

order positive and negative integers, decimals and fractions	use the symbols $=$ , $\neq$ , $<$ , $>$ , $\leq$ , $\geq$	apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers	understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals)	recognise and use relationships between inverse operations (e.g. cancellation to simplify calculations and expressions)	use conventional notation for operations, including brackets	use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor and lowest common multiples	use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5	use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate
use their knowledge of the order of operations to carry out calculations involving the four operations	estimate answers; check calculations using approximation and estimation, including answers obtained using technology	use and interpret algebraic notation, including: $ab$ in place of $a \times b$ , $3y$ in place of $3 \times y$ , $a^2$ in place of $a \times a$ , $a^2b$ in place of $a \times a \times a$ , $ab$ in place of $a + b$ .	substitute numerical into formulae and expressions	understand and use the concepts and vocabulary of expressions, equations, formulae and terms	compare and order fractions, including fractions $>1$	simplify and manipulate algebraic expressions by collecting like terms and multiplying a single term over a bracket	understand and use standard mathematical formulae	where appropriate, interpret simple expressions as functions with inputs and outputs
work with coordinates in all four quadrants	understand and use lines parallel to the axes, $y=x$ and $y=-x$	solve linear equations in one unknown algebraically	Generate terms of a sequence from a term-to-term rule	recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions	recognise and use square and cube numbers, simple arithmetic progressions	change freely between related standard units (e.g. time, length, area, volume/capacity, mass) in numerical contexts	express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1	
use ratio notation, including reduction to simplest form	divide a given quantity into two parts in a given part:part or part:whole ratio	define percentage as 'number of parts per hundred'	interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively		express one quantity as a percentage of another	compare two quantities using percentages	solve problems involving percentage change, including percentage increase/decrease	
use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries	use the standard conventions for labelling and referring to the sides and angles of triangles	solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate	draw diagrams from written description	apply the properties of angles at a point, point on a straight line, vertically opposite angles	derive and apply the properties and definitions of: special types of quadrilaterals; including square, rectangle, parallelogram, trapezium, kite and rhombus; and triangles and other plane figures using appropriate language	identify, describe and construct congruent shapes including on coordinate axes, by considering rotation, reflection and translation	solve geometrical problems on coordinate axes	identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres
use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money, etc.)	measure line segments and angles in geometric figures	know and apply formulae to calculate area of triangles, parallelogram, trapezia	calculate perimeters of 2D shapes	know and apply formulae to calculate volume of cuboids	describe translations as 2D vectors	interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data and know their appropriate use	interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range)	

# Stage 7

# Mathematics



1 Sort these numbers into ascending order, from smallest to largest:

a)      2      - 3      - 4.5       $\frac{1}{4}$       - 5      1.5

--	--	--	--	--	--

b)       $\frac{8}{15}$       0.47       $\frac{3}{8}$        $\frac{2}{5}$        $\frac{11}{11}$        $\frac{1}{3}$

--	--	--	--	--	--

(NSC1, 6 marks)

2 Are these statements true (T) or false (F)?

a)  $130 > 249$       .....      c)  $6 \times 5 \neq 5 \times 6$       .....

b)  $5 \times 9 < 50$       .....      d)  $10 \div \frac{1}{2} = 5$       .....

e)  $x$  is a negative number if  $x \leq 0$       .....

f) A condition to round a number,  $x$ , to 140 (to the nearest 10) is  $x \leq 145$       .....

(NSC2, 6 marks)



**3** Calculate

**a)**  $2345 \times 6.7$


**b)**  $2477 \div 25$  to one decimal place


.....

.....

**c)**  $221.67 + 287.4$


**d)**  $322.14 - 74.8$


.....

.....



e)  $3\frac{2}{3} + 2\frac{1}{4} =$

g)  $2\frac{3}{10} \times \frac{2}{5} =$

f)  $4\frac{3}{4} - 1\frac{1}{7} =$

h)  $\frac{3}{10} \div \frac{7}{3} =$

(NSC3, 18 marks)

4 Here are some number cards

6

3

1

5

4

a) Make the smallest possible five-digit number

--	--	--	--	--

b) How many numbers greater than 65 000 can be made?

.....  
(NSC4, 4 marks)



5 Calculate  $0.72 \times 47.5 + 4.75 \times 2.8$

.....  
(NSC5, 3 marks)

6 Calculate:

a)  $2 \times (5 + 4)$

c)  $60 \div 6 - 2 \times 3$

.....

.....

