



GCSE Maths Question and Answers 2020/2021

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Algebra - Equations and Inequalities (Questions)

1. Solve the simultaneous equations:

$$5x + 4y = 13$$

$$3x + 8y = 5$$

(Marks available: 4)

2. An orange costs 5 pence more than an apple.

a) Write down an expression, in terms of y , for the cost of one orange.

(1 mark)

b) Write down an expression, in terms of y , for the total cost of 3 apples and one orange.

(2 marks)

c) The total cost of 3 apples and one orange is 61 pence.

Form an equation in terms of y and solve it to find the cost of one apple.

(3 marks)

(Marks available: 6)

3. **a)** Solve this inequality

$$2x + 3 < 5x + 12$$

(3 marks)

b) (i) Solve this equation

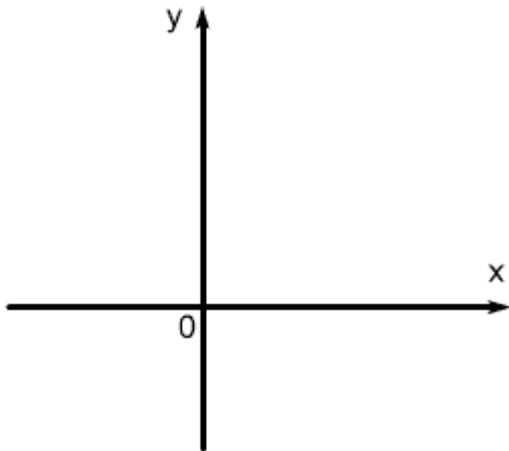
$$2x^2 + x - 3 = 0$$

(3 marks)

(ii) Sketch the graph of $y = 2x^2 + x - 3$

(2 marks)

Show clearly where the graph crosses the x-axis.



(Marks available: 8)

4. A company was contracted to make 840 vans in 90 days.

After they made 540, the manager worked out the average production per day. He worked out that, if they could increase this average by 1 van per day, they could fulfil the contract in exactly 90 days.

Let the average for the first 540 be x vans per day.

- a)** Write down an equation in x and show that it simplifies to

$$\frac{18}{10} + \frac{10}{x+1} = 3$$

(2 marks)

- b)** Use algebra to solve the equation.

Hence find the average production for the first 540 vans.

(7 marks)

(Marks available: 9)

Algebra - Equations and Inequalities (Answers)

Answer outline and marking scheme for question: 1

$$x = 3, y = -\frac{1}{2}$$

(Marks available: 4)

Answer outline and marking scheme for question: 2

a) $y + 5$

(1 mark)

b) $3y + y + 5$

(2 marks)

c) $3y + y + 5 = 61$

(3 marks)

(Marks available: 6)

Answer outline and marking scheme for question: 3

a) $x > -3$ or $-3 < x$

(3 marks)

b)(i) $-1\frac{1}{2}$ or 1

(3 marks)

(ii) U-shaped curve crossing x-axis twice. Intersections at $-1\frac{1}{2}$ or 1.

(2 marks)

(Marks available: 8)

1. Answer outline and marking scheme for question: 4

$$\frac{540}{x} + \frac{300}{x+1} = 90$$

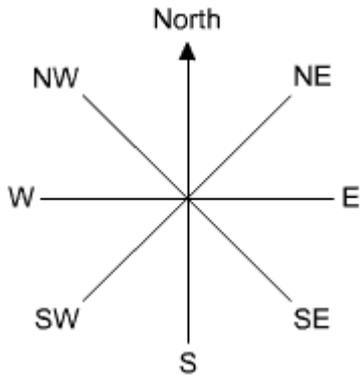
+ 30

a) gives the equation required

b) $x = 9$ and $-\frac{2}{3}$

(Marks available: 9)

Angles (Questions)



1.

a) What fraction of a complete turn is:

(i) North to East,

(1 mark)

(ii) North to South-East

(1 mark)

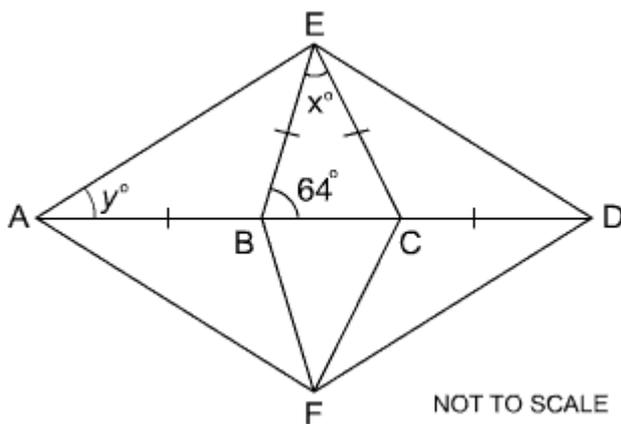
b) Jill faces West. She makes a $\frac{1}{4}$ turn anticlockwise. What direction does she face now?

(1 mark)

c) How many degrees are there in a $\frac{1}{4}$ turn?

(1 mark)

(Marks available: 4)



2.

In the diagram the lengths of AB, BE, EC and CD are equal.

Angle EBC = 64° .

a) Find the value of

(i) x ,

(2 marks)

(ii) y ,

(2 marks)

b) Quadrilateral AEDF is symmetrical about the line AD.

What special name is given to this quadrilateral?

(2 marks)

(Marks available: 6)

Angles (Answers)

Answer outline and marking scheme for question: 1

a) (i) One quarter

(ii) Three eighths

b) South

c) 90°

(Marks available: 4)

Answer outline and marking scheme for question: 2

a)(i) 52°

(ii) 32°

b) Rhombus

(Marks available: 6)

Approximations (Questions)

1. Graham has a plank of wood of length 610cm, correct to the nearest 10cm. He uses a cutting machine to cut the plank into pieces, without any wastage. Each piece of wood is of length 15 cm, correct to the nearest half centimetre.

Find the maximum number of pieces of wood that Graham can be certain of getting.

(Marks available: 3)

2. **a)** The diagram shows a goalkeeper standing between goal posts. Estimate the height, in metres, of a goal post.



(1 mark)

- b)** The length of a football pitch is 95 metres.

- (i)** Write this length in centimetres.

(1 mark)

- (ii)** By how many metres is the length of the football pitch less than one tenth of a kilometre?

