a cylinder	Find the area of the circle on the end and multiply it by the height of the cylinder. Answer will be in something cubed such as cm³	

Sketching the net of a cuboid	Just think what the box would look like if you unfolded it – don't forget the lid. Your dimensions should be accurate. This should only ever be a 2D drawing.	
Solids	Faces = think faces of dice, edges = side lengths & vertices = corners	A Cube has 6 faces, 8 vertices and 12 edges
Angles in a polygons	Angles in triangles = 180° angles in quadrilaterals = 360°	Quadrilateral is a 4 sided shape (square rectangle etc)
Angle facts	On a straight line = 180° and angles around a point = 360°	
Angle Types	Acute, less than 90°, Obtuse, 90° to 180° & Reflex angles greater than 180°	
Plans and Elevation	Plan View is from the top (birds eye view) Side and Front elevations will be stated. All drawings must be 2D and not 3D. Shown to the right is the 3d drawing with an arrow pointing to the front elevation. The top right is the side elevation. The middle is the plan view and the bottom is the front view. Use a ruler and pencil and make sure you use the correct measurements.	
Types of triangles	Right Angle Triangles have a 90° angle. Isosceles triangles have 2 equal sides and 2 equal base angle Equilateral triangles have 3 equal sides and 3 equal angles (60° each).	
Exterior angles of a regular polygon	For regular polygons divide 360 by the number of sides. The picture shows a regular hexagon which has 6 sides. 360/6 = 60 which means the exterior angle is 60°	Regular hexagon 360/6 = 60° 120° 60°
Interior angles of regular a polygon	Find the exterior, draw a straight line and subtract the exterior angle from 180°. For the sum just add the interior angles. Pictured to the right is a regular Hexagon. Each interior angle is 120° (we know the exterior angle is 60° from above)	120° 120° 120° 120° 120° 120° 60°
Opposite angles	Opposite angles are equal. x = x Remember also that angles on a straight line = 180°	x x
Alternate angles	Alternate angles, or Z angles are equal.	X X
Corresponding Angles	Corresponding angles or F angles are also the same y = y and z = z (y and z are not equal though).	z y z y
Co-interior Angles	Co-interior angles of C angles = 180° y + z = 180°	y z
Bearings	3 rules = (i) Measure from North (ii) Measure clockwise (iii) Your answer must have 3 digits When finding the bearing of B from A we measure from A. Draw your north line at A. Draw a line from A to B and measure clockwise from A to B.	Angle of 45° = bearing of 045° N 045°
Translating a shape	Translate means to move the shape. Top number left/right, right = + & left = - Bottom number up/down, up = + down = - Check the scale of the axis on the exam paper!	$\binom{2}{3}$ $\binom{-5}{-3}$ $\binom{1}{-4}$ $\binom{-6}{2}$ You may be asked to state fully a transformation. So in these cases " A translation by (2,3) is fine for example

Rotations of shapes	State (i) Direction (ii) Angle and (iii) centre of rotations.	Clockwise, 45° about (0,1) USE THE TRACING PAPER!
Reflections	Learn the lines x = 1 y = 3 and so on. Use a mirror if you are unsure	Describe the transformation fully i.e. "reflected in line x=2"
Enlargements of shapes	You will be given a scale factor and centre.	Just make the side lengths twice as big if the scale factor is 2 for example
Line Symmetry	How many mirror lines can you draw on the shape? A Regular Hexagon for example has 6 lines of symmetry. Be careful with patterns within shapes!	
Rotational Symmetry	How many times does the shape fit back on itself when you turn it 360°? Be careful with patterns as they will influence the order of symmetry. (See the last example). Use tracing paper if you need!	Order 5 Order 2 Order 1
Bisecting an angle and loci.	Use a compass and keep it set in one position throughout the bisection. Bisecting an angle is shown to the right. You MUST leave your construction lines. Bisect means 'cut in half' Loci are the set of fixed points and will often include drawing a circle.	
Metric units	Mm,cm,meters and km = length Grams, kg and tonnes = mass/weight ml,cl and litres = volume	Mans height around 1.8-2m Adults weight 70kg Glass of coke is about 250ml
Imperial units	Feet and inches = length/height Lbs and ounces = mass/weight Pints and fluid ounces = volume	Mans height around 6ft Adults weight is around 200lb Glass of coke is a half pint
Speed distance time	Speed = distance ÷ time (divided) Distance = speed x time Time = distance ÷ speed (divided) USE THE CORRECT UNITS!	D S × T
Reading scales	Check the units and check the amount the scale is increasing by each time.	Speed dials, weighing scales and thermometers etc
Pythagoras Theorem for Right Angle Triangles	b c a $a^2 + b^2 = c^2$ a and b are the 2 shorter sides and c is the hypotenuse (longest side) Square the 2 shorter sides, add them and square root the answer. Check the question wants the hypotenuse!	Find the length of 'c' 3cm c 4cm **a = 4, b = 3 c = ?** $a^2 + b^2 = c^2$ $4^2 + 3^2 = c^2$ $16 + 9 = c^2$ $25 = c^2$ $5cm = c$