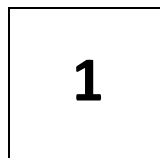
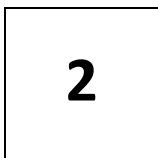
b)  $(12 + 6) \div (6 - 3)$

d)  $60 + 12 \div (12 \div 6)$

.....

.....  
(NSC6, 8 marks)

7 Here are some number cards



a) Choose three different cards to make a three-digit prime number

--	--	--



- b) Choose three different cards to make a three-digit number that is a multiple of 5

--	--	--

- c) Choose three different cards that are common factors of 36 and 42

--	--	--

- d) Choose two different cards to make the lowest common multiple of 3 and 17

--	--

(NSC7, 4 marks)

- 8 Which is the greatest? Place a circle around your choice.

a) 5 squared or  $6^2$

b) 2 cubed or  $3^2$

c)  $3^4$  or  $4^3$

d)  $\sqrt[2]{400}$  or  $\sqrt[3]{1000}$

(NSC8, 4 marks)



9 a) Anne travels for 1.5 hours at an average speed of 40 km/h.

How far does Anne travel?

..... km

b) Sami earns £4.50 per hour.

How many hours does he need to work to earn £90?

..... hours

c) A paddling pool fills at a rate of 3.5 litres per minute.

What will be the capacity of the pool after 15 minutes?

..... litres  
(NMA1, 6 marks)

10 a) Round 73.629 to:

73.629

i) One decimal place: .....

ii) Two decimal places: .....

iii) One significant figure: .....

iv) Two significant figures: .....

(NMA2, 4 marks)



11 Estimate the value of these calculations

a)  $\frac{4532 \times 37}{2.06}$

.....

b)  $886.93 \div 27.32$

.....

c)  $\sqrt{\frac{207.3 \times 1.97}{0.967}}$

.....

(NMA3, 8 marks)





**12 a)** Rewrite these statements using correct algebraic notation:

**i)**  $a \times b = \dots\dots\dots$

**iv)**  $a \times a = \dots\dots\dots$

**ii)**  $4 \times b = \dots\dots\dots$

**v)**  $a + a + a + a = \dots\dots\dots$

**iii)**  $b \times b \times b = \dots\dots\dots$

**vi)**  $4 \times b \times a = \dots\dots\dots$

**b)** Write the expression  $a \div b$  in a different way

.....  
(ANVM1, 7 marks)

**13** Evaluate:

**a)**  $5a + 8$  when  $a = 3$

.....

**b)**  $3b - 20$  when  $b = 5$

.....

**c)**  $A = 3x^2$  when  $x = 4$

.....  
(ANVM2, 4 marks)



14 a) Look at the words here:

<b>Equation</b>	<b>Expression</b>	<b>Formula</b>
-----------------	-------------------	----------------

Choose a word that describes each algebraic statement.

Statement	Description
i) $2a + 4b$	: .....
ii) $3x - 5 = 20$	: .....
iii) $P = 2a + 2b$	: .....
iv) $A = 6x^2$	: .....
v) $6x^2$	: .....
vi) $5(x - 4)$	: .....

b) Look at the words here:

<b>Equation</b>	<b>Expression</b>	<b>Formula</b>	<b>Term</b>
-----------------	-------------------	----------------	-------------

Choose two words to complete this sentence

$4b$  is a ..... in the .....  $5a + 4b$

(ANVM3, 8 marks)



15 a) Simplify:

i)  $5a - 4b - 2a + 6b$

.....

ii)  $7b + 3c - 4 + b - 2c$

.....

b) Multiply out the brackets:

i)  $5(x + 3)$

ii)  $a(a - 3)$

.....

.....

(ANVM4, 8 marks)

16 a) The perimeter of a rectangle can be calculated using the formula

$$P = 2a + 2b$$

where  $a$  is the width of the rectangle and  $b$  is the length of the rectangle.

Using the formula, calculate the perimeter of a rectangle with  $a = 8$  cm and  $b = 13$  cm.

$P = \dots\dots\dots$  cm

b) An estimate of the area of a circle can be found using the formula

$$A = \frac{3d^2}{4}$$

where  $d$  is the diameter of the circle.