(2 marks)

- (iii)** 1 yard = 0.9144 metres

Work out the length of the football pitch in yards.

(2 marks)

- c)** The transfer fee for a footballer was £2,300,000

- (i)** Round this figure to the nearest million.

(1 mark)

- (ii)** Round this figure to the nearest half million.

(1 mark)

(Marks available: 8)

Approximations (Answers)

Answer outline and marking scheme for question: 1

$$605 \div 15.25 = 39 \text{ or}$$

$$605 \div 15.249 \text{ recurring} = 40$$

(Total = 3 marks)

Answer outline and marking scheme for question: 2

a) The height is between or equal to 2 and 3 metres.

b) (i) 9500cm

(ii) 5m

(iii) 104, 103.9 or 103.89 yards.

c) (i) 2,000,000 or 2m

(ii) 2,500,000 or 2.5m

(Total = 8 marks)

Calculator (Questions)

1.

a) Use your calculator to find the value of

$$3.2^2 - \sqrt{4.84}$$

(1 mark)

b) (i) Use your calculator to find the value of

$$\frac{3.9^2 + 0.53}{3.9 \times 0.53}$$

Write down all the figures on your calculator display.

(1 mark)

(ii) Round your answer to part **b) (i)** to 2 decimal places.

(1 mark)

(iii) Write down a calculation you can do in your head to check your answer to part **b) (i)**.

Calculation:

Write down your answer to this calculation.

(2 marks)

(Marks available: 5)

Calculator (Answers)

Answer outline and marking scheme for question: 1

a) 8.04

b) (i) 7.6149

(ii) 7.61

(iii)

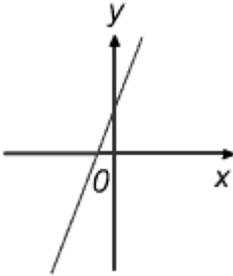
$$\frac{4^2 + (0.5)}{4 \times 0.5} , \frac{4^2 + 0.53}{4 \times 0.5}$$

8 to 8.3

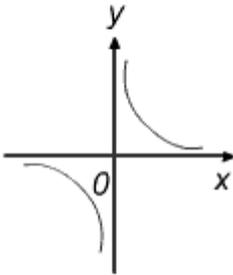
(Marks available: 5)

Graph (Questions)

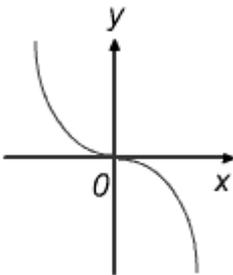
1. The graphs of eight functions are sketched below.



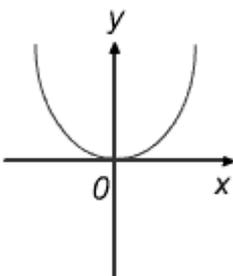
(1)



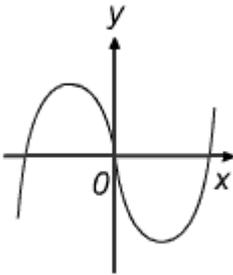
(2)



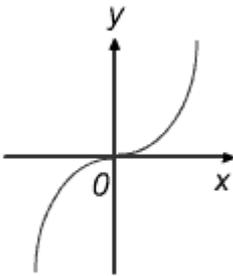
(3)



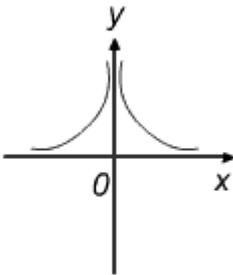
(4)



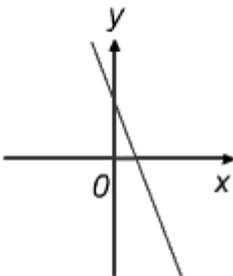
(5)



(6)



(7)



(8)

Which graph could represent

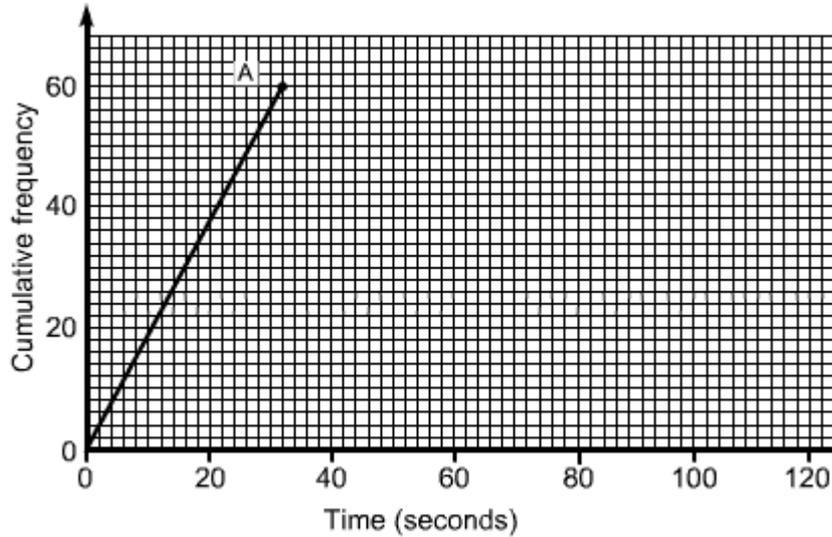
a) $y = 5 - 3x$

b) $y = \frac{12}{x}$

c) $y = 2x^3$

(Marks available: 3)

2. The graph shows the speed of a car in kilometres per hour (km/h).



a) What is the speed of the car after 10 seconds?

(1 mark)

b) After 30 seconds, the car travels at a steady speed of 60 km/h for 1 minute. Continue the graph by drawing a line AB to show this.

(1 mark)

c) Draw a straight line from B to the point C (110,0).

(1 mark)

d) What does the graph between B and C tell you about what the car is doing?

