GCSE

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MATHEMATICS

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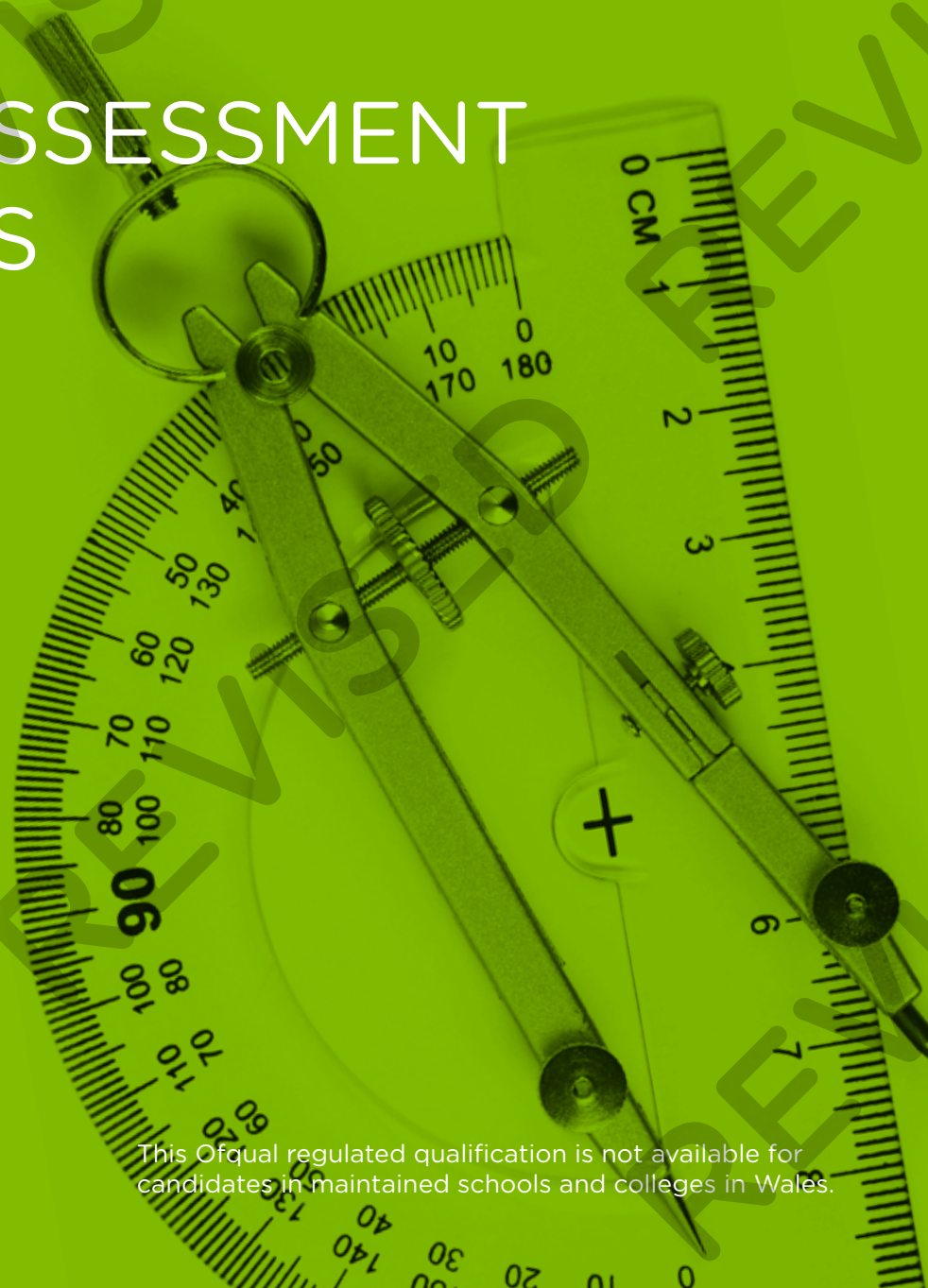
SAMPLE ASSESSMENT MATERIALS

Teaching from 2015



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FOR TEACHING FROM 2015
FOR AWARD FROM 2017

GCSE (9-1) MATHEMATICS

SAMPLE ASSESSMENT MATERIALS

CONTENTS

Candidate Name	Centre Number					Candidate Number				
						0				

GCSE MATHEMATICS

COMPONENT 1

Non-Calculator Mathematics

Higher Tier

SPECIMEN PAPER

2 hour 15 minutes

ADDITIONAL MATERIALS
The use of a calculator is not permitted in this examination.
A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES
Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided in this booklet.

Take π as 3·14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

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For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**4**	
3.	**4**	
4.	**6**	
5.	**3**	
6.	**4**	
7.	**4**	
8.	**4**	
9.	**3**	
10.	**5**	
11.	**4**	
12.	**5**	
13.	**7**	
14.	**6**	
15.	**5**	
16.	**10**	
17.	**4**	
18.	**4**	
19.	**2**	
20.	**5**	
21.	**7**	
22.	**6**	
23.	**7**	
24.	**8**	
TOTAL	**120**	

Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

$$\text{Curved surface area of a cone} = \pi rl$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

1. Given that $a = 10,\ b = 3$ and $c = -5,$ find the value of each of the following expressions.

(a) b^2 [1]

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(b) $\dfrac{ab}{c}$ [1]

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(c) $\dfrac{2bc}{a}$ [1]

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2. *(a)* Write $6{\cdot}8 \times 10^4$ in decimal notation. [1]

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(b) Write in standard form the value of 0·0000853. [1]

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(c) Find in standard form the value of $(3 \times 10^2) \times (5 \times 10^6)$. [2]

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3. Cherry Blossom paint is made by mixing red and white paint in a certain ratio.
4 litres of **red** paint is used to make 9 litres of Cherry Blossom paint.
The diagram below shows the relationship between the amount of red paint and the amount of white paint needed to make Cherry Blossom paint.

Write down the correct scale on the 'Amount of red paint (litres)' axis.
You must put a value on each of the dotted lines on the axis.
You must show all your working to support your answer. [4]

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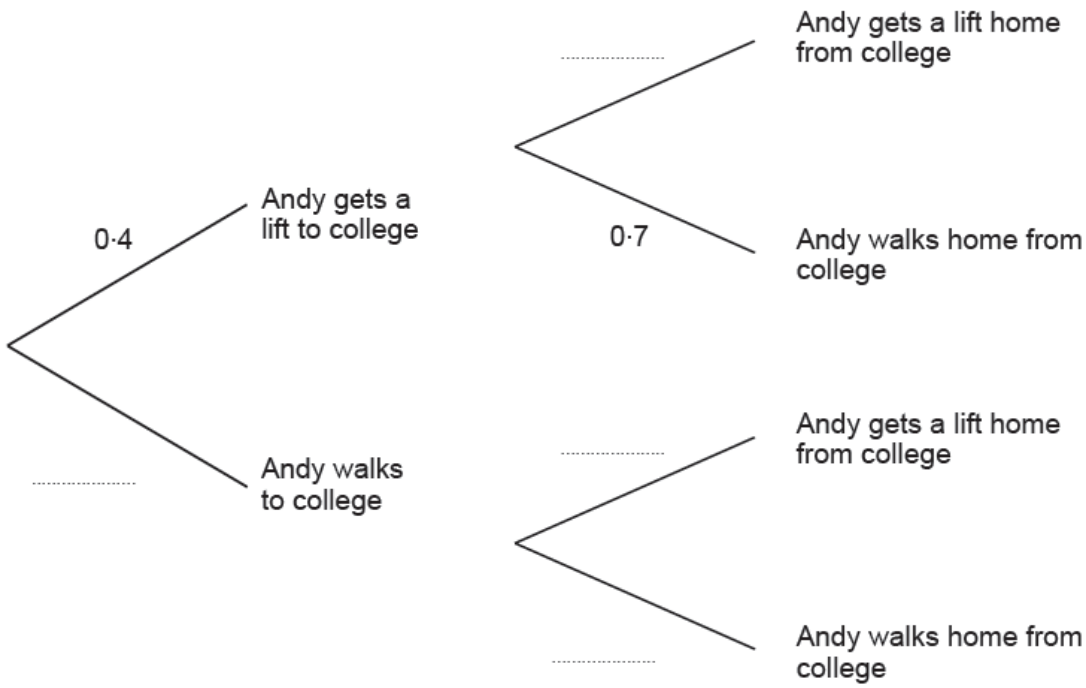
4. Andy sometimes gets a lift to and from college.
When he does not get a lift he walks.
The probability that he gets a lift to college is 0·4.
The probability that he walks home from college is 0·7.
Getting to college and getting home from college are independent events.

(a) Complete the following tree diagram. [2]



(b) Calculate the probability that Andy gets a lift to college and walks home from college [2]

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(c) Calculate the probability that Andy **does not** get a lift to or from college. [2]

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5. Write 3600 as a product of prime factors using index notation. [3]

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6. Alex bought 3 tins of paint and 4 brushes at a total cost of £23.
Brian bought 2 tins of paint and 3 brushes at a total cost of £16.

Using an algebraic method, calculate the price of a single tin of paint and the price of one brush. [4]

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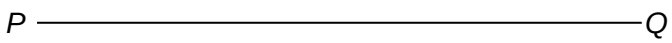
The price of a single tin of paint = ……

The price of one brush = ……..

7. Using ruler and compass construction, shade the region that satisfies both of the following conditions.

(i) The points are less than 5 cm from *P*
(ii) The points are nearer to *Q* than to *P* [4]



8. Two brothers, Richard and Andrew, share a sum of money in the ratio 2 : 7.
Andrew gets £30 more than Richard.
Calculate how much the brothers share. [4]

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9. Factorise the following expressions.

(a) $6x^2 + 8x$ [2]

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(b) $x^2 - 100$ [1]

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10. Peter decides to cover the floor of a room with a striped carpet.
A shop sells this striped carpet from a roll that is 3 m wide at a price of £25 per metre length.

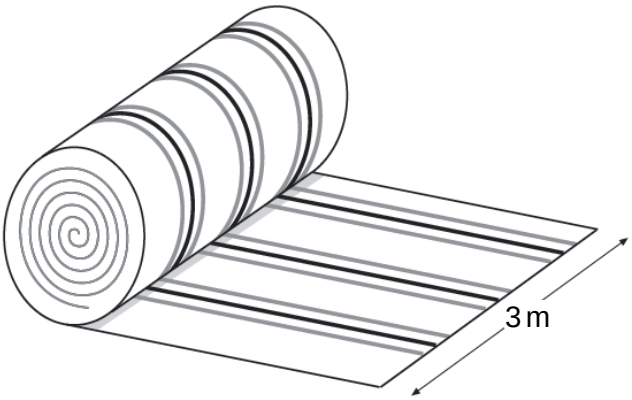

Diagram not drawn to scale

His floor is rectangular in shape with length 13 m and width 8 m.

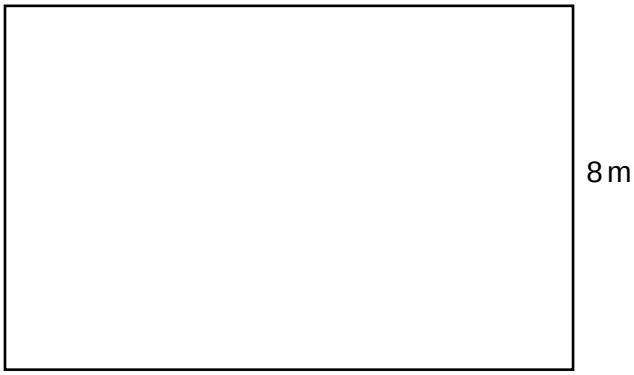

Diagram not drawn to scale

The carpet is laid to ensure that the stripes on the carpet are parallel to two of the sides of the room and lie in one direction only.

Find the cost of the cheapest way of covering the floor, and state by how much it is cheaper.
Show all your working. [5]

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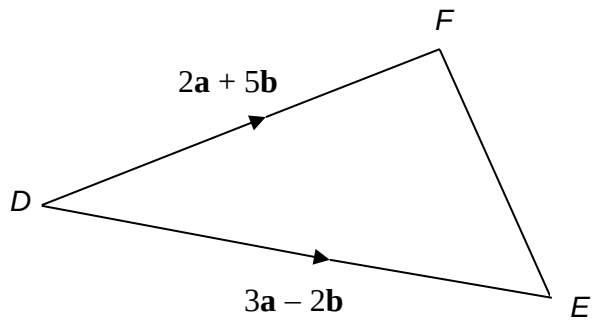
11. Vectors **DF** and **DE** are shown in the diagram below.



Line *PQ* is 3 times the length of line *EF*.
PQ is in the opposite direction to **EF**.

Find **PQ** in the form $m\mathbf{a} + n\mathbf{b}$. [4]

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12. A building company used 24 workers to prepare a building site.
The site measured 30 acres and the work was completed in 10 days.

(a) The company is asked to prepare another site measuring 45 acres.
This work has to be completed in 15 days.
Calculate the least number of workers the company should employ for this work. [3]

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(b) State one assumption you have made in your answer to part *(a)*.
How would your answer to part *(a)* change if you did not make this assumption? [2]

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13. The line L_1 is shown in the diagram below.
The line L_2, which is not shown, is perpendicular to L_1.

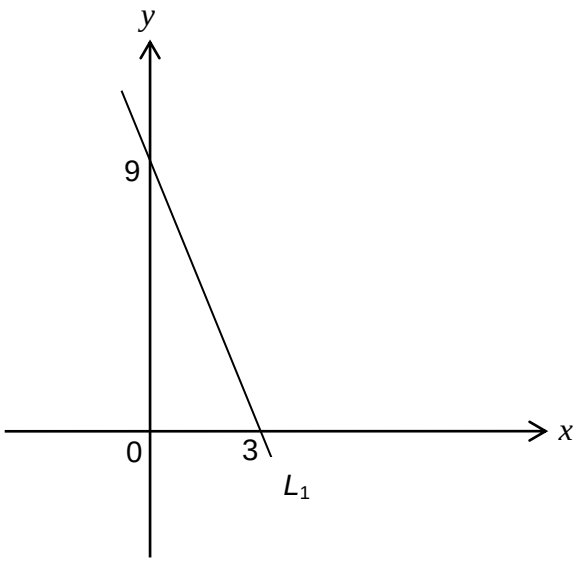

Diagram not drawn to scale

(a) *(i)* Find the gradient of L_1. [2]

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(ii) Write down the gradient of L_2. [1]

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(b) The two straight lines L_1 and L_2 intersect at the point (1, 6).
Find the equation of L_2 and write it in the form $ax + by + c = 0$. [4]

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14. On a journey from Dover to Sheffield, Liam drove at an average speed of 40 mph for the first three hours of his journey.