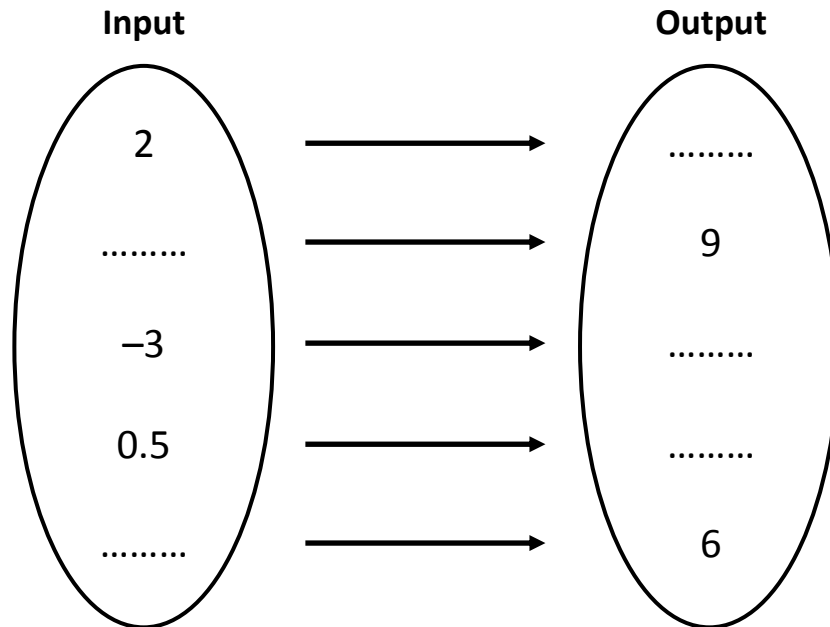
Using the formula, calculate an estimate of the area of a circle with  $d = 2$  cm

$A = \dots\dots\dots$  cm<sup>2</sup>  
(ANVM5, 6 marks)



17 A function machine 'doubles the input and adds six'.

Complete the mapping diagram.

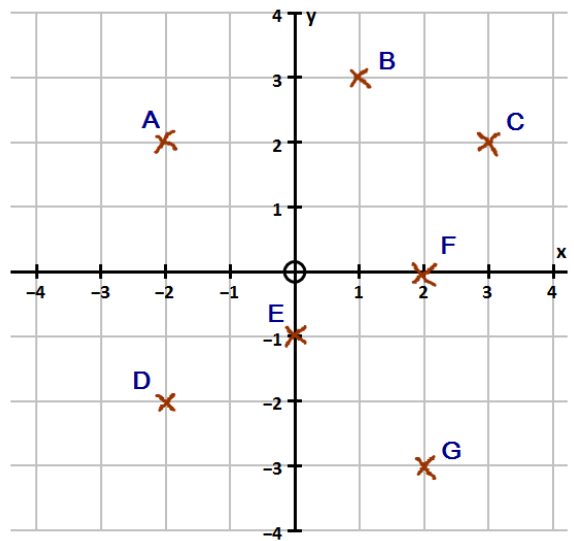


(ANVM6, 3 marks)



18 Are the statements true (T) or false (F)?

- |                 |                 |
|-----------------|-----------------|
| A (2, 2) .....  | E (-1, 0) ..... |
| B (1, 3) .....  | F (0, 3) .....  |
| C (3, -2) ..... | G (-3, 2) ..... |
| D (-2, 2) ..... |                 |



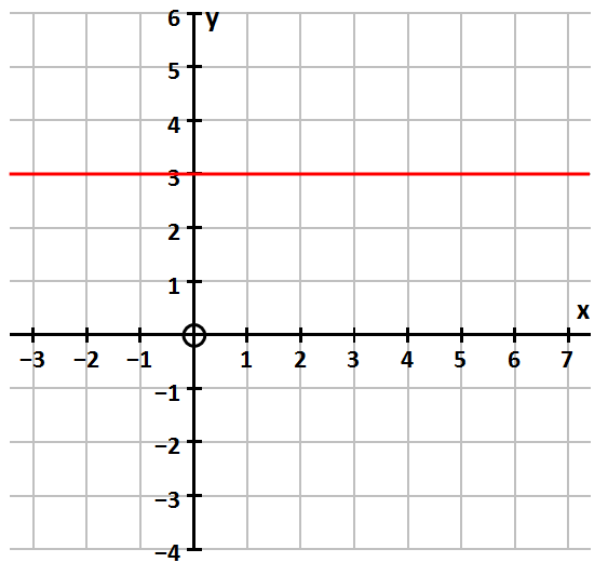
(AG1, 7 marks)

19 Look at this graph.

a) Josh thinks the equation of the line is  $x = 3$ .

Do you agree with Josh?

Explain your answer.



b) On the same axes, draw **and label** the graphs:

i)  $y = -3$

ii)  $y = x$

iii)  $y = -x$

(AG2, 5 marks)



20 Solve:

a)  $4x - 12 = 60$

b)  $50 = 3a + 8$

.....