(1 mark)

(Marks available: 4)

Graph (Answers)

Answer outline and marking scheme for question: 1

a) 8

b) 2

c) 6

(Marks available: 3)

Answer outline and marking scheme for question: 2

a) 20km/h

b) Horizontal straight line, ending at (90,60).

c) Straight line from (90,60) to (110,0)

d) 'Slowing down' or 'stopping'

(Marks available: 4)

Indices (Questions)

1. a) Simplify $t^4 \times t^2$

(1 mark)

- b) Solve

(i) $3(x - 1) = x + 4$

(3 marks)

(ii) $8x + 5 > 25$

(2 marks)

- c) Factorise $4x^2 - 25$

(2 marks)

- d) (i) Factorise $x^2 + 7x + 6$

- (ii) Hence solve the equation

$$x^2 + 7x + 6 = 0$$

(1 mark)

(Marks available: 9)

2. **Simplify:**

(i) $5^4 \times 5^3$

(ii) $(3^2)^4$

(Marks available: 2)

Indices (Answers)

Answer outline and marking scheme for question: 1

a) t^6

b) (i) $x = 3.5$

(ii) $x > 2.5$ ($2\frac{4}{8}$ or better)

c) $(2x + 5)(2x - 5)$

d) (i) $(x + 1)(x + 6)$

(ii) -1 and -6

(Marks available: 9)

Answer outline and marking scheme for question: 2

(i) $5^4 \times 5^3 = 5^{4+3} = 5^7$

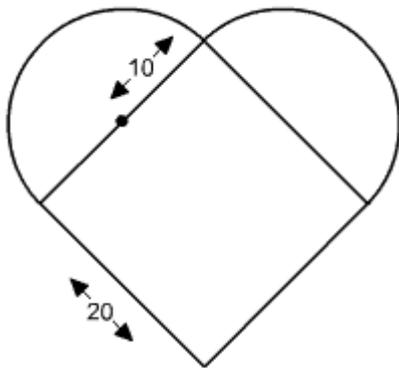
(ii) $(3^2)^4 = 3^{2 \times 4} = 3^8 = 6561$

(Marks available: 2)

Measurement (Questions)

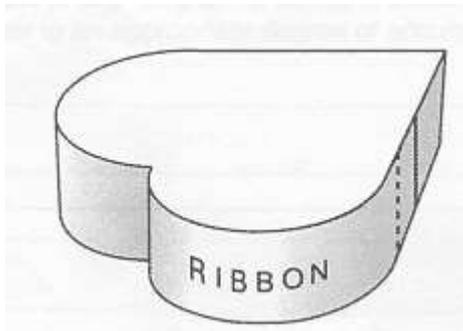
1. **Instructions for making a heart shaped cake:**

- Bake a square cake of side 20cm.
- Bake a round cake of radius 10cm.
- Cut the round cake in half.
- Join the two halves to the square cake, as shown in the diagram.



a) Find the area of the heart-shape. State the units of your answer.

(4 marks)

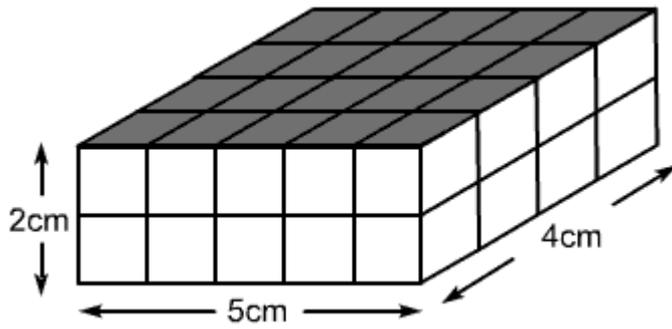


A red ribbon is fixed around the sides of the heart-shaped cake with the ends overlapping by 3cm.

b) Find the length of the ribbon required.

(3 marks)

(Marks available: 7)



2.

(i) What is the volume of the cuboid?

(1 mark)

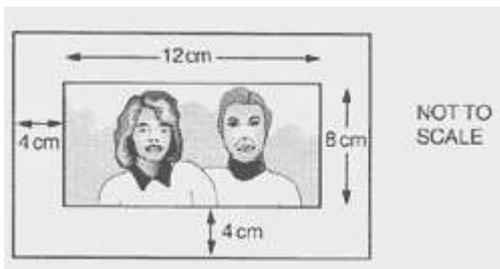
(ii) What is the area of the shaded top of the cuboid?

(1 mark)

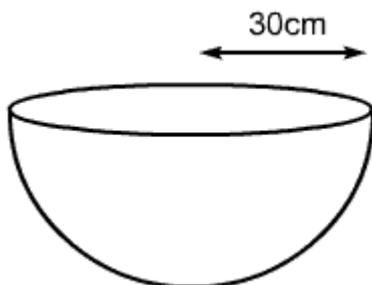
(Marks available: 2)

3. A rectangular photograph, 12cm long and 8cm wide, fits into a rectangular frame so that there is a border 4cm wide all the way round it.

Use calculations to show whether or not the two rectangles are similar.



(Marks available: 4)

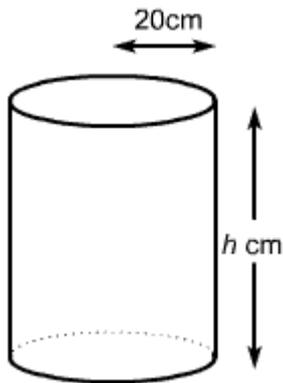


4.

A hemispherical bowl has a radius of 30cm.

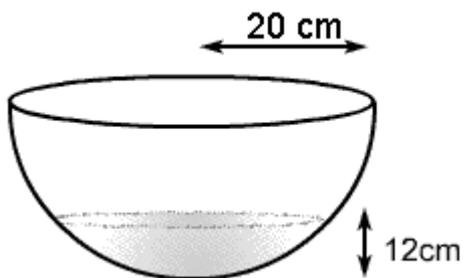
a) (i) Calculate the volume of the bowl. Leave your answer as a multiple of π .

(2 marks)



(ii) A cylinder of radius 20cm and height h cm has the same volume as the bowl. Calculate the value of h .

(2 marks)



b) Calculate the radius of the surface of the water.

(3 marks)

(Marks available: 7)

Measurement (Answers)

Answer outline and marking scheme for question: 1

a) 714 to 714.2 cm²

(4 marks)

b) 105.8 to 106 cm

(3 marks)

(Marks available: 7)

Answer outline and marking scheme for question: 2

(i) 40cm³

(ii) 20cm²

(Marks available: 2)

Answer outline and marking scheme for question: 3

Using corresponding ratios/fractions, compare the sides of the pictures, which should show the pictures as not similar.