The remaining 120 miles of his journey were completed at an average speed of 30 mph.

Liam told his friend that he had completed the whole journey at an average speed of 35 mph.

Check to see if Liam is correct. [6]

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15. Triangle *ABC* is isosceles with *AB* = *AC*.

The line *BP* bisects $A\hat{B}C$.

The line *CQ* bisects $A\hat{C}B$.

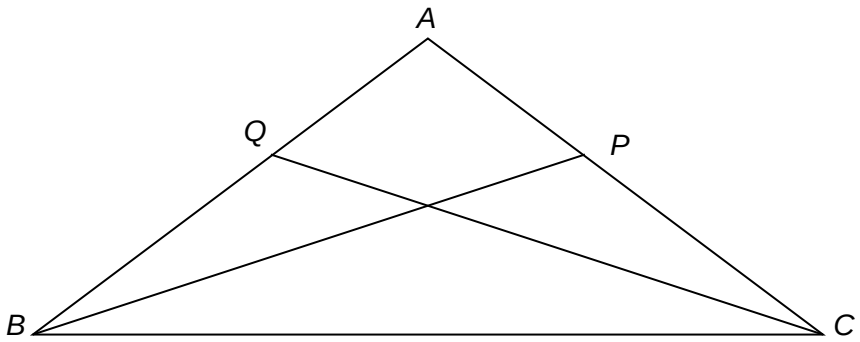

Diagram not drawn to scale

Prove that triangle *BCP* and triangle *CBQ* are congruent.
You must give reasons to support your statements. [5]

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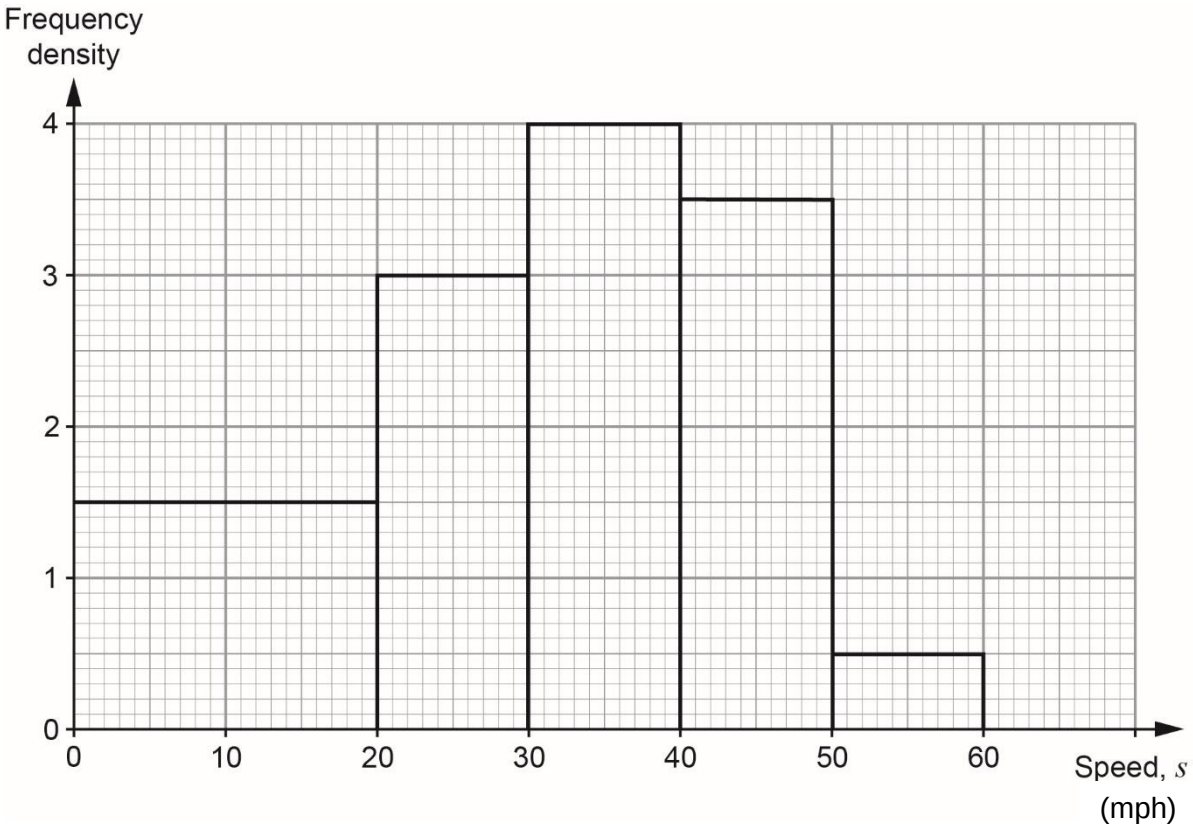
16. A survey was carried out to record the speeds of cars entering a village.
The histogram illustrates the results of the survey.



(a) Use the histogram to complete the grouped frequency table below. [2]

Speed, s (mph)	$0 < s \leq 20$	$20 < s \leq 30$	$30 < s \leq 40$	$40 < s \leq 50$	$50 < s \leq 60$
Frequency					

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(b) 40% of the cars surveyed were fined for exceeding a certain speed as they entered the village.
Calculate an estimate of this speed. [4]

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(c) A further survey was carried out after the placement of a speed camera warning sign.

The results are summarised in the grouped frequency distribution below.

Speed, s (mph)	$0 < s \leq 20$	$20 < s \leq 30$	$30 < s \leq 40$	$40 < s \leq 50$	$50 < s \leq 60$
Frequency	60	40	20	15	5

Draw a histogram to illustrate the results of this survey. [3]

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(d) Compare the two histograms. Do you consider the speed camera warning sign to have been effective?

Give a reason for your answer. [1]

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17. y is inversely proportional to x.

$y = 16$ when $x = \frac{1}{2}$.

Write an expression for y in terms of x. [4]

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18. Simplify $\dfrac{3\sqrt{7}}{4+\sqrt{7}}$ [4]

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19. Express $x^2+12x+14$ in the form $(x+a)^2+b$, where a and b are whole numbers to be found. [2]

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20. *(a)* Express $0\cdot\dot{7}\dot{8}$ as a fraction. [2]

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(b) Evaluate $3^{-2}\times 9^{\frac{1}{2}}$, giving your answer as a recurring decimal. [3]

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21. The diagram below shows a composite shape formed by joining two rectangles.

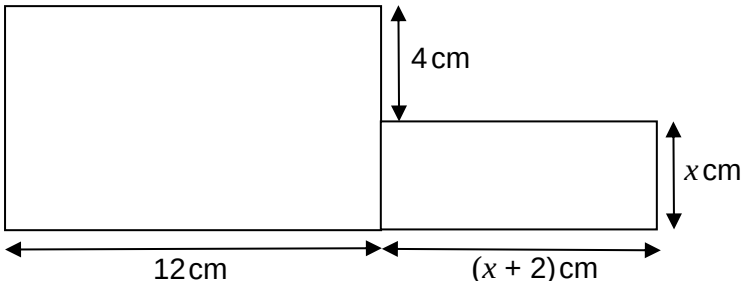

Diagram not drawn to scale

The area of the larger rectangle is 4 times the area of the smaller rectangle.

Calculate the dimensions of the smaller rectangle.
You must justify any decisions that you make. [7]

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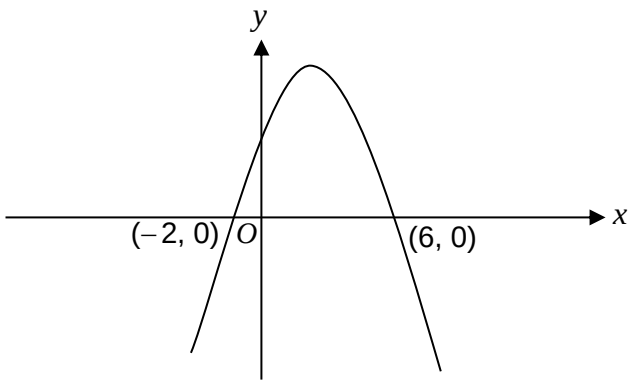
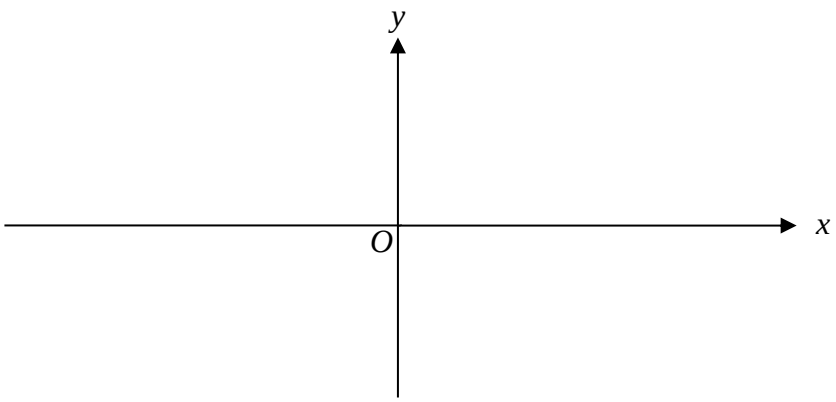
22. *(a)* The diagram shows a sketch of the graph $y = f(x)$.
The graph passes through the points $(-2, 0)$ and $(6, 0)$.

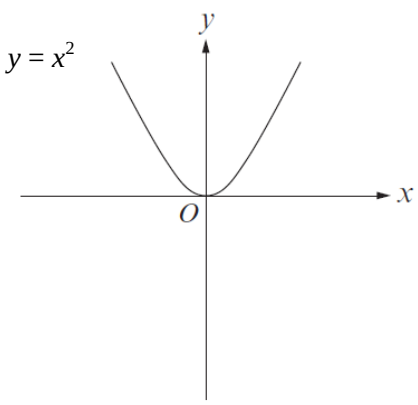


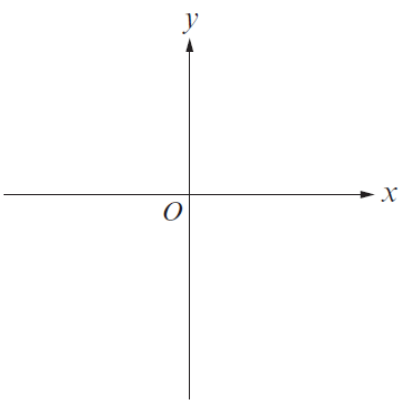
Sketch the graph of $y = f(x + 5)$ on the axes below.
You must indicate the coordinates of the points of intersection of the graph with the x-axis. [3]



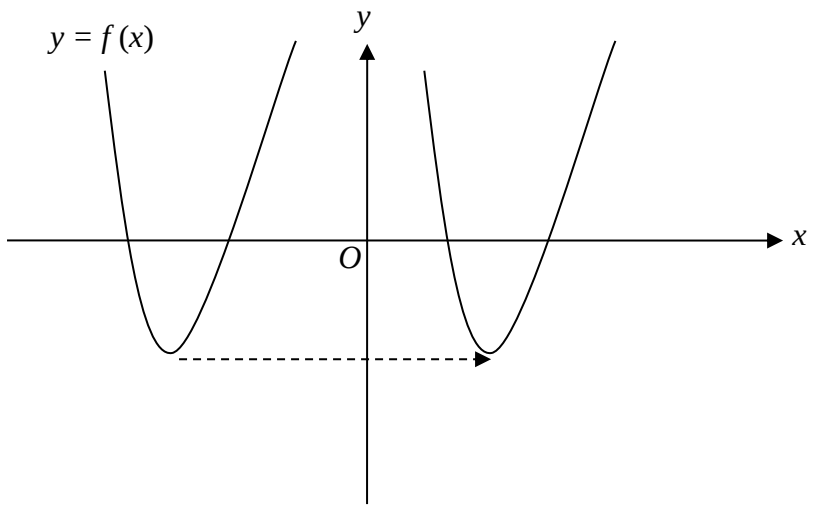
(b) The diagram below on the left shows a sketch of the graph $y = x^2$.

Sketch the graph of $y = -x^2 + 3$ on the axes on the right.
You must indicate the coordinates of the stationary point. [2]





(c) The function $f(x)$ has been translated, as shown in the diagram below. Explain why you cannot say exactly what translation was used. [1]



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23. *(a)* When Kayla shoots an arrow, the probability that she hits the target is 0·3. Each attempt is independent of any previous shot.

(i) What is the probability that she hits the target for the first time on her third attempt? [2]

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(ii) Check whether or not there is more than a 50% chance of Kayla hitting the target **once only** on her **first three** attempts. [3]

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(b) (i) A fairground game consists of removing two balls at random from a box containing 15 blue balls and 5 red balls.

A player wins the game if two red balls are removed.

John calculates that the probability of winning the game is

$$\left(\frac{1}{4}\right)^2 = \frac{1}{16}.$$

What assumption has John made for his answer to be correct? [1]

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(ii) If John's assumption was not true, what effect would this have on the probability of winning the game? [1]

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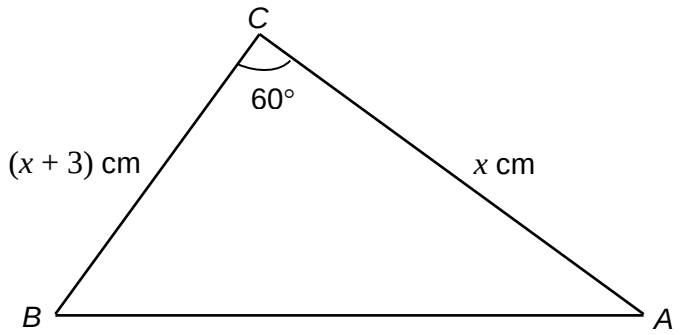
24.



The area of the triangle is $\sqrt{300}\,\text{cm}^2$.

Calculate the length of *AB*. [8]

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						0				

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3.	**4**	
4.	**4**	
5.	**2**	
6.	**11**	
7.	**3**	
8.	**5**	
9.	**4**	
10.	**2**	
11.	**5**	
12.	**3**	
13.	**2**	
14.	**5**	
15.	**6**	
16.	**4**	
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19.	**3**	
20.	**5**	
21.	**4**	
22.	**3**	
23.	**5**	
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26.	**4**	
27.	**5**	
28.	**2**	
29.	**5**	
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$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

1. From the numbers

27 13 9 10 48 8

write down

a multiple of 5, ... [1]

a prime number, ... [1]

the value of 3^3, ... [1]

$\sqrt{64}$. ..... [1]

2. *(a)* Write the number 7 500 000 in words. [1]

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(b) What is the value of the 9 in the number 239 815. [1]

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(c) Using all the digits **6 7 3 8** write down the smallest odd number. [1]

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3. Some people took part in a book quiz.
The number of points that each person scored in the quiz is shown below.