.....

c)  $5(p + 4) = 75$

d)  $\frac{2b+18}{5} = 20$

.....

.....

(ASE1, 10 marks)



21 Find the next two terms of these sequences:

a) 0, 3, 7, 10, 14, ..... , .....

c) 1, 3, 9, ..... , .....

b) 14, 10, 6, 2, ..... , .....

d) 1, 5, 10, 16, ..... , .....

(AS1, 4 marks)

22 a) Describe the following sequences using the words:

<b>Arithmetic</b>	<b>Triangular</b>	<b>Cube</b>	<b>Square</b>
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Sequence	Description
i) 1, 3, 6, 10, ...	: .....
ii) 1, 4, 9, 16, ...	: .....
iii) 1, 4, 7, 10, ...	: .....
iv) 1, 8, 27, 64, ...	: .....

b) Find the 10<sup>th</sup> term of the sequence:

4, 10, 16, 22, 28, ...

.....  
(AS2, 6 marks)



**23** Are these statements true (T) or false (F)?

- |                      |       |                                  |       |
|----------------------|-------|----------------------------------|-------|
| a) 6.53 km = 653 m   | ..... | d) 654 g = 6.54 kg               | ..... |
| b) 2.54 cm = 25.4 mm | ..... | e) 3.273 litres = 3273 ml        | ..... |
| c) 4320 cm = 43.2 m  | ..... | f) 1 hour 30 minutes = 1.3 hours | ..... |

(RPRC1, 6 marks)

**24** Express 750 grams as a fraction of 2 kilograms

.....  
(RPRC2, 2 marks)

**25** Simplify fully:

- |              |                           |
|--------------|---------------------------|
| a) 8 : 24 =  | d) 50p : £4 =             |
| b) 12 : 20 = | e) 15 minutes : 2 hours = |
| c) 35 : 21 = | f) 50 g : 1 kg =          |

(RPRC3, 6 marks)

**26 a)** John, Jean and Jan share £120 in the ratio 2 : 5 : 3

How much do John, Jean and Jan get?

John: £ ..... Jean: £ ..... Jan: £ .....





- b) Lisa mixes cornflakes and muesli in the ratio 3 : 5. How much muesli is needed to mix with 48 grams of cornflakes?

..... grams  
(RPRC4, 6 marks)

- 27 Complete the statement:

17 per cent means ..... parts per .....

(RPRC5, 1 mark)

- 28 Complete the statements:

- a) 23% of an amount

$$23\% = \frac{\square}{\square} = 0.\square$$

- b) An increase of 70%

$$\square\% = \frac{\square}{\square} = 1.7$$

(RPRC6, 4 marks)

- 29 Express 750 grams as a percentage of 3 kilograms

.....%  
(RPRC7, 2 marks)



**30** Bob scores 34 out of 40 on a test.

Emily scores 48 out of 60 on a test.

Who scored the best mark? Explain your answer.

*(RPRC8, 3 marks)*

**31** Dave buys a car for £12 000 and sells it for £9000.

Calculate his percentage loss.

.....%  
*(RPRC9, 3 marks)*



32 a) Draw or describe an example of:

<b>Point</b>	<b>Line</b>	<b>Vertex</b>
<b>Edge</b>	<b>Plane</b>	<b>Parallel lines</b>
<b>Perpendicular lines</b>	<b>Right angle</b>	<b>Polygon</b>

b) Name a shape with rotational symmetry of order 6

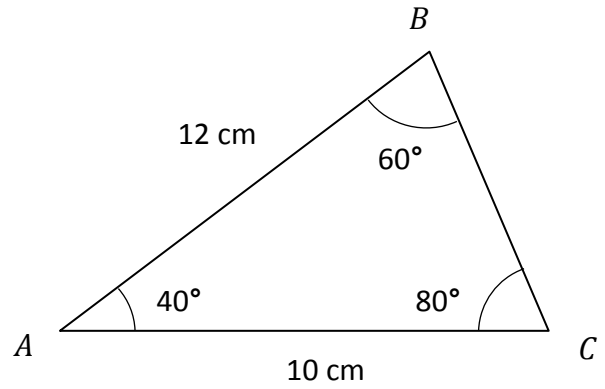
.....  
(GMPC1, 10 marks)



33 Here is a sketch of a triangle.

In the triangle:

$AB = 12 \text{ cm}$   
 $\angle ABC = 60^\circ$



Use the correct notation to complete the statements:

a) ..... = 10 cm

b) ..... = 80°

c) ..... = 40°

(GMPC2, 3 marks)

34 a) Draw an irregular pentagon with sides 4 cm, 3 cm, 2 cm and two other sides.