(Marks available: 4)

Answer outline and marking scheme for question: 4

a)(i) 18000 cm³

(ii) 45

b) 24

(Marks available: 7)

Percentages (Questions)

1. a) Work out $\frac{2}{3}$ of £4.56.

(2 marks)

- b) A travel firm offers a discount of 12% on a holiday costing £490. Work out the amount of the discount.

(2 marks)

- c) Three tins of dog food cost £1.38. What will 8 tins of the same dog food cost?

(3 marks)

- d) Use your calculator to multiply 450,000 by 800,000.

(1 mark)

(Marks available: 8)

2. A French supermarket buys coffee for 25.80 francs per kilogram.

- a) The supermarket sells the coffee to make a profit of 60%.

Calculate the selling price of one kilogram of coffee.

(3 marks)

- b) A British importer also buys the coffee at 25.80 francs per kilogram.

The exchange rate is £1 = 9.63 francs.

Calculate the cost of one kilogram of coffee in British money.

Give your answer to an appropriate degree of accuracy.

(3 marks)

(Marks available: 6)

3. **An electricity company supplies electricity to a family with the following charges:**

Standing charge: 9.13 pence

Electricity used: 6.19 pence per unit

VAT of 5% is added to the total

The green family receives a bill for 91 days. In that time they used a total of 1272 units of electricity. Calculate the amount that the Greens have to pay.

(Marks available: 5)

4. **a)** Kelly invested £450 for 3 years at a rate of 6% per year compound interest.

Calculate the total amount that the investment is worth at the end of the 3 years.

(3 marks)

- b)** Kelly decides to buy a television.

After a reduction of 15% in the sale, the one she bought cost her £319.60.

What was the original price of the television?

(3 marks)

(Marks available: 6)

Percentages (Answers)

Answer outline and marking scheme for question: 1

- a) £3.04
- b) £58.80
- c) £3.68
- d) 3.6×10^{11}

(Marks available: 8)

Answer outline and marking scheme for question: 2

- a) 41.28 francs
- b) £2.68

(Marks available: 8)

Answer outline and marking scheme for question: 3

£91.40 or £91.39

(Marks available: 8)

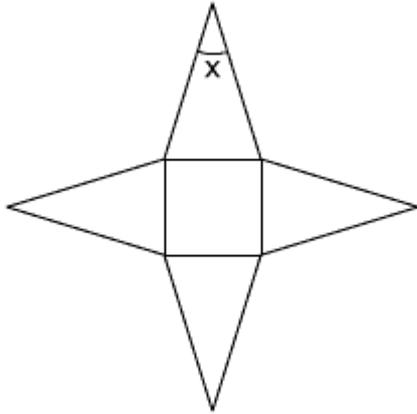
Answer outline and marking scheme for question: 4

- a) £535.95 or £535.96
- b) £376

(Marks available: 8)

Polygons and Circles (Questions)

1.



The diagram above is the net of a solid.

(i) Write down the name of the solid.

(1 mark)

(ii) Measure and write down the size of the angle marked x .

(1 mark)

(iii) Draw the lines of symmetry on the diagram.

(2 marks)

(iv) The diagram also has rotational symmetry.

Write down the order of rotational symmetry.

(1 mark)

(Marks available: 5)

Polygons and Circles (Answers)

Answer outline and marking scheme for question: 1

(i) (Square) Pyramid.

(1 mark)

(ii) Anything between 51° and 55° is an acceptable answer.

(1 mark)

(iii) 4 correct lines drawn.

(2 marks)

(iv) 4

(1 mark)

(Marks available: 5)

Probability (Questions)

1. In the game of 'Soap', two fair dice, with the faces numbered 1 to 6, are thrown.

The total of the scores on the dice is the score for that turn. The player then moves the same number of places as their score.

For example, if (3,5) is thrown, the player moves on 8 places.

a) Khalid wants to land on the space marked "Albert Square". He is now on "Coronation Street" which is 6 spaces away.

By considering the possibility space (all possible outcomes), work out the probability that Khalid lands on "Albert Square" on his next turn.

(3 marks)

Caroline does not want to land on "Ramsey Street" which is 7 spaces away.

b) What is the probability that Caroline does not land on "Ramsey Street" on her next turn?

(2 marks)

You can only escape from "Cell Block H" if you score the same number on each dice. John is on "Cell Block H".

c) What is the probability that John escapes on his next turn?

(1 mark)

(Marks available: 6)

2. In a class of 20 pupils, 11 have dark hair, 7 have fair hair and 2 have red hair.

Two pupils are chosen at random to collect the homework. What is the probability that they

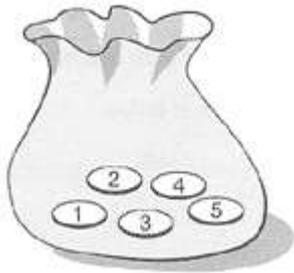
a) both have fair hair

(3 marks)

b) each have hair of a different colour

(4 marks)

(Marks available: 7)



3.

A bag contains five discs that are numbered 1, 2, 3, 4 and 5.

Rachel takes a disc at random from the bag. She notes the number and puts the disc back.

She shakes the bag and picks again. She adds this number to the first number.

a) Complete the table to show all the possible totals.

		First number				
+		1	2	3	4	5
Second number	1	2				
	2					
	3				7	
	4					
	5					

(2 marks)

b) Find the probability that Rachel's total is

(i) 10 [1]

(ii) 1 [1]

(iii) 3 or 4

(4 marks)

(Marks available: 6)

4. The Morgan family leave Manchester to catch the 12 noon ferry from Dover.

The probability that they will catch the ferry is 0.9.

The Collins family leaves Croydon to catch the same ferry.

The probability that they will catch the ferry is 0.8.