16	27	18	26	28	10	22	29
25	13	28	23	19	26	14	25
26	15	17	27	11	27	16	21
11	24	29	18	24	12	28	17

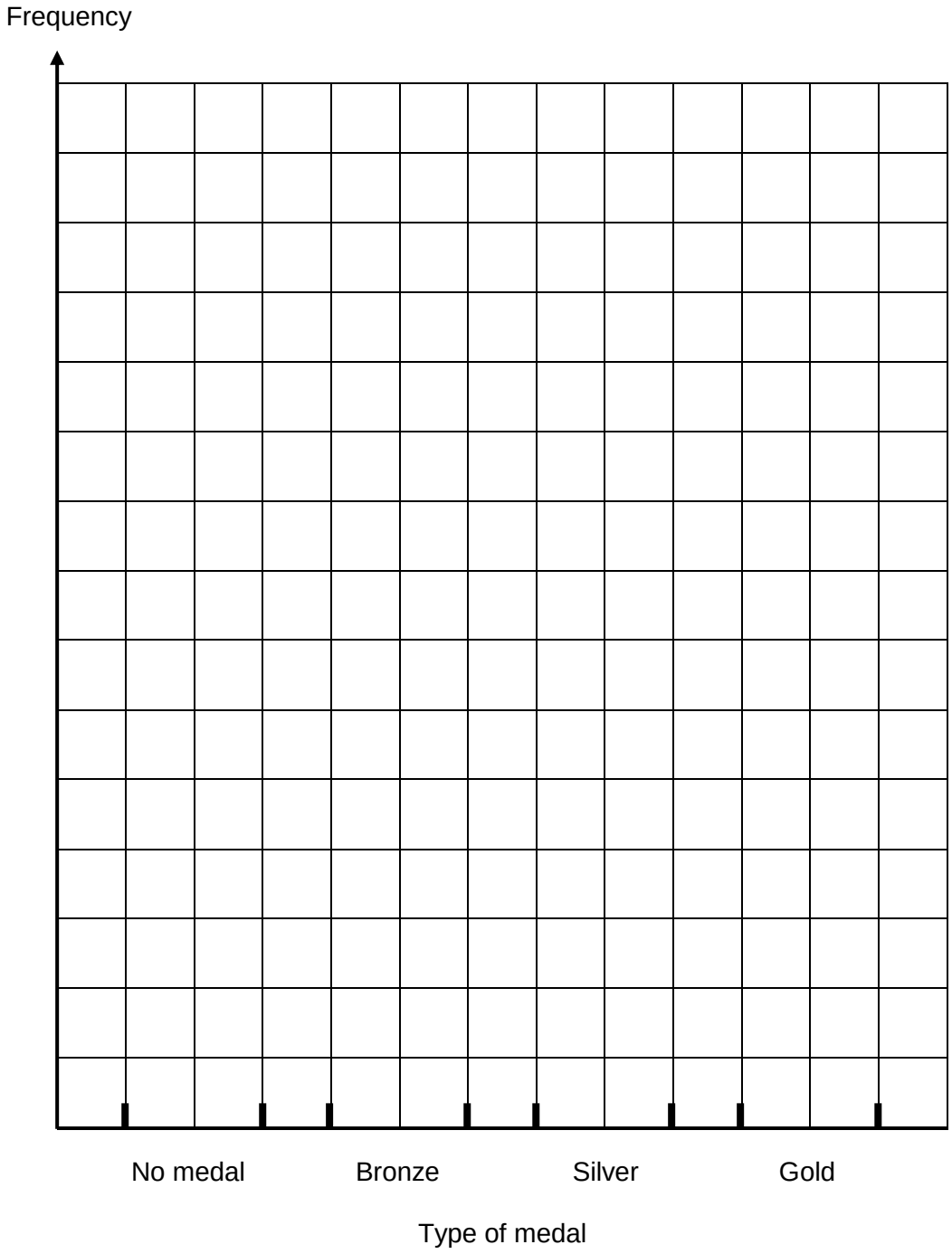
(a) A table is drawn to summarise these results and to show the number of medals that were awarded at the end of the competition.

Complete the table below.

You must make sure that all the intervals in the Points column are of equal width. [2]

Points	Number of competitors	Type of medal
10 to 14	6	No medal
15 to 19		Bronze
..... to		Silver
..... to 29		Gold

(b) Using the squared paper below, draw a suitable bar chart that shows how the medals were shared. [2]



4. *(a)* Write 2187 correct to the nearest 10. [1]

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(b) Write 54 478 correct to the nearest 1000. [1]

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(c) **Estimate** the answer to $51 \times 3{\cdot}9$. [2]

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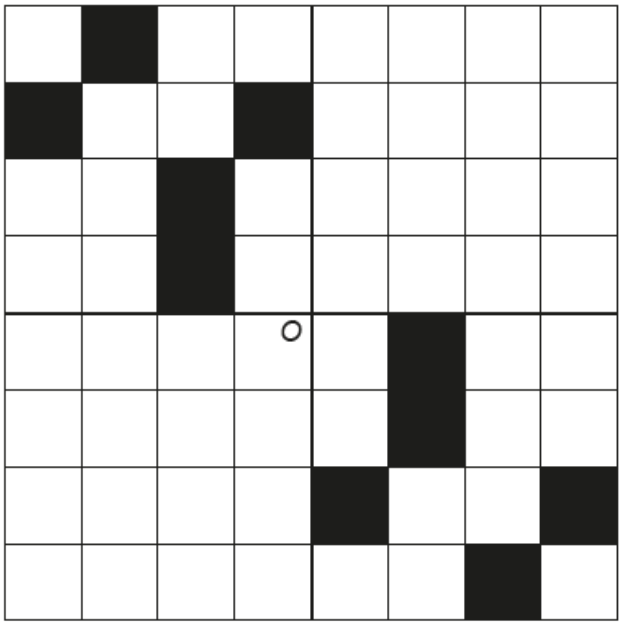
5. Draw patterns like the given ones in each of the other 2 sections, so that the completed pattern has rotational symmetry of order 4 about *O*. [2]



6. The table shows the number of cars that used a town's car park during a period of one week.

Day	Mon	Tues	Wed	Thurs	Fri	Sat	Sun	**TOTAL**
Number of cars	104	43	112	163	116	182	80	**800**

(a) How many cars used this car park during the weekend (Saturday and Sunday)? [1]

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(b) One of the days between Monday and Friday is the town's market day. On another day, between Monday and Friday, the shops are only open in the morning.

Using the information given in the table, which days do you think they are? [2]

Market day	Morning opening only

(c) The car park has space for 170 cars. Explain how it was possible for 182 cars to have used the car park on Saturday. [1]

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The charge for using this car park is displayed on the notice shown below.

CAR PARK

Monday to Friday: £2 per day
Free parking on Saturday and Sunday

(No time limit)

(d) How much money was spent on parking at this car park for the week shown in the table? [2]

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(e) The town council is considering a new system for the way it charges for parking.
The new system is

- reducing the charge to £1.50
  and
- charging this amount on all seven days of the week
  and
- allowing free parking for those who stay for less than one hour.

That week, a quarter ($\frac{1}{4}$) of the cars stayed for less than one hour.

Using this information, decide whether this new system would collect more or less money for the council.
You must show all your working. [3]

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(f) State an assumption you have made in part *(e)* and explain how your results would change if this assumption had not been made. [2]

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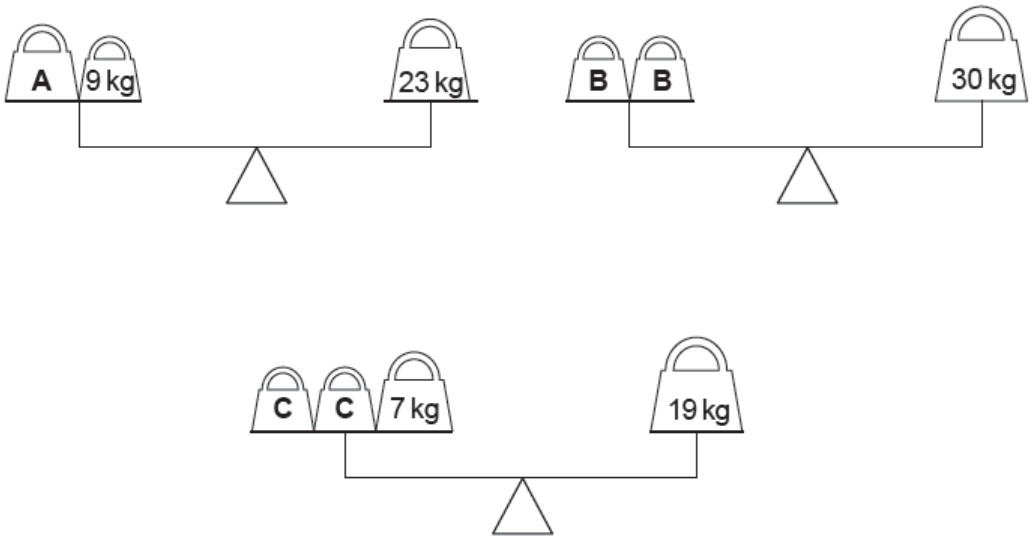
7. Each diagram represents a balance with the total weight on each side being equal. Find the values of **A**, **B** and **C**. [3]



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A = ……kg **B =** ……kg **C =** ……kg

8. Points *A* and *B* are at the end of one of the longest straight roads in the USA.

In the scale diagram below, 1 cm represents 10 km.

A ——————————————— *B*

(a) What is the actual distance between point *A* and point *B*? [3]

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(b) Would a bicycle travelling at an average speed of 40 km/h cover the distance from point *A* to point *B* in less than 2 hours?
You must explain your answer. [2]

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9. Shari was asked to buy the following items from her local shop.

Item	**Price**
Chicken curry	£2.97
Pizza	£3.04
Washing powder	£6.09
Butter	£1.47
Bread	89 pence

The shopkeeper tells Shari that the total cost is £102.23.

Shari does not think that this is correct.

(a) Show clearly how Shari could **approximate each of these prices** to convince the shopkeeper that **his total** is not correct. [3]

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(b) What mistake do you think the shopkeeper made? [1]

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10. A piece of wood is 32 cm long.
Alan wants to drill two holes in the wood at points *A* and *B,* where *AB* = 18 cm.
The distance *PA* and *QB* must be equal.

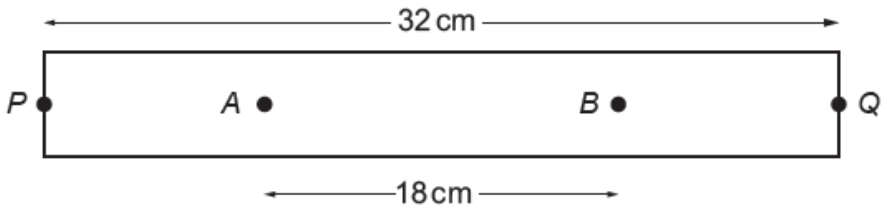

Diagram not drawn to scale

Calculate the length *PA.* [2]

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11. Simplify each of the following.

(a) $7a + 3b + 2a + 5b$ [2]

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(b) $3(y - 2)$ [1]

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(c) $3y \times 2y$ [1]

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(d) $\dfrac{y^6}{y^2}$ [1]

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12. Three identical rectangles, each measuring 7 cm by 3 cm, are placed together to make the shape shown in the diagram.

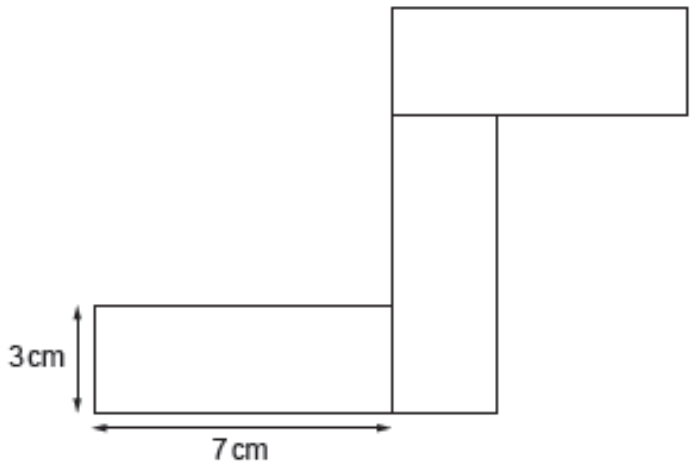

Diagram not drawn to scale

Calculate the perimeter of the shape. [3]

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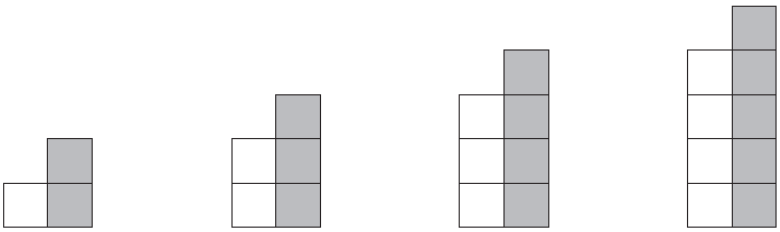
13. The following patterns have been made using shaded and unshaded squares.



Pattern 1 2 3 4

Find the **total** number of squares in pattern 60. [2]

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14. Shafira had collected £720 in a sponsored event.

She gave $\frac{1}{2}$ of the amount collected to her local youth club.

She gave 40% of the amount collected to a children's hospital.

She gave the rest of the money to a mountain rescue group.

(a) How much money did Shafira give to the mountain rescue group? [3]

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(b) What percentage of the £720 did Shafira give to the mountain rescue group? [2]

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15. Susan recorded the temperature outside her house five times on one day.
She recorded the first temperature at 7:00 a.m. and repeated the process every three hours.

The temperatures she recorded are shown in the table below.

(a) Complete the table to show the times at which she recorded the other three temperatures. [2]

Time	7:00 a.m.				7:00 p.m.
Temperature	14°C	18°C	23°C	19°C	16°C

(b) What was the range of the temperatures that Susan recorded? [1]

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(c) What was the mean of the temperatures that Susan recorded? [2]

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(d) Explain why the answers you have found may not be the correct mean and range of the temperature for the whole time between 7:00 a.m. and 7:00 p.m. [1]

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16. The diagram below shows a sign that needs to be painted.

Paint, worth a total of £60, can cover an area of $18\,m^2$.