(GMPC3, 2 marks)



b) Using your diagram:

i) Measure the length of the two other sides (to the nearest millimetre)

Side 1: .....

Side 2: .....

ii) Measure the 5 interior angles (to the nearest degree)

Angle 1: .....°

Angle 2: .....°

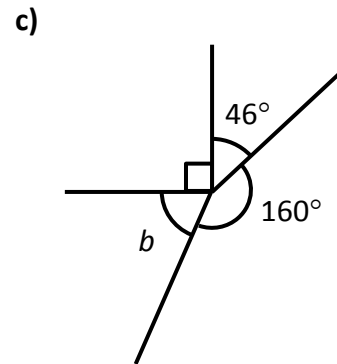
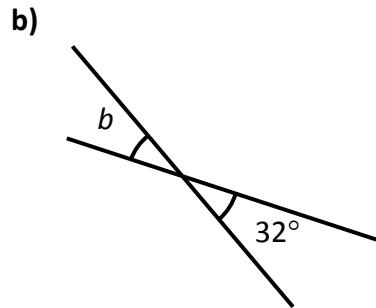
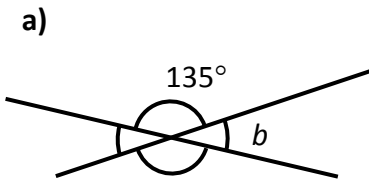
Angle 3: .....°

Angle 4: .....°

Angle 5: .....°

(GMMC2, 7 marks)

35 Find the size of the angle labelled 'b' in these diagrams



.....°

.....°

.....°

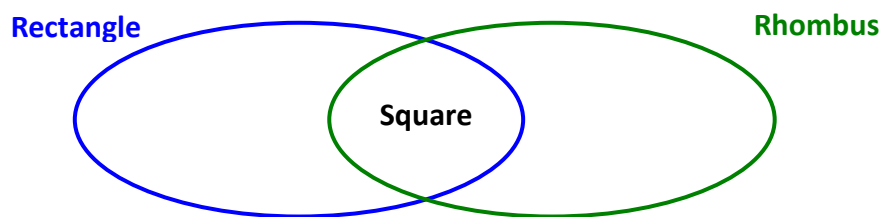
(GMPC4, 5 marks)



36 a) Are the statements always true (A), sometimes true (S) or never true (N)?

- i) A rectangle is a parallelogram .....
- ii) A parallelogram is a rhombus .....
- iii) A trapezium has two pairs of parallel sides .....
- iv) A trapezium has a right angle .....
- v) A right angled triangle is an isosceles triangle .....
- vi) A kite is a parallelogram .....
- vii) A right angled triangle is an equilateral triangle .....

b) Do you agree with the diagram? Explain your answer.



(GMPC5, 9 marks)



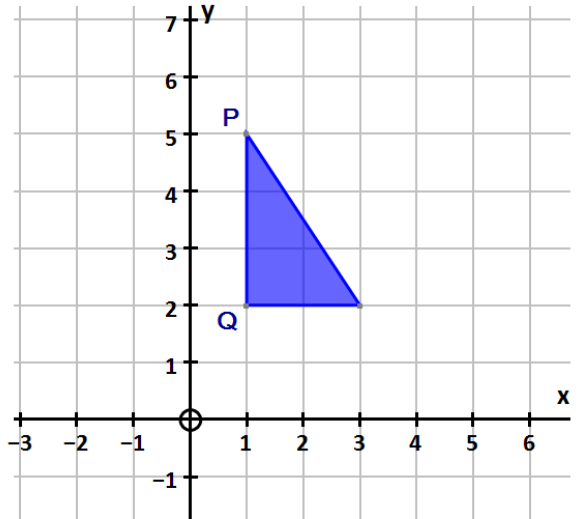
37 Look at the triangle on the grid

a) Matt translates the triangle using the vector

$$\begin{pmatrix} -3 \\ -2 \end{pmatrix}$$

Find the new co-ordinates of **vertex P**.

.....



b) Karen reflects the triangle in the y-axis.

Find the new co-ordinates of **vertex Q**.

.....

c) Charlie rotates the triangle 90° clockwise about the point Q.

Find the new co-ordinates of **vertex P**.