The two events are independent.

a) Find the probability that

(i) Both families will catch the ferry

(2 marks)

(ii) Neither will catch the ferry

(2 marks)

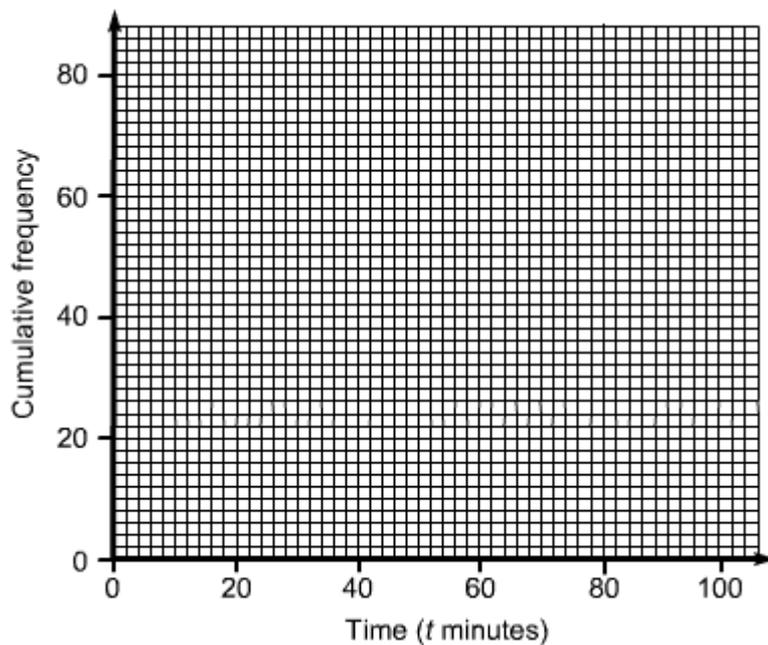
b) (i) Complete the cumulative frequency table below.

(1 mark)

Time (t minutes) $t \leq 20$ $20 < t \leq 40$ $40 < t \leq 60$ $60 < t \leq 80$

Number of families

(ii) On the grid below, draw the cumulative frequency diagram of the waiting times of the 80 families.



(2 marks)

(Marks available: 7)

5. Anil has five bars of chocolate in a cupboard.

Three are Kit-Kats, one is a Mars bar and one is a Fudge bar.

He takes one at random on each weekday to eat at school.

a) Calculate the probability that the bar of chocolate will be a Kit-Kat on both Monday and Tuesday of that week.

(2 marks)

b) Calculate the probability that the bar of chocolate will be a Kit-Kat on Monday, Tuesday and Wednesday and a Mars bar on Thursday.

(2 marks)

c) Calculate the probability that the bar of chocolate will not be a Kit-Kat on any two consecutive days in that school week.

(3 marks)

(Marks available: 7)

Probability (Answers)

Answer outline and marking scheme for question: 1

a) $\frac{5}{36}$

(3 marks)

b) $\frac{5}{6}$

(2 marks)

c) $\frac{1}{6}$

(1 mark)

(Marks available: 6)

Answer outline and marking scheme for question: 2

a) $\frac{21}{190}$

(3 marks)

b) $\frac{226}{380}$

(4 marks)

(Marks available: 7)

Answer outline and marking scheme for question: 3

a)

		First number				
+		1	2	3	4	5
Second number	1	2	3	4	5	6
	2	3	4	5	6	7
	3	4	5	6	7	8
	4	5	6	7	8	9
	5	6	7	8	9	10

(2 marks)

b) (i) $\frac{1}{25}$ or 0.04 or 4%

(1 mark)

(ii) 0 or impossible

(1 mark)

(iii) $\frac{5}{25}$ or $\frac{1}{25}$ or 0.2 or 20%

(2 marks)

(Marks available: 6)

Answer outline and marking scheme for question: 4

a) (i) 0.72

(ii) 0.02

b) (i) 4, 23, 53, 71, 80.

(ii) Correct plots at 20, 40, 60, 80, 100.

Curve or ruled joins (at least 4 points).

(Marks available: 7)

Answer outline and marking scheme for question: 5

a) $\frac{3}{10}$

(2 marks)

b) $\frac{1}{20}$

(2 marks)

c) $\frac{1}{10}$

(3 marks)

(Marks available: 7)

Representing Data (Questions)

1. The heights of 100 plants were measured. The results are shown in the table below.

Height (h cm)	$4 < h \leq 5$	$5 < h \leq 6$	$6 < h \leq 7$	$7 < h \leq 8$	$8 < h \leq 9$	$9 < h \leq 10$	$10 < h \leq 11$	$11 < h \leq 12$
Frequency	3	7	11	28	24	17	8	2

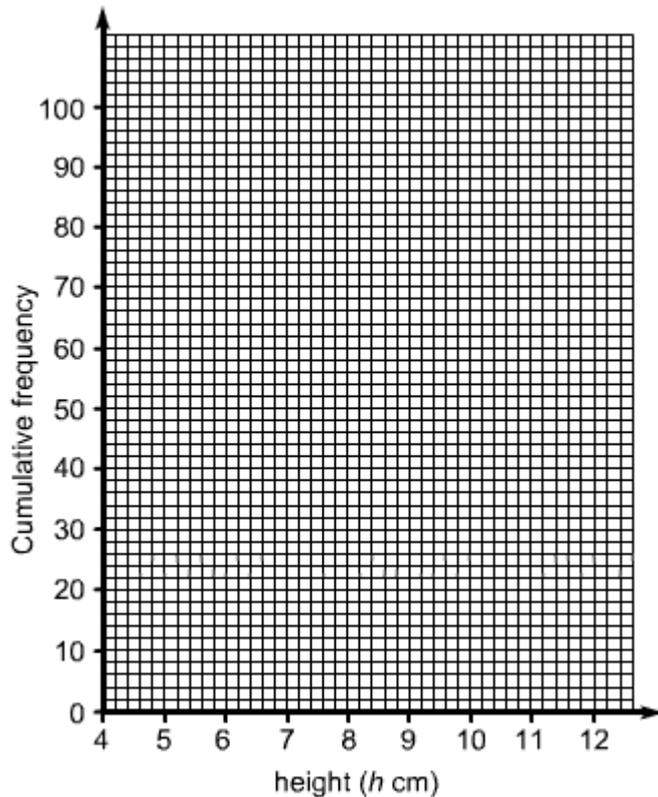
- a) Complete the cumulative frequency table for the 100 plants.

(1 mark)

Height (h cm)	$h \leq 4$	$4 < h \leq 5$	$5 < h \leq 6$	$6 < h \leq 7$	$7 < h \leq 8$	$8 < h \leq 9$	$9 < h \leq 10$	$10 < h \leq 11$	$11 < h \leq 12$
Cumulative Frequency	0	3							

- b) Draw the cumulative frequency diagram on the grid below.