How much would it cost to paint the sign below using this paint? [4]

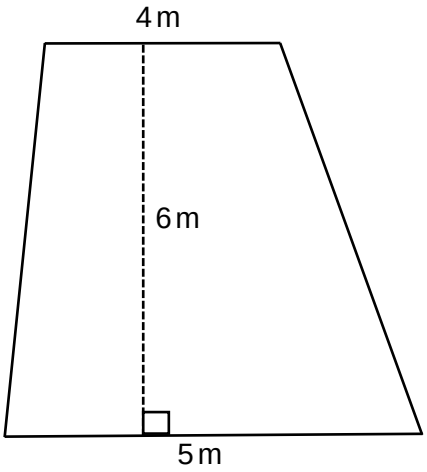

Diagram not drawn to scale

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17. In the diagram below, *ABD* is a straight line.
$A\hat{C}B = 80°$ and $C\hat{B}D = 130°$.
Show that triangle *ABC* is an isosceles triangle.
You must explain your reasoning. [4]

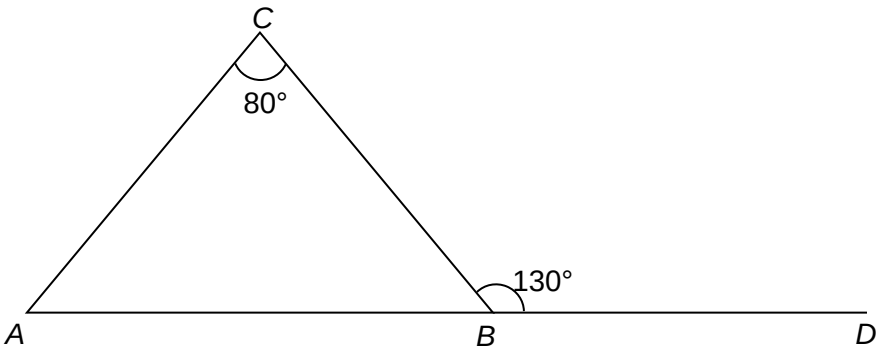

Diagram not drawn to scale

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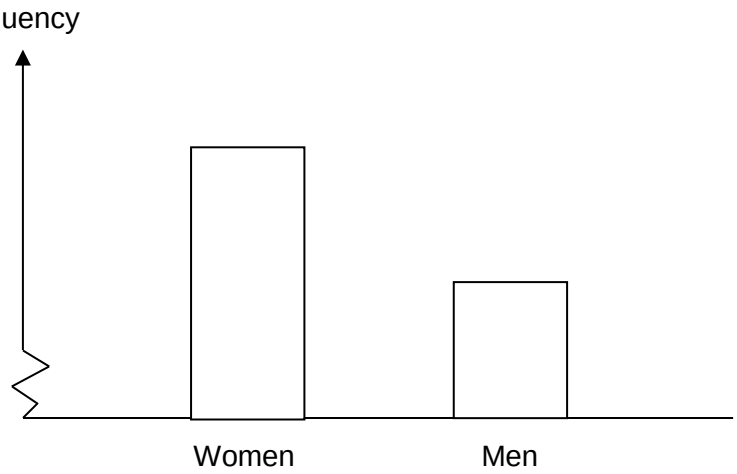
18. *(a)* Explain why the statements that accompany each of the following diagrams in a newspaper may not be true.
Your comments should be based on the diagrams and not on your personal opinion.

(i) Taken from an item about accidents in the home. [1]



'Twice as many women as men have accidents in the home.'

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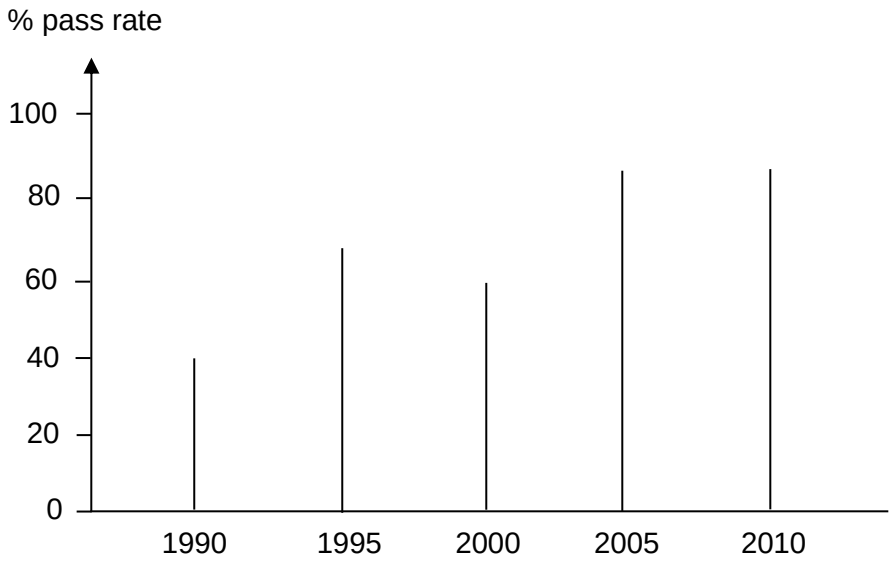
(ii) Taken from an item about a school's examination percentage pass rates. [1]



'The percentage pass rate has remained constant between 2005 and 2010'

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(b) Is the following statement true or false?
You must give a full explanation for your decision. [1]

'Every whole number that ends in a 3 is a prime number'.

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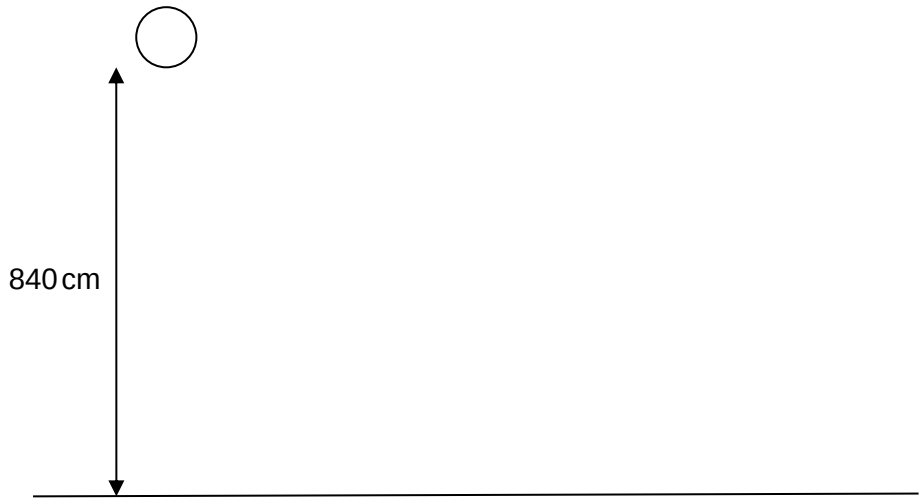
19. A ball is dropped from a height of 840 cm onto a floor.
After each bounce it rises to a height that is half of the distance it has just fallen.



After how many bounces will the ball fail to reach a height of 1 m for the first time?
You must show all your working. [3]

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20. The areas of two rectangles A and B are in the ratio 1 : 3 respectively.
Rectangle A measures 4 m by 3 m.

(a) (i) Give a possible pair of values for the length and width of rectangle B. [3]

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Length = ... Width = ...

(ii) Give a **different** possible pair of values for the length and width of rectangle B. [1]

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Length = ... Width = ...

(b) Are the two rectangles you have identified in part *(a)* **similar**?
You must give a reason for your answer. [1]

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21. Last year, there were 36 pupils in a class.
Of these pupils, 20 studied French, 9 studied German and 3 studied both French and German.

A pupil was chosen at random from the class.
Find the probability that the pupil did not study French or German. [4]

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22. Factorise the following expressions.

(a) $6x^2 + 8x$ [2]

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(b) $x^2 - 100$ [1]

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23. Amir buys 10 bags of daffodil bulbs at a total cost of £24.

A label on each bag states that it contains between 30 and 40 bulbs.

Amir states that the cost per single daffodil is 8p.

(a) Explain how Amir reached this conclusion.
You must show working to support your answer. [2]

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(b) What could have been the lowest cost per single daffodil bulb that Amir paid? [2]

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(c) Using your answers to parts *(a)* and *(b)*, write down what conclusion can be made about the cost of a single daffodil bulb. [1]

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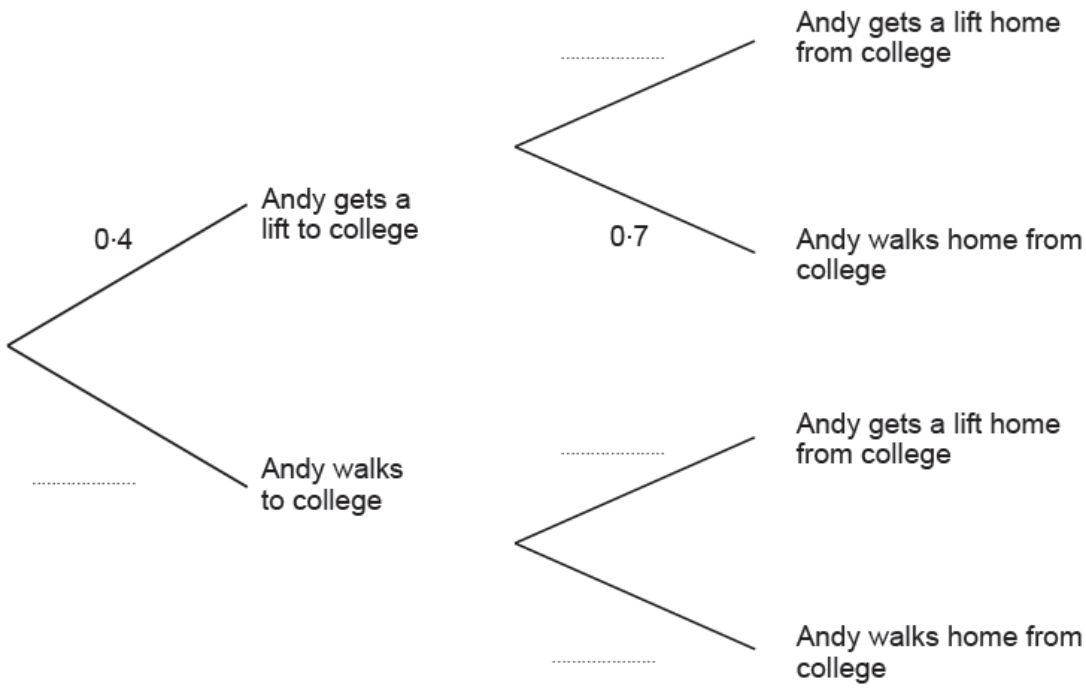
24. Andy sometimes gets a lift to and from college.
When he does not get a lift he walks.
The probability that he gets a lift to college is 0·4.
The probability that he walks home from college is 0·7.
Getting to college and getting home from college are independent events.

(a) Complete the following tree diagram. [2]



(b) Calculate the probability that Andy gets a lift to college and walks home from college [2]

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(c) Calculate the probability that Andy **does not** get a lift to or from college. [2]

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25. Cherry Blossom paint is made by mixing red and white paint in a certain ratio.
4 litres of **red** paint is used to make 9 litres of Cherry Blossom paint.
The diagram below shows the relationship between the amount of red paint and the amount of white paint needed to make Cherry Blossom paint.

Write down the correct scale on the 'Amount of red paint (litres)' axis.
You must put a value on each of the dotted lines on the axis.
You must show all your working to support your answer. [4]

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26. Alex bought 3 tins of paint and 4 brushes at a total cost of £23.
Brian bought 2 tins of paint and 3 brushes at a total cost of £16.

Using an algebraic method, calculate the price of a single tin of paint and the price of one brush.

[4]

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The price of a single tin of paint = ……

The price of one brush = ……..

27. Peter decides to cover the floor of a room with a striped carpet.
A shop sells this striped carpet from a roll that is 3 m wide at a price of £25 per metre length.

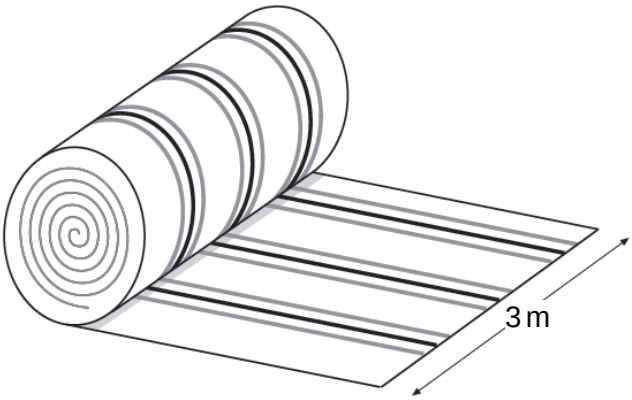

Diagram not drawn to scale

His floor is rectangular in shape with length 13 m and width 8 m.

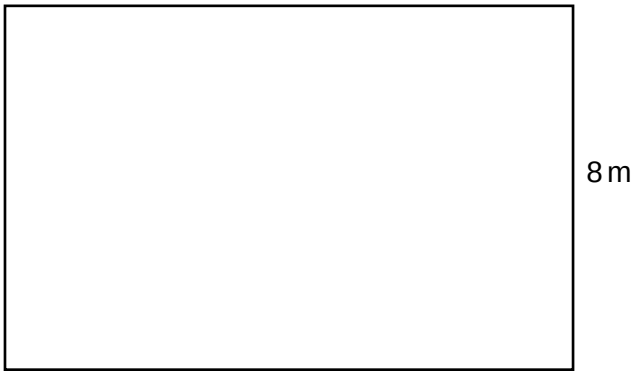

Diagram not drawn to scale

The carpet is laid to ensure that the stripes on the carpet are parallel to two of the sides of the room and lie in one direction only.

Find the cost of the cheapest way of covering the floor, and state by how much it is cheaper.
Show all your working. [5]

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28. Find, in standard form, the value of $(3 \times 10^2) \times (5 \times 10^6)$. [2]

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29. A building company used 24 workers to prepare a building site.
The site measured 30 acres and the work was completed in 10 days.