.....  
(GMPC6, 6 marks)

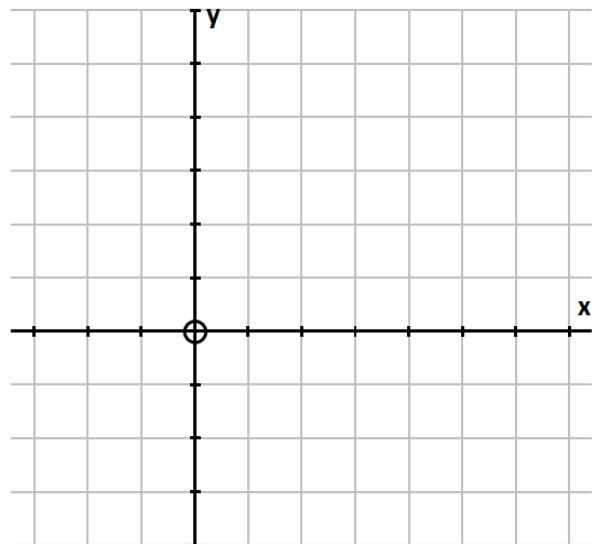
38 Triangle ABC is an isosceles triangle.

Vertex A has co-ordinates (-1, 1)

Vertex B has co-ordinates (2, 1)

Find **two** possible pairs of co-ordinates for vertex C.

..... and .....



(GMPC7, 2 marks)



39 a) Complete the table:

Name of 3-D shape	Number of faces	Number of edges	Number of vertices
Cube			
Triangular prism			
Triangular pyramid			
	7	12	7
	8	18	12

b) Name the **3-D shape** that fits the definition:

i) A 3-dimensional object whose uniform cross-section is a circle.

.....

ii) A 3-dimensional shape consisting of a circular base, a vertex in a different plane, and line segments joining all the points on the circle to the vertex.

.....

iii) A closed surface, in 3-dimensions, consisting of all the points that are a given distance from the centre

.....

(GMPC8, 8 marks)





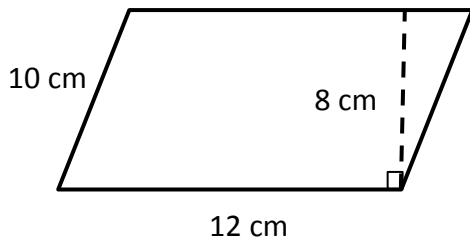
40 Estimate, using an appropriate metric unit where possible:

- a) The height of a two-storey house .....
- b) The mass of an average man .....
- c) The time for professional runners to complete the 100 metre race .....
- d) The capacity of a can of drink .....
- e) The distance between Birmingham and London .....
- f) The mass of a mouse .....
- g) The volume of a cube equal in height to an average adult .....
- h) The time for professional runners to complete a marathon running race .....

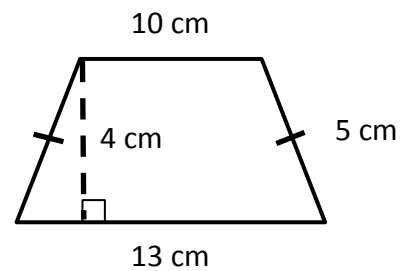
(GMMC1,8 marks)

41 Find the area of these shapes

a)



b)

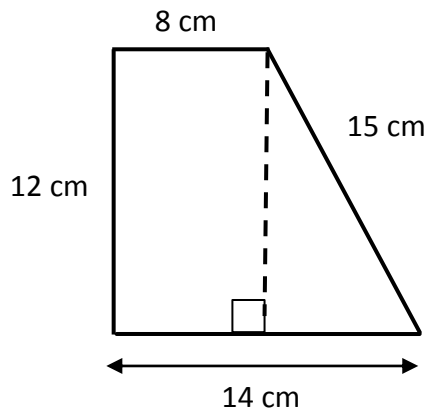


..... cm<sup>2</sup>

..... cm<sup>2</sup>

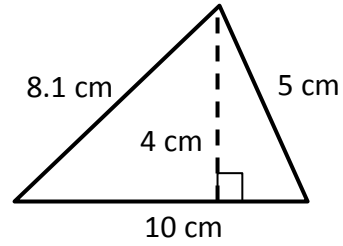


c)



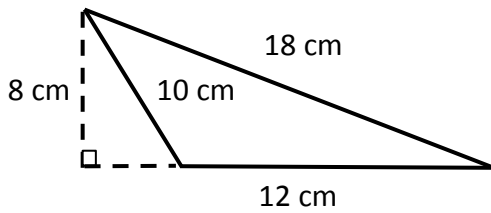
..... cm<sup>2</sup>

d)