(3 marks)



- c) Use your graph to estimate how many plants are less than 9.4cm high.

(1 mark)

d) Use your cumulative frequency diagram to estimate the inter-quartile range of the heights.

(2 marks)

(Marks available: 7)

2. a) Ian and Alex decide to conduct a survey on the use of computers.

They want to know whether boys or girls use a computer in their coursework for word-processing, spreadsheets or both.

In the space below, design an observation sheet to collect information from a group of boys and girls.

(3 marks)

b) Alex used a spell-check on her computer to find spelling mistakes in some course-work.

The table below shows the distribution of spelling mistakes

Number of spelling mistakes on the page 0 1 2 3 4

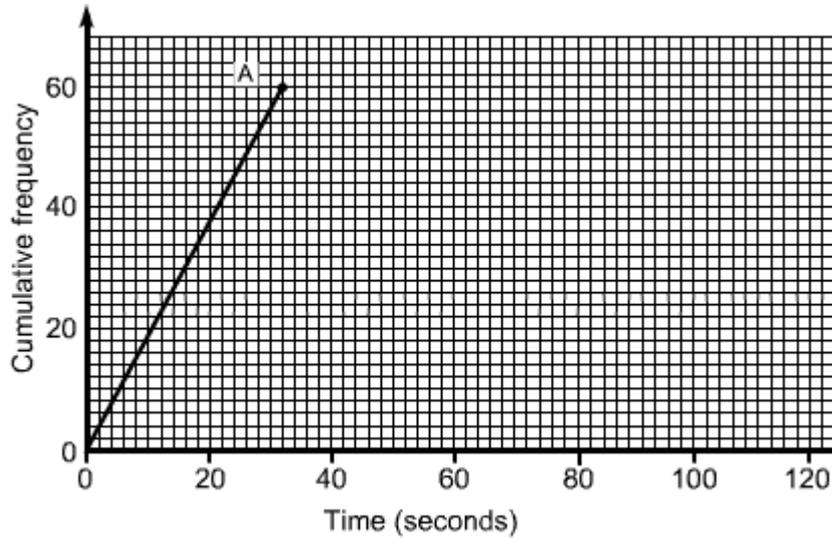
Number of pages 10 6 1 1 2

Calculate the mean number of spelling mistakes per page.

(3 marks)

(Marks available: 6)

3. The graph shows the speed of a car in kilometres per hour (km/h).



a) What is the speed of the car after 10 seconds?

(1 mark)

b) After 30 seconds, the car travels at a steady speed of 60 km/h for 1 minute. Continue the graph by drawing a line AB to show this.

(1 mark)

c) Draw a straight line from B to the point C (110, 0).

(1 mark)

d) What does the graph between B and C tell you about what the car is doing?

(1 mark)

(Marks available: 4)

Representing Data (Answers)

Answer outline and marking scheme for question: 1

a)

Height (h cm) $h \leq 4$ $h \leq 5$ $h \leq 6$ $h \leq 7$ $h \leq 8$ $h \leq 9$ $h \leq 10$ $h \leq 11$ $h \leq 12$

Cumulative Frequency 0 3 10 21 49 73 90 98 100

(1 mark)

b) 9 points plotted correctly, curve or straight lines.

(3 marks)

c) 78 to 82

(1 mark)

d) 1.7 to 2.2

(2 marks)

(Marks available: 7)

Answer outline and marking scheme for question: 2

a) **Two way table** with boys/girls

Columns for WP, SS, both, neither.

One way table or questionnaire

Gender column or box

Columns or boxes for WP & SS

(3 marks)

b) 0.95 or $\frac{19}{20}$

(3 marks)

(Marks available: 6)

Answer outline and marking scheme for question: 3

- a)** 20km/h
- b)** Horizontal straight line, ending at (90,60).
- c)** Straight line from (90,60) to (110,0)
- d)** 'Slowing down' or 'stopping'

(Marks available: 4)

Sequences (Questions)

1. 'Start with a number, double it and then add one'.

Use this rule to fill in the boxes below.



(Marks available: 3)

2. Write down the n th term of each of the following sequences.

a) 2 5 10 17 26 37

(2 marks)

b) 4 16 36 64 100 144

(2 marks)

(Marks available: 4)

Sequences (Answers)

Answer outline and marking scheme for question: 1

8, 11, 7

(Marks available: 3)

Answer outline and marking scheme for question: 2

a) $n^2 + 1$

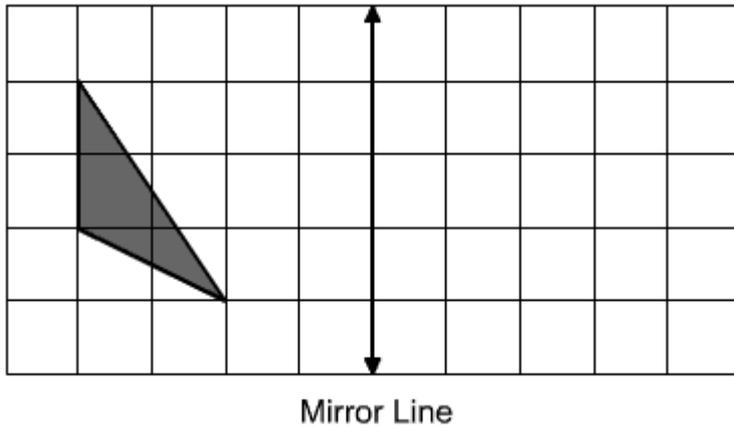
b) $4n^2$ or $(2n)^2$

(Marks Available: 4)

Transformations (Questions)

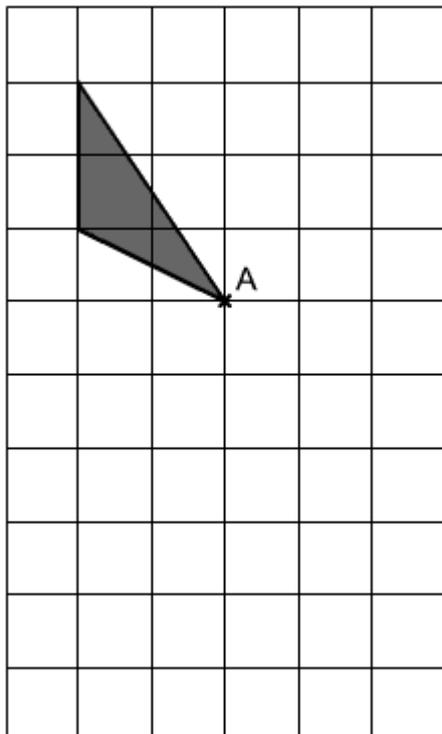
1. a) Reflect the triangle in the mirror line.