(a) The company is asked to prepare another site measuring 45 acres.
This work has to be completed in 15 days.
Calculate the least number of workers the company should employ for this work. [3]

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(b) State one assumption you have made in your answer to part *(a)*.
How would your answer to part *(a)* change if you did not make this assumption? [2]

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Candidate Name	Centre Number					Candidate Number				
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GCSE MATHEMATICS

COMPONENT 2

Calculator-Allowed Mathematics

Higher Tier

SPECIMEN PAPER

2 hours 15 minutes

ADDITIONAL MATERIALS
A calculator will be required for this examination.
A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES
Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided in this booklet.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**3**	
3.	**5**	
4.	**5**	
5.	**4**	
6.	**5**	
7.	**4**	
8.	**6**	
9.	**5**	
10.	**4**	
11.	**3**	
12.	**9**	
13.	**6**	
14.	**5**	
15.	**4**	
16.	**3**	
17.	**6**	
18.	**6**	
19.	**7**	
20.	**7**	
21.	**4**	
22.	**9**	
23.	**6**	
TOTAL	**120**	

Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

$$\text{Curved surface area of a cone} = \pi rl$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

1. *(a)* In an election, Stella gained 28 416 votes out of a total of 38 400 votes.
Write 28 416 as a percentage of 38 400. [2]

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(b) Jake needs to find a selling price which is 12% more than £766.
Find the selling price. [2]

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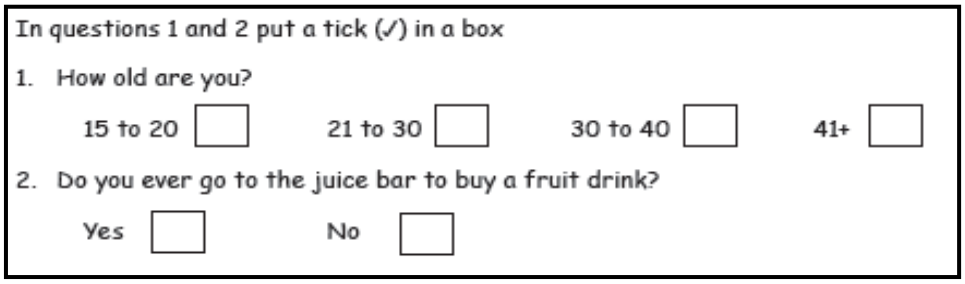
2. A survey is carried out by asking people questions as they come out of a juice bar.

A section of the questionnaire is shown below.



(a) Explain why this is a biased survey. [1]

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(b) State two criticisms of the design of question 1. [2]

First criticism of question 1:

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Second criticism of question 1:

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3. The diagram shows a square.
All the lengths are measured in centimetres.

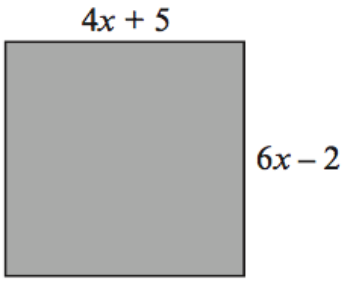

Diagram not drawn to scale

Use an algebraic method to find the length of one side of the square. [5]

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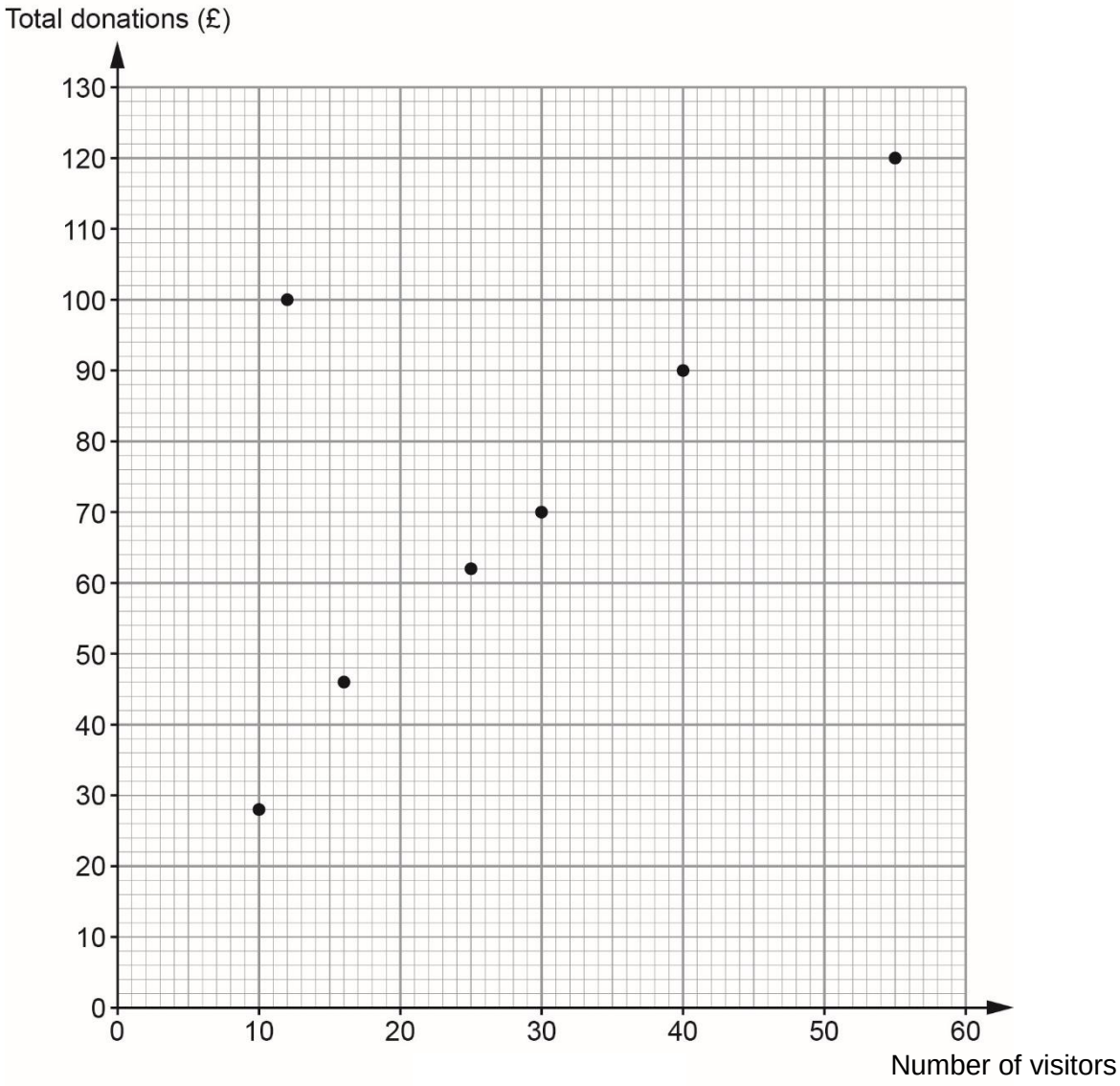
4. The number of visitors to an animal rescue centre and the total donations received were recorded every day for 7 days.
The table and scatter diagram below show the results.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of visitors	40	10	16	30	25	55	12
Total donations (£)	90	28	46	70	62	120	100



(a) Draw, by eye, a line of best fit on your scatter diagram. [1]

(b) Describe the relationship between the number of visitors and the total donations. [1]

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(c) Which particular day does not fit the relationship? [1]

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(d) The animal rescue centre manager says:

"If we have 35 visitors to the centre next Wednesday we will definitely receive £80 in donations."

(i) Explain how the manager may have come to this conclusion? [1]

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(ii) Is the manager's statement correct?
You must give a reason for your answer. [1]

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5. *(a)* Solve $\frac{3}{x} = 12$. [1]

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(b) Solve $9x - 4 = 7(x + 2)$. [3]

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6. *(a)* Find the nth term of the sequence 6, 13, 20, 27, … [2]

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(b) In a sequence of four numbers, the difference between each number is 7.
The sum of the four numbers is 6.
What are the numbers in the sequence?
You must show all your working. [3]

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7. A man is working out the height of a vertical tree.
The man is able to measure the angle of elevation of the top of the tree from his measuring instrument.
The measuring instrument is 1·8 m above ground level.
When the man is standing 19 m from the base of the tree, the angle he measures is 56°.

A sketch of this situation is shown below.

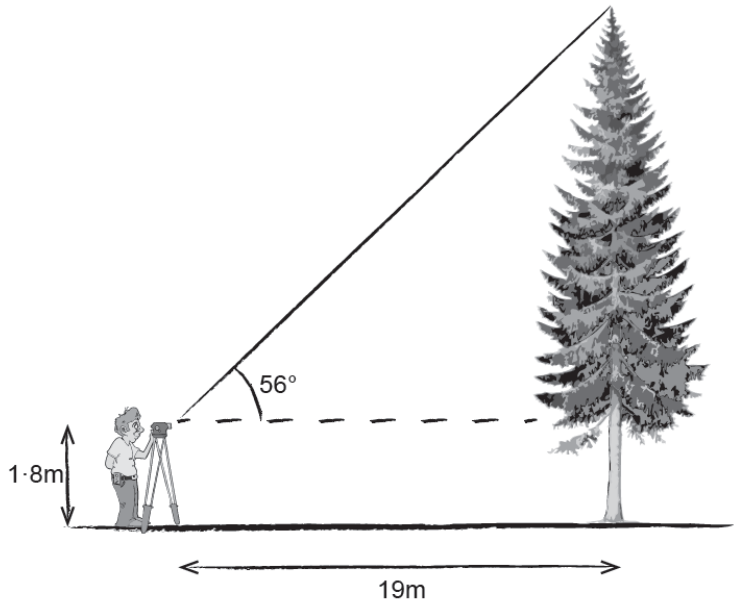

Diagram not drawn to scale

Calculate the full height of the tree. [4]

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8. *(a)* When visiting a hat shop, each customer had the circumference of their head measured.
The table shows the results for the customers who bought a hat during December.

Head circumference, c (cm)	Number of customers
$50 \leq c < 54$	12
$54 \leq c < 58$	32
$58 \leq c < 62$	14
$62 \leq c < 66$	2

Calculate an estimate for the mean head circumference. [4]

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(b) The hat shop sells 4 different sizes of hats.
The conversion table from head circumference to hat size is shown below.

Head circumference, c (cm)	Hat size
$50 \leq c < 54$	1
$54 \leq c < 58$	2
$58 \leq c < 62$	3
$62 \leq c < 66$	4

A salesman places an order for new stock for the hat shop.
The salesman's order form shows that about half of the hats ordered are size 2.
The owner of the shop says the order should show that about a quarter of the hats ordered are size 2.
Who is more likely to be correct, the salesman or the owner of the shop?
You must give a reason for your answer. [2]

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9. In an experiment, the mass added to the end of a vertical spring is gradually increased.

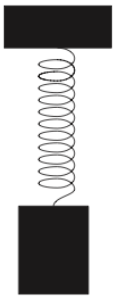
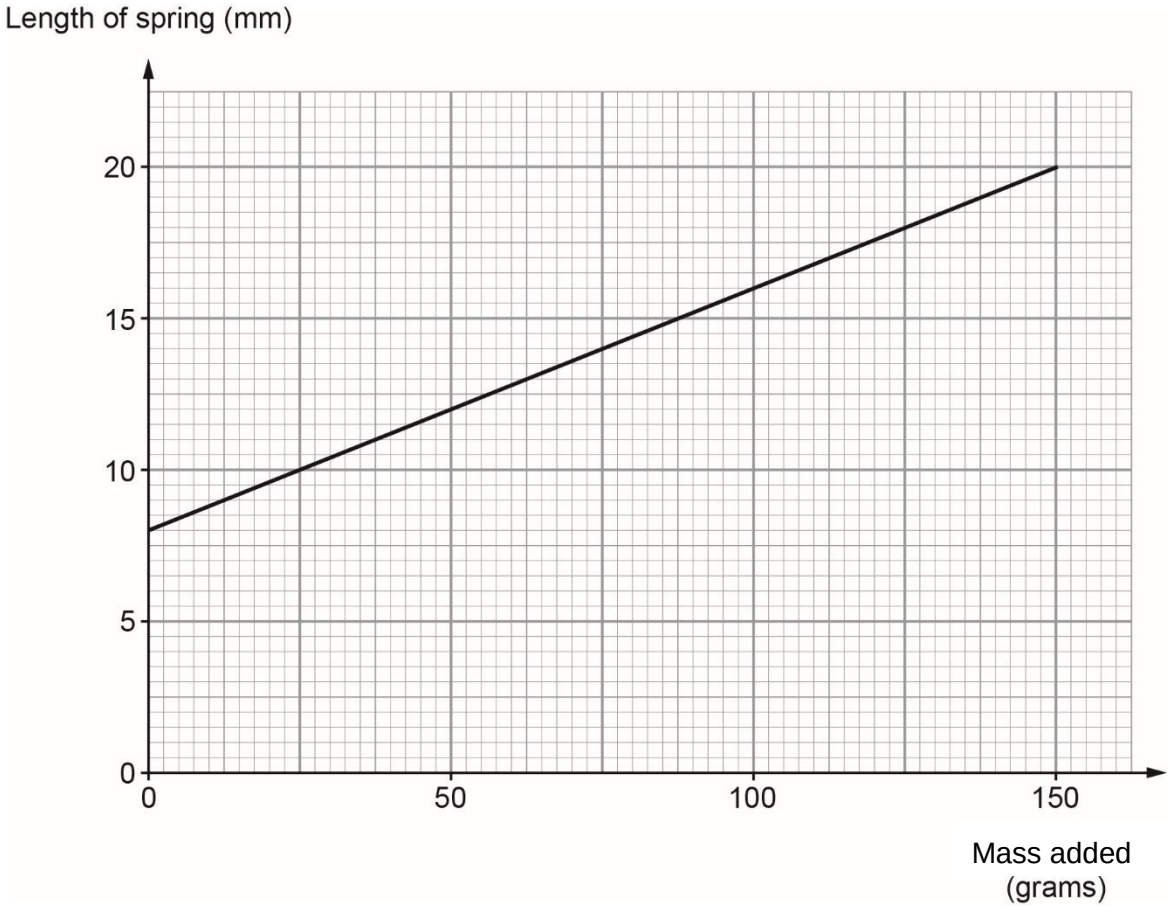


Diagram not drawn to scale

At the end of the experiment, a computer produced the graph shown below.



(a) Write down the length of the spring without any mass added. [1]

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(b) (i) Calculate the gradient of the straight line drawn on the graph. [2]

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(ii) Explain what the gradient of this graph tells you in relation to the experiment.

[1]

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(c) The straight line stops before the right-hand edge of the graph paper. Why do you think this might be?