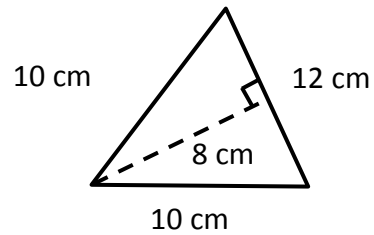
..... cm<sup>2</sup>

e)



..... cm<sup>2</sup>

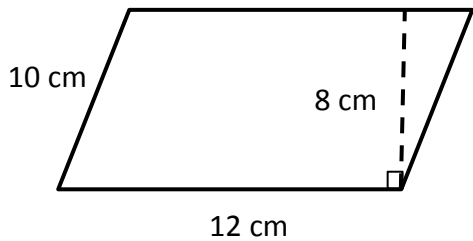
f)



..... cm<sup>2</sup>  
(GMMC3, 12 marks)

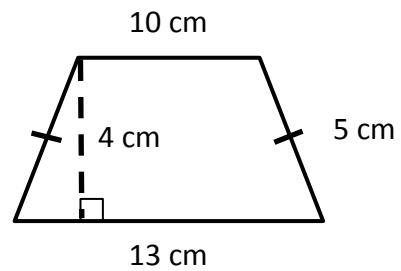
42 Calculate the perimeter of these shapes:

a)



..... cm

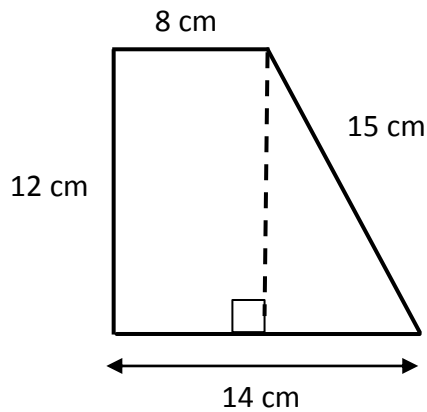
b)



..... cm

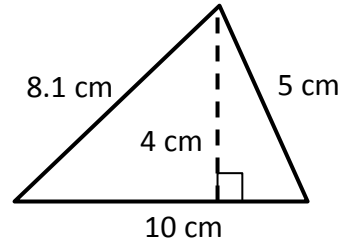


c)



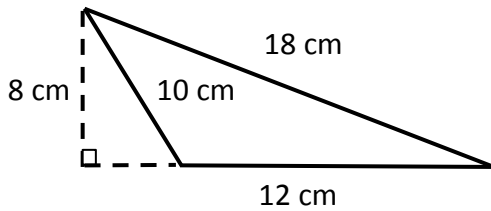
..... cm

d)



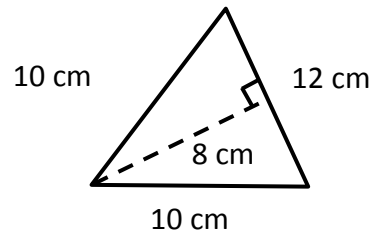
..... cm

e)



..... cm

f)



..... cm  
(GMMC4, 12 marks)

43 a) Calculate the volume of a cuboid with dimensions 5 cm by 4 cm by 3 cm.

..... cm<sup>3</sup>

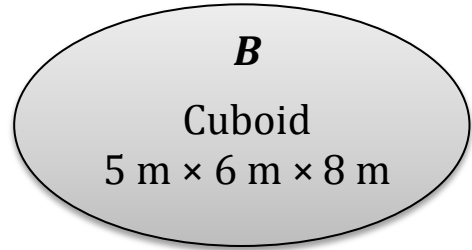
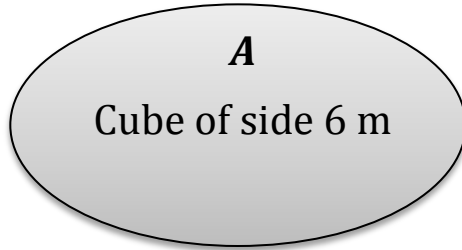
b) Find the dimensions of a cuboid with volume 450 cm<sup>3</sup>

..... cm × ..... cm × ..... cm  
(GMMC5, 4 marks)



44 Which has the greatest surface area?

Tick the one that does



Explain your answer.