(1 mark)



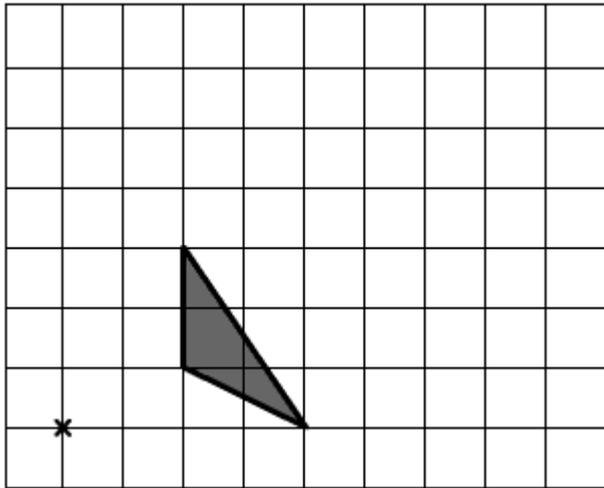
- b) Rotate the triangle through 180° about centre A.

(2 marks)



- c) Enlarge the triangle by scale factor 2, centre B.

(3 marks)

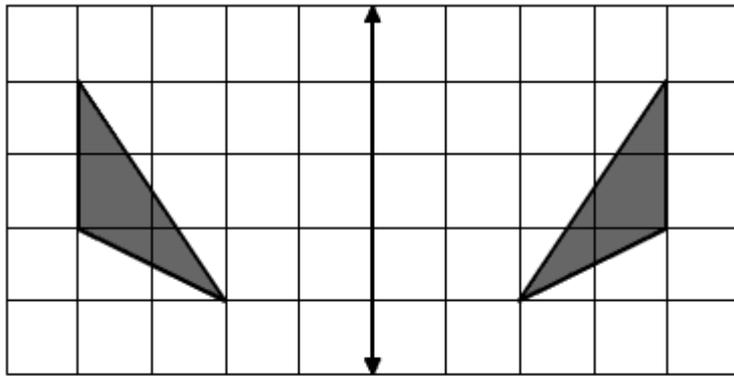


(Marks available: 6)

Transformations (Answers)

Answer outline and marking scheme for question: 1

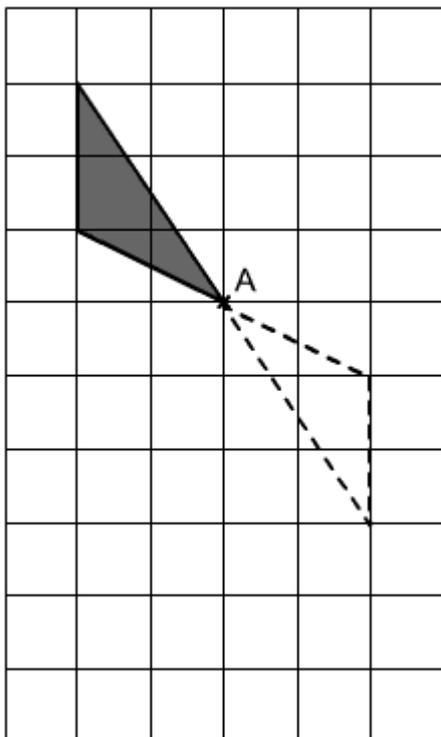
a)



Mirror Line

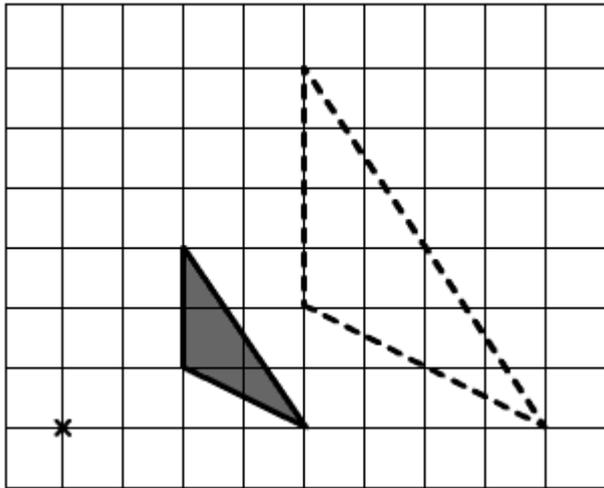
(1 mark)

b)



(2 marks)

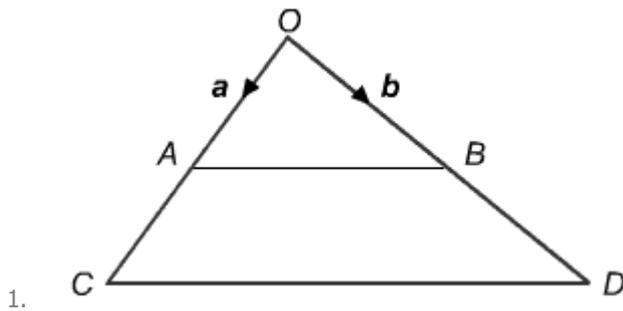
c)



(3 marks)

(Marks available: 6)

Trigonometry (Questions)



In the diagram A and B are the midpoints of OC and OD respectively.

$$\vec{OA} = \mathbf{a} \text{ and } \vec{OB} = \mathbf{b}$$

a) Write down \vec{OC} in terms of \mathbf{a} and \mathbf{b} .

(1 mark)

b) (i) Write down \vec{AB} in terms of \mathbf{a} .

(1 mark)

(ii) Use a vector method to prove that CD is parallel to AB .

(3 marks)

(iii) What other conclusions can you make about AB and CD ?