[1]

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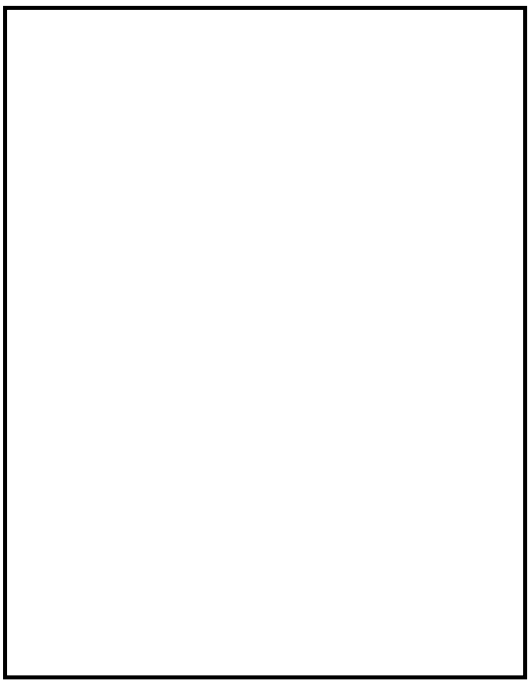
10. A statue is on display inside a glass cabinet.
A scale drawing of the plan view (bird's eye or aerial view) of the cuboid is shown below.

Scale 1 cm : 20 cm

A barrier is built around the cuboid so that no one can stand within 60 cm of the cuboid.
Using the given scale, draw accurately the barrier on the scale drawing shown below. [4]



11. The village of Sumston is organising a Spring Fayre to raise money for the local community centre.

(a) In the 'lucky dip', everyone wins either a toy or a pen or a pencil.
The probabilities of winning the different prizes are given in the following table.

Prize	Toy	Pen	Pencil
Probability	x	$3x$	$16x$

Find the value of x. [2]

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(b) In the raffle, a free second ticket is given with every ticket bought.

Stephen thinks this offer will double his chance of winning a prize.
Is Stephen correct?
You must explain your answer. [1]

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12. Laura has her own car.

During April
- Laura drove a total distance of 560 miles in her car.
- For each gallon of petrol, Laura's car travelled 37·8 miles.
- Petrol cost £1.48 per litre.
- Laura spent 10 hours 45 minutes driving her car.

(a) 1 gallon is approximately 4·55 litres.
Calculate the cost of petrol that Laura used during April.

You must show all your working. [5]

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(b) Select which of the following best describes the roads on which Laura travelled during April.
You must show working to support your answer.
You must give a reason for your answer. [4]

A. Mainly small narrow country lanes

B. Mainly inner city roads with lots of traffic lights

C. Mainly motorways and dual carriageways

D. Mainly roads with speed limits of 30 mph

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Reason:

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13. *(a)* During an experiment, a scientist notices that the number of bacteria **halves** every **second**.
There were $2{\cdot}3 \times 10^{30}$ bacteria at the start of the experiment.
Calculate how many bacteria were left after 5 seconds.
Give your answer in standard form correct to two significant figures.

[3]

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(b) In a different experiment the number of bacteria is reduced by a quarter each second. On this occasion the number of bacteria initially was x.

Write a formula to calculate the number of bacteria, r, remaining after t seconds.

[3]

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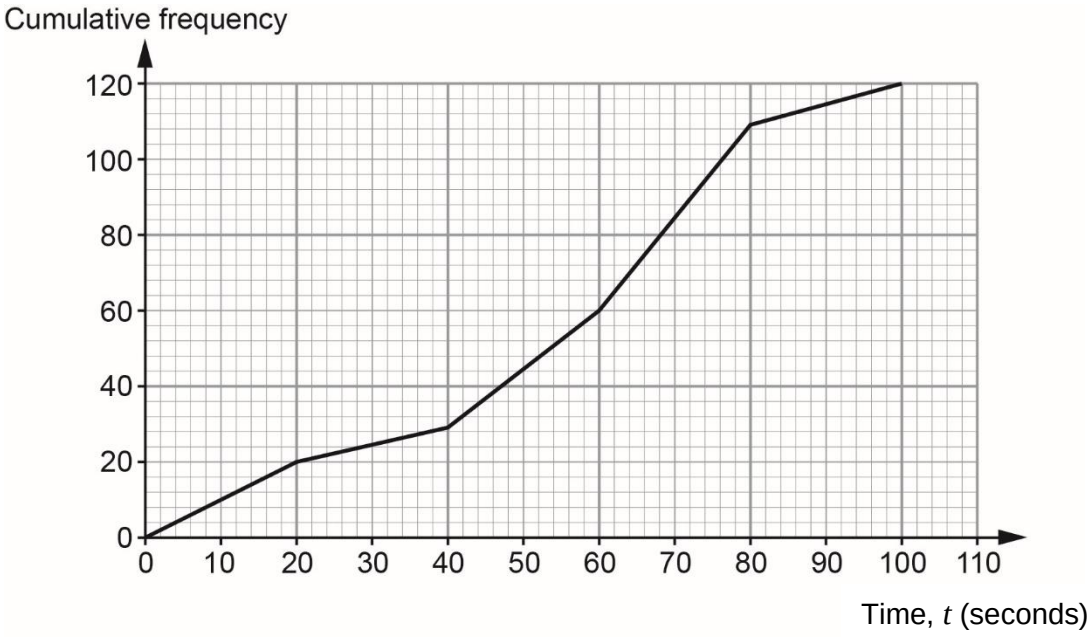
14. The times taken by customer service operators to answer 120 telephone calls are illustrated in the cumulative frequency diagram shown below.



(a) Calculate an estimate for the percentage of telephone calls that were answered within 50 seconds.

[2]

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(b) The customer service team was given a target to answer 80% of the telephone calls within 70 seconds.
Did the team meet their target?
Give a reason for your answer and state any assumption you have made when calculating your answer.
You must show all your working. [3]

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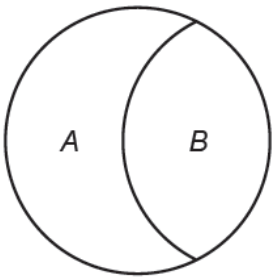

Diagram not drawn to scale

The diagram shows a circle split into two regions: A and B.

The ratio of the areas of the regions *A* and *B* is 2 : 3.
The radius of the circle is 1·5 cm.

Calculate the area of region *A*. [4]

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16. Use the formula method to solve the equation $2x^2 + 3x - 3 = 0$.
Give your solutions correct to two decimal places.

[3]

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17. The inside of a large industrial container has a height of 3 metres, measured correct to the nearest 10 cm.
It is used to hold a single stack of flat metal plates.
Each metal plate has a thickness of 4 centimetres, measured correct to the nearest millimetre.

(a) Find the greatest possible number of these plates that could be stacked in the container.

[3]

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(b) Damian states that it may not be possible to stack 73 of these plates in the container.
Show that Damian is correct.

[3]

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18. *(a)*

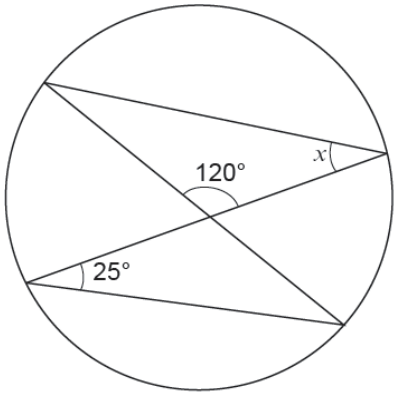

Diagram not drawn to scale

Calculate the size of the angle marked x.
You must give a reason for your answer. [2]

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(b) The diagram shows a circle with centre *O*.
The tangent *PT* touches the circle at *C*.
The reflex angle at the centre of the circle is 280°.

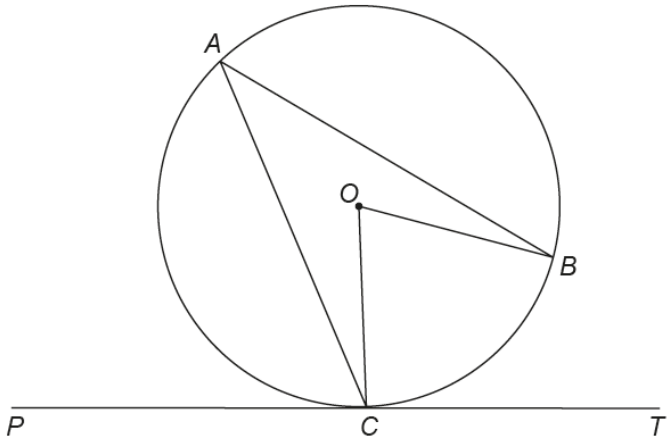

Diagram not drawn to scale

Find the size of $B\hat{A}C$.
You must give a reason for your answer. [2]

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(c) The points *A, B* and *C* lie on the circumference of a circle.
The straight line *PBT* is a tangent to the circle.
$C\hat{B}P = x$, where x is measured in degrees.

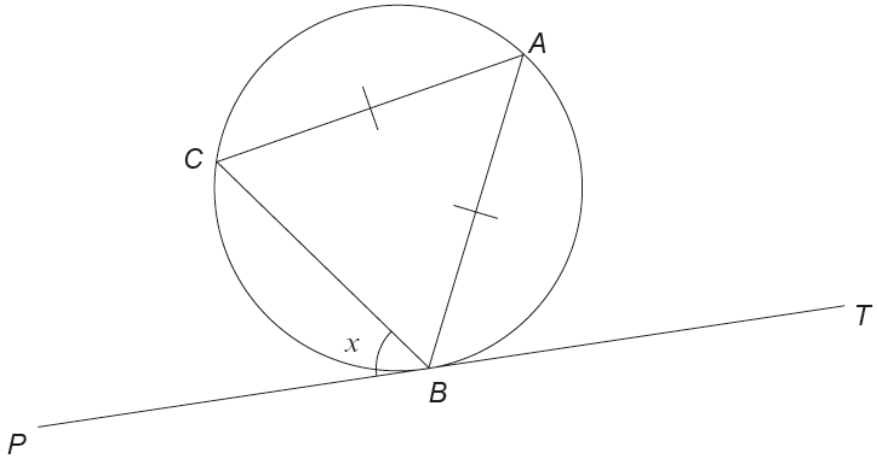

Diagram not drawn to scale

Show that the size of $A\hat{B}C$ in degrees is $90 - \frac{1}{2}x$.

You must give reasons for each step of your answer. [2]

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19. A cylinder is made of bendable plastic.
A dog's toy is made by bending the cylinder to form a ring.

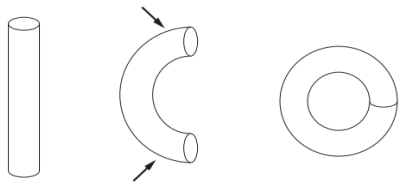

Diagram not drawn to scale

The inner radius of the dog's toy is 8 cm.
The outer radius of the dog's toy is 9 cm.

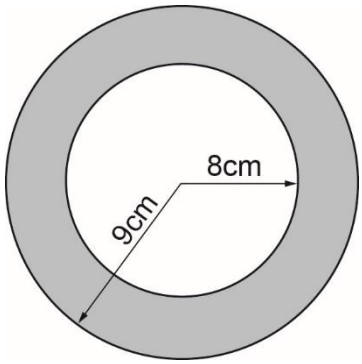

Diagram not drawn to scale

Calculate an approximate value for the volume of the dog's toy.
State and justify what assumptions you have made in your calculations and the impact they have had on your results.

[7]

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20. A pebble is thrown vertically upwards.
It has an initial speed of u metres per second.
The pebble reaches a maximum height of h metres, before falling vertically downwards.
It is known that h is directly proportional to u^2.

When the pebble is thrown with an initial speed of 10 m/s it reaches a maximum height of 5 m.

(a) Calculate the maximum height reached when the pebble is thrown with an initial speed of 12 m/s.

[5]

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(b) Find the initial speed of the pebble if the maximum height reached is 16 m.

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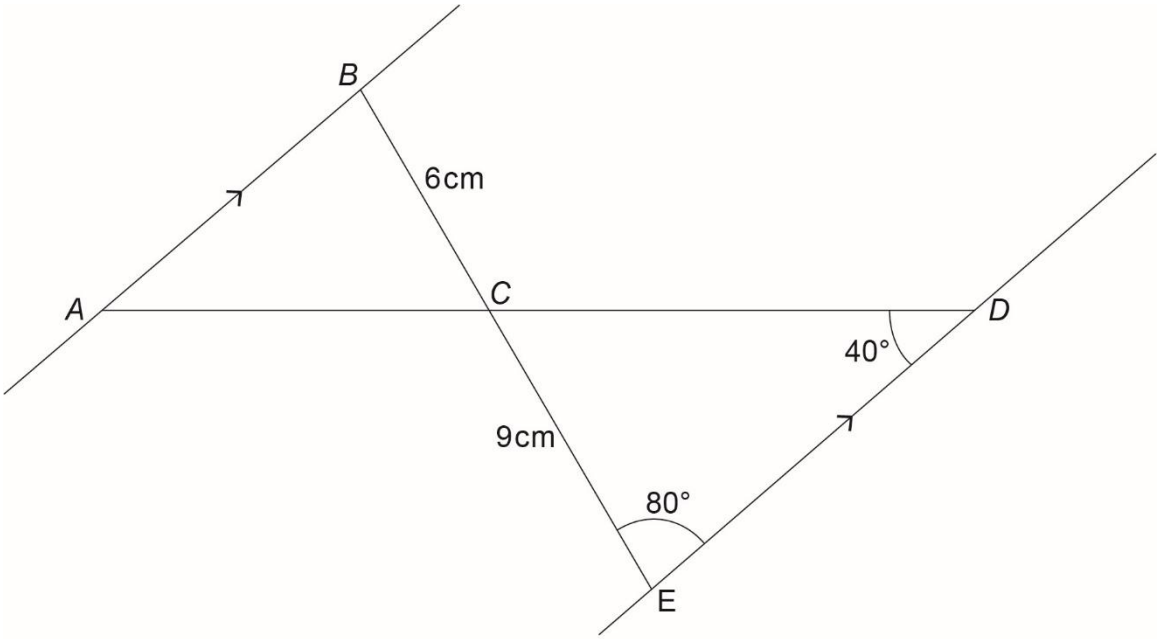

Diagram not drawn to scale

Given that *AB* is parallel to *ED,* calculate the length of *AB*. [4]

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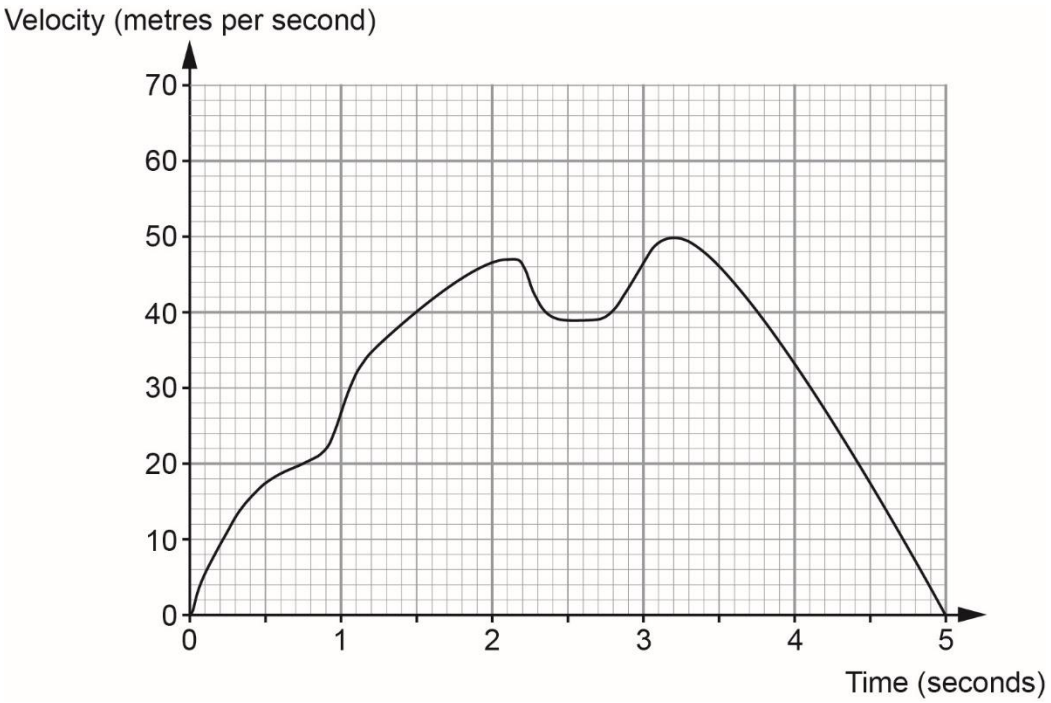
22. An engineer carried out an experiment.
He recorded the velocity of a particle during the first 5 seconds of the experiment.