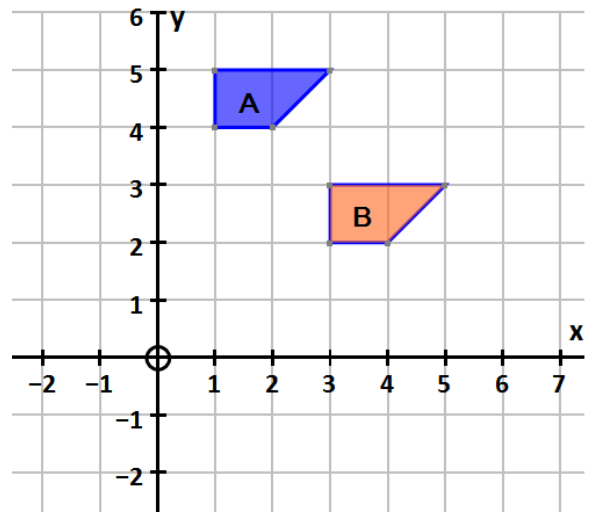
(GMMC6, 4 marks)



45 Shape A is translated to shape B.

Describe the translation using vector notation

.....



(V1, 2 marks)



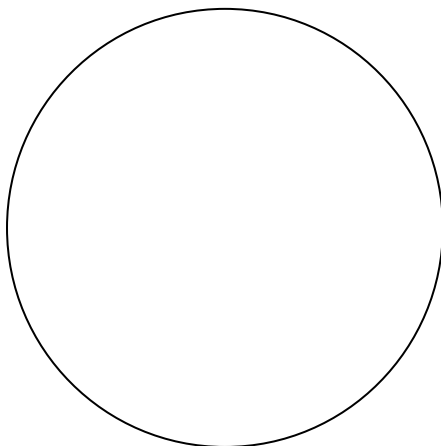
46 a) Kate is shown two pie charts. One section of the pie chart is the same size on both.

Kate says:

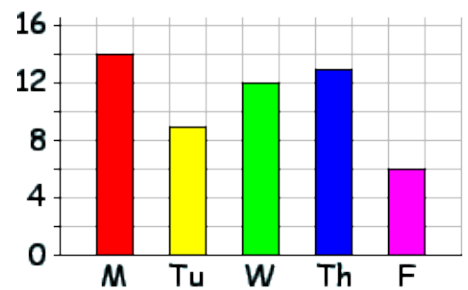
*'The amount of data the section represents is the same in each pie chart.'*

Do you agree with Kate? Explain your answer.

b) Sketch a pie chart for the data represented in this bar chart.



No. of pints



(S1, 6 marks)

47 a) Find 5 different numbers with a mean of 6, median of 5 and range of 10

....., ....., ....., ....., .....

b) Find a set of 5 numbers with two modes, a median of 7 and a range of 5.

....., ....., ....., ....., .....



c) The frequency table shows information about a football team

Goals Scored	Frequency
0	3
1	5
2	4
3	1
4	2

i) Calculate the mean number of goals scored.

.....

ii) Calculate the median number of goals scored.

.....

iii) Find the modal number of goals scored.

.....

iv) Find the range of the number of goals scored.

.....

(S2, 12 marks)



<b>Structure and Calculation</b>	<b>Measures and Accuracy</b>	<b>Notation, Vocabulary and Manipulation</b>	<b>Graphs</b>	<b>Solving Equations and Inequalities</b>	<b>Sequences</b>	<b>Ratio, Proportion and Rates of Change</b>	<b>Properties and Construction</b>	<b>Mensuration and Calculation</b>	<b>Vectors</b>	<b>Statistics</b>
<b>NUMBER</b>		<b>ALGEBRA</b>				<b>GEOMETRY &amp; MEASURES</b>				

**NOT GOT IT YET?**

Key topics I need to work on:

**Stage 7 Mathematics**

The grid contains various mathematical topics such as:
 

- Using the unit circle to determine the sine and cosine values of angles in standard position.
- Use trigonometry to determine the length of sides and angles of triangles.
- Use the area formulae for triangles and quadrilaterals.
- Use the area formulae for circles and sectors.
- Use the volume formulae for rectangular prisms and cylinders.
- Use the volume formulae for spheres and cones.
- Use the area formulae for irregular shapes.
- Use the area formulae for composite figures.
- Use the area formulae for similar figures.
- Use the area formulae for congruent figures.
- Use the area formulae for dissection.
- Use the area formulae for approximation.
- Use the area formulae for estimation.
- Use the area formulae for measurement.
- Use the area formulae for calculation.
- Use the area formulae for comparison.
- Use the area formulae for analysis.
- Use the area formulae for synthesis.
- Use the area formulae for evaluation.
- Use the area formulae for creation.