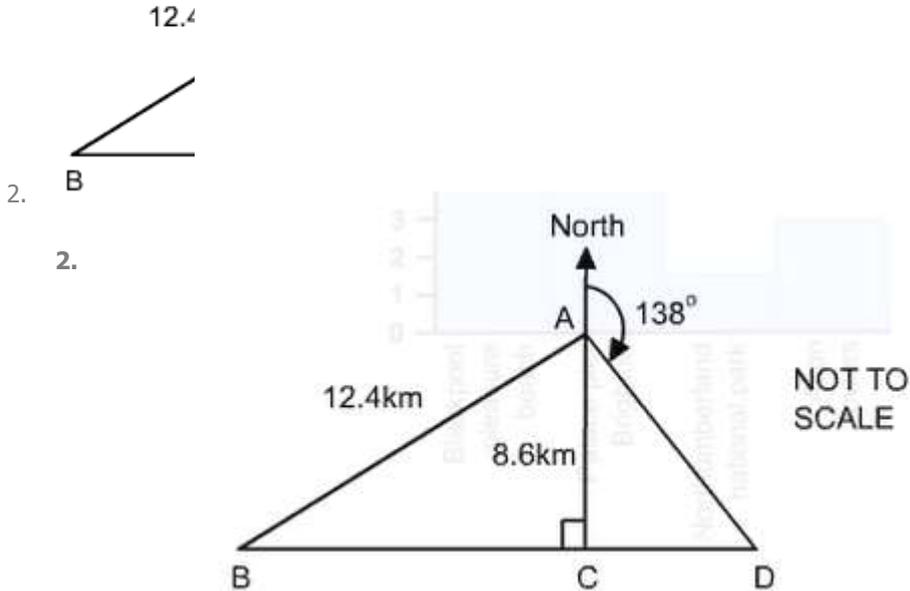
(1 mark)

E is the midpoint of CD .

c) Use a vector method to prove that $OAEB$ is a parallelogram.

(2 marks)

(Marks available: 8)



The diagram shows the positions of points A, B, C and D.

A is due North of C. The straight line BCD is perpendicular to AC.

A is 12.4 kilometres from B and 8.5 kilometres from C.

a) Calculate the distance BC.

(3 marks)

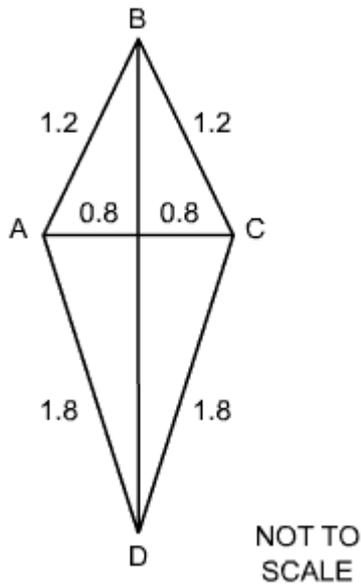
b) The bearing of D from A is 138° .

Calculate the distance DC.

(3 marks)

(Marks available: 6)

3.



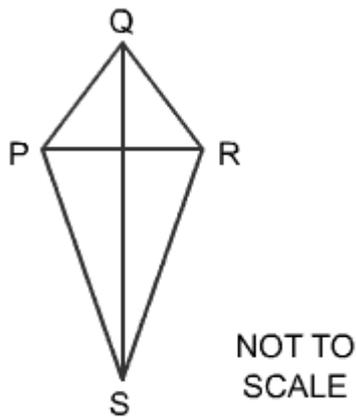
a) The diagram shows a kite ABCD with measurements in metres.

BD bisects AC at right angles.

Calculate the size of angle ABC.

(4 marks)

b)



PQRS is similar to ABCD.

PR is of length 1m.

Calculate the length of the side PS.

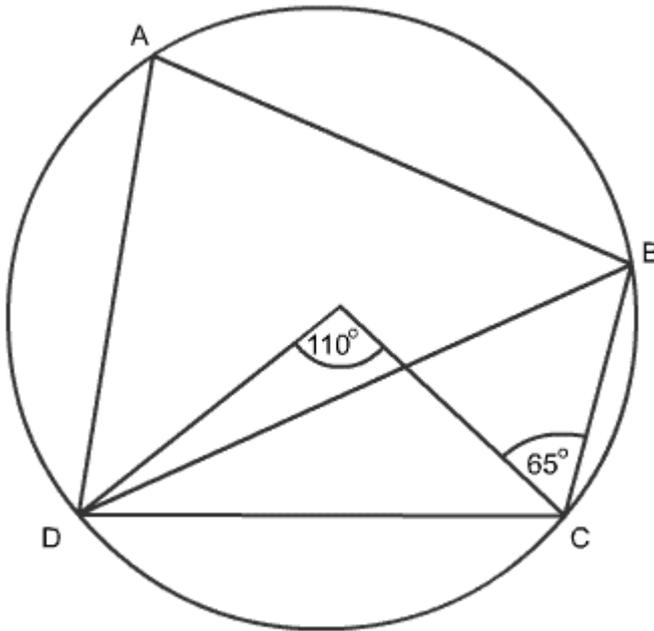
(2 marks)

(Marks available: 6)

4. O is the centre of a circle through A, B, C and D.

Angle DOC is 110° and angle OCB is 65° .

a)



NOT TO SCALE

(i) Find angle DBC.

(1 mark)

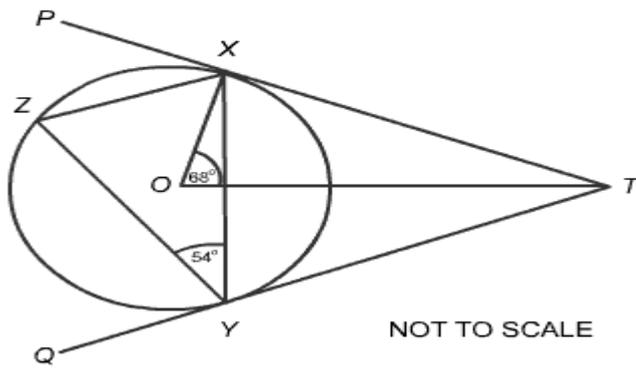
(ii) Find angle DCO.

(1 mark)

(iii) Find angle DAB.

(1 mark)

b)



(i) Find angle PXZ .

(1 mark)

(ii) Find angle OTY .

(2 marks)

(Marks available: 6)