(a) Calculate the acceleration of the particle at 3 seconds.
You must state the units of your answer.

[4]

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(b) Calculate an estimate for the distance travelled by the particle in the 5 second period. [4]

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(c) Suggest how you could improve the method you used in *(b)* to find a more accurate approximation of the actual distance travelled? [1]

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23. The functions $f(x)$ and $g(x)$ are given by the following:

$$f(x) = 2x$$
$$g(x) = 3 + 2x$$

(a) Calculate the value of $gf(4)$. [2]

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(b) Solve the equation $fg(x) = 14$. [4]

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Candidate Name	Centre Number					Candidate Number				
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GCSE MATHEMATICS

COMPONENT 2

Calculator-Allowed Mathematics

Foundation Tier

SPECIMEN PAPER

2 hours 15 minutes

ADDITIONAL MATERIALS
A calculator will be required for this examination.
A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES
Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided in this booklet.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**2**	
3.	**2**	
4.	**3**	
5.	**2**	
6.	**4**	
7.	**2**	
8.	**6**	
9.	**4**	
10.	**3**	
11.	**3**	
12.	**2**	
13.	**5**	
14.	**5**	
15.	**5**	
16.	**5**	
17.	**4**	
18.	**5**	
19.	**4**	
20.	**6**	
21.	**3**	
22.	**4**	
23.	**7**	
24.	**3**	
25.	**5**	
26.	**2**	
27.	**6**	
28.	**4**	
29.	**4**	
30.	**4**	
TOTAL	**120**	

Formula list

Area and volume formulae

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

$$\text{Curved surface area of a cone} = \pi rl$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

1. (*a*) Lisa buys the following items from an online music store.

Complete her bill. [3]

Item	Cost
10 badges at 85p each	£
3 T-shirts at £7.95 each	£
20 blank CDs at £2.49 per pack of 5	£
Total	£

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(*b*) The online store gives free delivery when the total cost is £50 or over.
How much more does Lisa need to spend to get free delivery? [1]

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(*c*) The music store also has a special offer on music-video downloads.

Download one music-video for £1.99

SPECIAL OFFER TODAY

3 for the price of 2

What is the cost of 9 music-video downloads with this special offer? [2]

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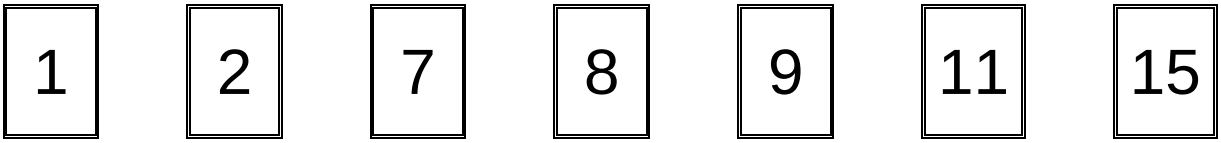
2. Circle the numbers that are multiples of **both** 3 **and** 4. [2]

10 **11** **12** **13** **14** **15**

16 **17** **18** **19** **20**

21 **22** **23** **24**

3. Seven numbered cards are placed face down.



One card is chosen at random.
What is the probability that the card chosen will have:

(a) an odd number? [1]

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(b) a number greater than 8? [1]

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4. In a school, $\frac{3}{5}$ of the pupils are girls.
There are 390 girls in the school.

Calculate the total number of pupils in the school. [3]

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5. A square *ABCD* has sides of length 5 units.
Find the coordinates of point *C*.

[2]

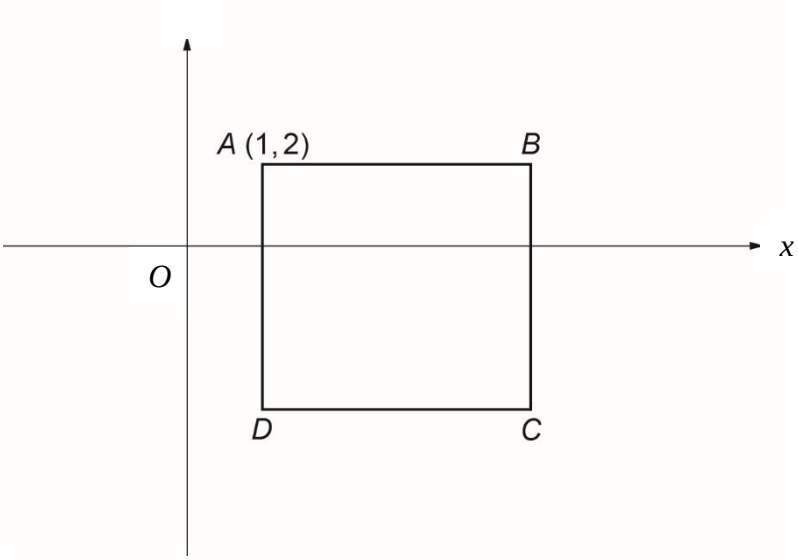

Diagram not drawn to scale

Coordinates of *C* = (…….. , ……)

6. Charlie has x pens.
Lisa has 3 more pens than Charlie.
Julian has twice as many pens as Lisa.
How many pens do Charlie, Lisa and Julian have altogether?
Simplify your answer as far as possible. [4]

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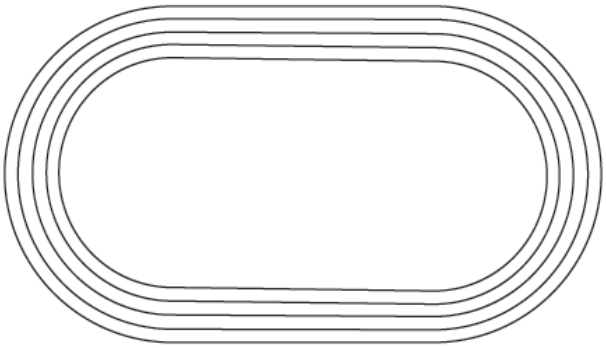

A single lap of an athletics track is 400 metres.
How many laps will a person run in a two kilometre race? [2]

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8.

A fashion store buys 200 bracelets for £6.30 each.
The store sells 60% of the bracelets for £10 each.
The remaining bracelets are later sold at a reduced price of £4 each.
How much profit or loss did the fashion store make?
You must show all your working. [6]

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9. *(a)* Solve $4x = 16.$ [1]

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(b) Solve $\frac{y}{5} = 4.$ [1]

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(c) Solve $5a - 8 = 17.$ [2]

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10. Angela plays netball for her local team.
The number of goals she has scored in her first seven games is 3, 4, 5, 5, 6, 8 and 9.

(a) Explain why the mode is 5. [1]

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(b) Angela's coach thinks that it is possible for Angela to achieve a median of 6 and a range of 7 after two more games are completed.
Give a possible number of goals scored in each of the next two games that would allow Angela to achieve this.
[2]

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11. Using the formula below, find the value of k when $p = 50$ and $q = 10$.
You must show all your working. [3]

$$2q = p - 10k$$

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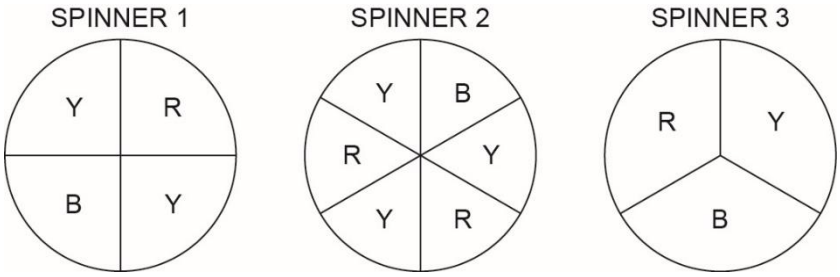
12. Kyle and Ethan play a game using a spinner.
A player wins when the spinner stops on their chosen colour.
A player can choose from the colours Yellow (Y), Black (B) or Red (R).
Kyle always chooses Red.
Ethan always chooses Yellow.

Which of the following spinners should Ethan choose so that he has the greatest chance of beating Kyle?
Give a reason for your answer.

[2]



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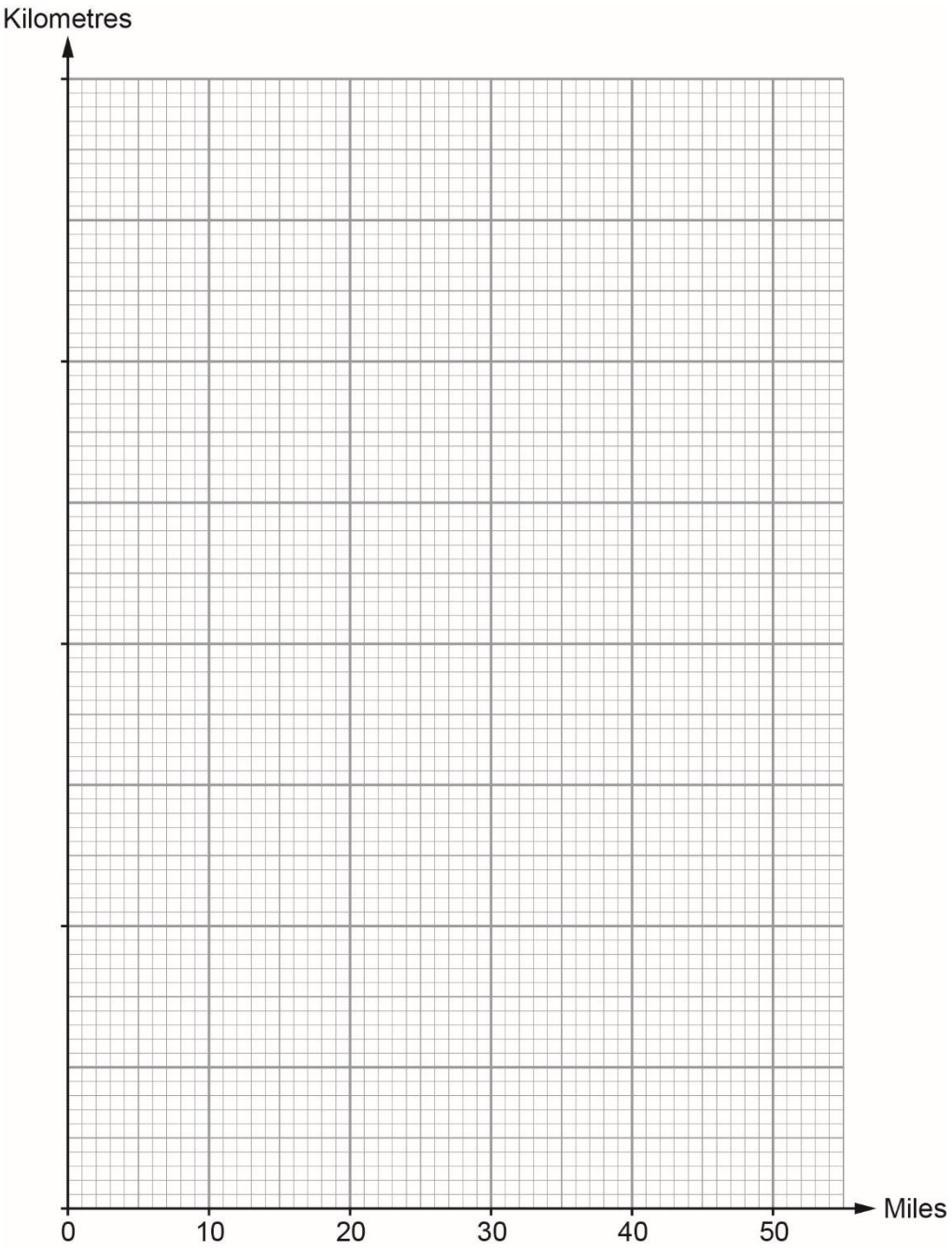
13. Martin prefers to measure distances in kilometres rather than miles.
The following table shows the number of miles and the number of kilometres for each of three distances.

Miles	5	30	42·5
Kilometres	8	48	68

(a) Use the data in the table to draw a conversion graph. [3]



(b) The distance between Martin's house and his favourite bicycle shop is 70 miles.

Explain how he can use the graph to find this distance in kilometres.

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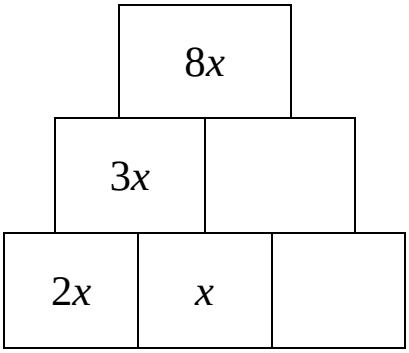
Complete the following sentence:

70 miles is approximately **.....** km.

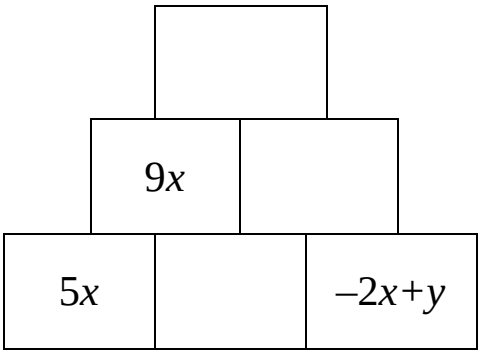
[2]

14. To fill in a block, you must add the values on the two blocks directly below it.
Some values are already displayed.
Fill in the empty blocks.
You must simplify your answer.

(a) [2]



(b) [3]



15. On 1 January 2014, Jasmine weighed 84 kg and was overweight for her height.
By eating healthy food and exercising she lost 6% of her body weight during the first three months of 2014.
Her weight then remained the same for the next two months.
During June, Jasmine cycled every day and, by doing so, she lost 2·8% of her April body weight.

(a) Calculate Jasmine's body weight at the end of June. [3]

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(b) What percentage of her original body weight did Jasmine lose in these six months?

[2]

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16. On an island there are two companies that hire out fishing boats to visitors.

Fishing Boats R Us
Hire charges
£45 for first hour then £30 per hour (or part of an hour)

Ocean Blue Boats
Hire charges
£32 per hour (or part of an hour)

Robert wants to hire a boat to go fishing with his friends.
He needs the boat from 9:15 a.m. to 5:30 p.m.
Which company would you advise Robert to use?
Show all your working and a give a reason for your answer.

[5]

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17. Faizal has £400.

He spends $\frac{1}{4}$ of it on rent and $\frac{2}{5}$ of it on food.

What fraction does he have left?

Write your answer in its simplest terms.

[4]

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18. *(a)* What percentage is £95 of £250? [2]

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(b) The total cost of 6 copies of a magazine and 4 copies of a newspaper is £29.04.
The magazines cost £4.12 each.
Find the cost of one newspaper. [3]

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19. A cuboid with length 45 cm, width 20 cm and height 35 cm is completely filled with water.
The water is then poured into a larger cuboid with length 100 cm and width 15 cm.
Calculate the height of the water in the larger cuboid.
Show all your working.

[4]

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20. A team of examiners has 48 000 examination papers to mark.
It takes each examiner 1 hour to mark approximately 16 papers.

(a) The chief examiner says that a team of 25 examiners could mark all 48 000 papers in 8 days.
What assumption has the chief examiner made?
You must show all your calculations to support your answer. [4]

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(b) Why is the chief examiner's assumption unrealistic?
What effect will this have on the number of days the marking will take? [2]

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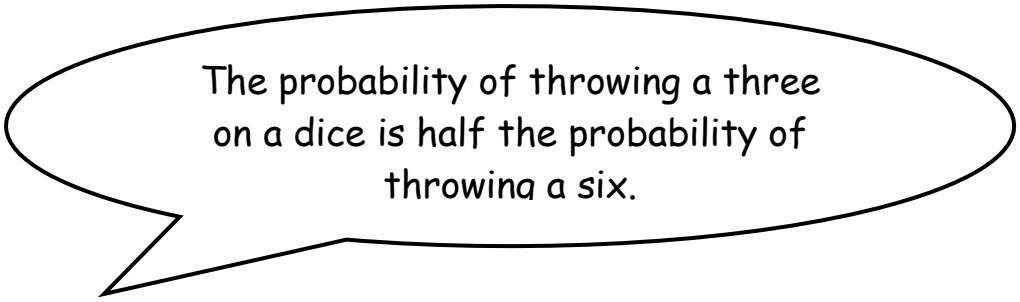
21. Nancy makes two statements about the probability of events based on throwing fair dice.

For each of her statements below, decide whether or not Nancy is correct.
You must explain your decisions **using probabilities**.



Is Nancy correct? .....

Explanation:

[1]

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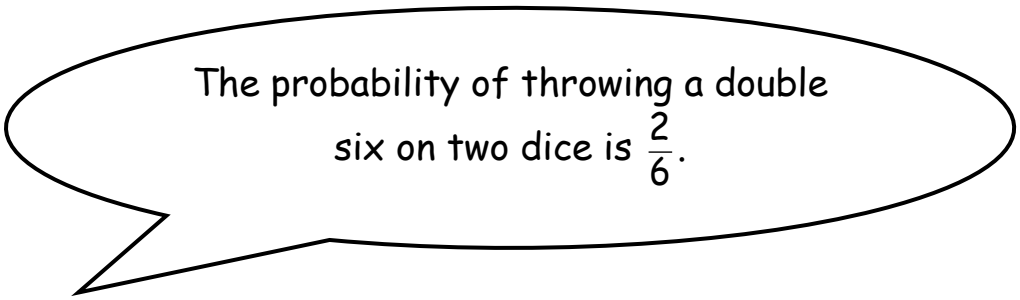

Is Nancy correct? .....

Explanation:

[2]

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22. Complete the table below.

Original amount	After a decrease of	
	40%	2%
£ ……..….	£492	£ ……..….

[4]

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23. Eliza makes this **sketch** of a pond.

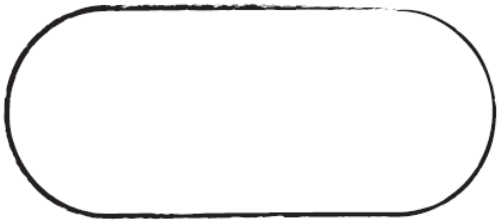

Diagram not drawn to scale

The shortest distance across the pond is 6 m.
The longest distance across the pond is 20 m.

Eliza estimates that the surface area of the pond is 120 m^2.

(a) Explain how Eliza arrived at her estimate. [2]

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(b) **Calculate** an estimate for the surface area of the pond that would be more accurate than Eliza's estimate.
Explain how you have decided to calculate your estimate.
You must justify your decision.
Show all of your working.
[5]

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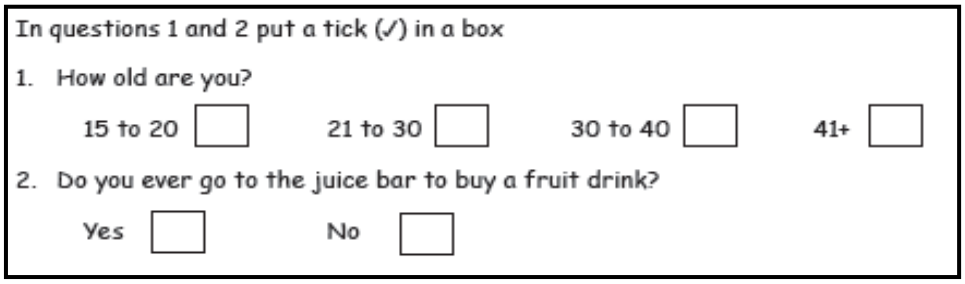
24 A survey is carried out by asking people questions as they come out of a juice bar.

A section of the questionnaire is shown below.



(a) Explain why this is a biased survey. [1]

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(b) State two criticisms of the design of question 1. [2]

First criticism of question 1:

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Second criticism of question 1:

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25. The diagram shows a square.
All the lengths are measured in centimetres.

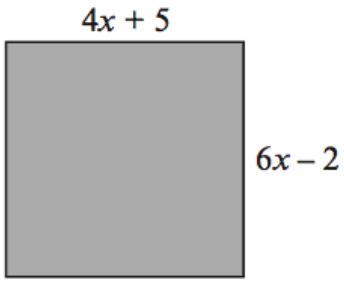

Diagram not drawn to scale

Use an algebraic method to find the length of one side of the square. [5]

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26. Find the nth term of the sequence 6, 13, 20, 27, … [2]

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27. *(a)* When visiting a hat shop, each customer had the circumference of their head measured.

The table shows the results for the customers who bought a hat during December.

Head circumference, c (cm)	Number of customers
$50 \leq c < 54$	12
$54 \leq c < 58$	32
$58 \leq c < 62$	14
$62 \leq c < 66$	2

Calculate an estimate for the mean head circumference.

[4]

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(b) The hat shop sells 4 different sizes of hats.

The conversion table from head circumference to hat size is shown below

Head circumference, c (cm)	Hat size
$50 \leq c < 54$	1
$54 \leq c < 58$	2
$58 \leq c < 62$	3
$62 \leq c < 66$	4

A salesman places an order for new stock for the hat shop.
The salesman's order form shows that about half of the hats ordered are size 2.
The owner of the shop says the order should show that about a quarter of the hats ordered are size 2.
Who is more likely to be correct, the salesman or the owner of the shop?
You must give a reason for your answer.

[2]

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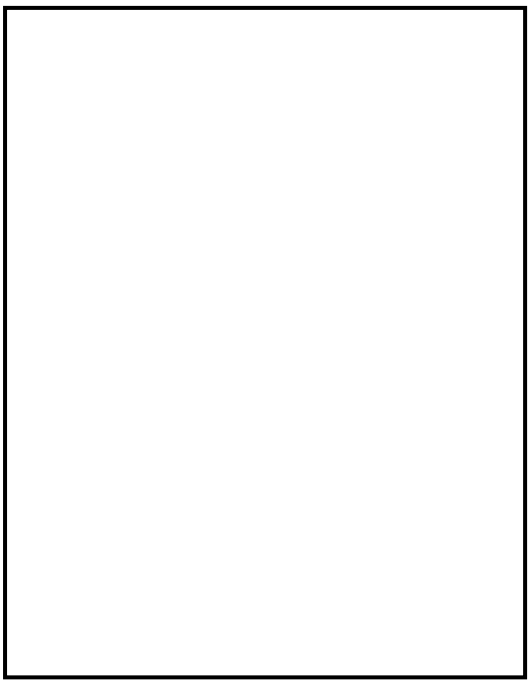
28. A statue is on display inside a glass cuboid.
A scale drawing of the plan view (bird's eye or aerial view) of the cuboid is shown below.

Scale 1 cm : 20 cm

A barrier is built around the cuboid so that no one can stand within 60 cm of the cuboid.
Using the given scale, draw accurately the barrier on the scale drawing shown below.
[4]



29. A man is working out the height of a vertical tree.
The man is able to measure the angle of elevation of the top of the tree from his measuring instrument.
The measuring instrument is 1·8 m above ground level.
When the man is standing 19 m from the base of the tree, the angle he measures is 56°.

A sketch of this situation is shown below.

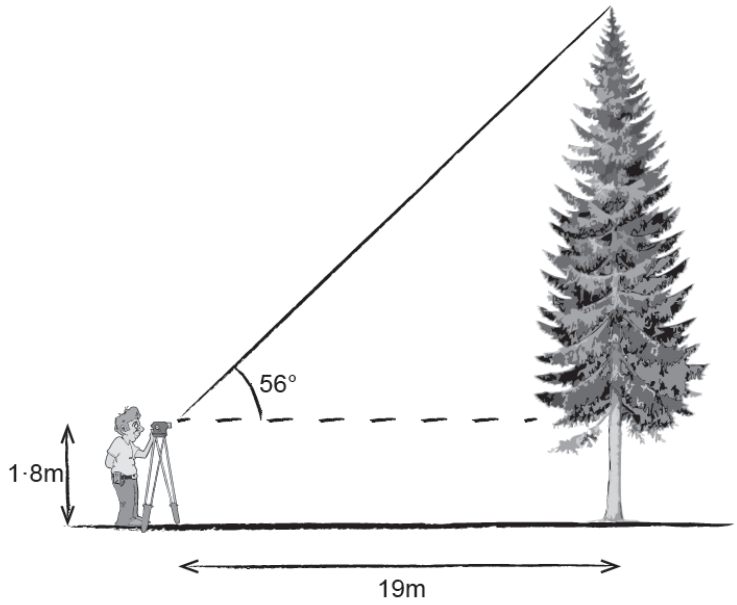


Diagram not drawn to scale

Calculate the full height of the tree. [4]

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30. *(a)* A cube of weight 10 N rests on horizontal ground.
The area of each face of the cube is $0{\cdot}2\,m^2$.
Calculate the pressure exerted by the cube on the ground.
State the units of your answer.

[3]

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(b) A different cube also has a weight of 10 N.
The area of each face of this cube is $x\,m^2$.
Find an expression for the pressure exerted by this cube on the ground.
Give your answer in terms of x.

[1]

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COMPONENT 1: NON-CALCULATOR MATHEMATICS, HIGHER TIER

GENERAL INSTRUCTIONS for MARKING GCSE Mathematics

1. The mark scheme should be applied precisely and no departure made from it. Marks should be awarded directly as indicated and no further subdivision made. When a candidate follows a method that does not correspond to the methods explicitly set out in the mark scheme, marks should be awarded in the spirit of the mark scheme. In such cases, further advice should be sought from the Team Leader or Principal Examiner.

2. Marking Abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

CAO = correct answer only
MR = misread
PA = premature approximation
bod = benefit of doubt
oe = or equivalent
si = seen or implied
ISW = ignore subsequent working

F.T. = follow through ($\surd$ indicates correct working following an error and $\not\surd$ indicates a further error has been made)

Anything given in brackets in the marking scheme is expected but, not required, to gain credit.

3. Premature Approximation

A candidate who approximates prematurely and then proceeds correctly to a final answer loses 1 mark as directed by the Principal Examiner.

4. Misreads

When the data of a question is misread in such a way as not to alter the aim or difficulty of a question, follow through the working and allot marks for the candidates' answers as on the scheme using the new data.
This is only applicable if a wrong value, is used consistently throughout a solution; if the correct value appears anywhere, the solution is not classed as MR (but may, of course, still earn other marks).

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- 'm' marks are dependant method marks. They are only given if the relevant previous 'M' mark has been earned.
- 'A' marks are given for a numerically correct stage, for a correct result or for an answer lying within a specified range. They are only given if the relevant M/m mark has been earned either explicitly or by inference from the correct answer.
- 'B' marks are independent of method and are usually awarded for an accurate result or statement.
- 'S' marks are awarded for strategy
- 'E' marks are awarded for explanation
- 'U' marks are awarded for units
- 'P' marks are awarded for plotting points
- 'C' marks are awarded for drawing curves

COMPONENT 1: NON-CALCULATOR MATHEMATICS, HIGHER TIER

Specimen Assessment Materials Non-calculator Higher	Mark	Elements linked to AOs	Comments
1. (a) 9 (b) –6 (c) –3	B1 B1 B1 (3)	1.3a 1.3a 1.3a (3)AO1 (0)AO2 (0)AO3	
2. (a) 68000 (b) $8{\cdot}53 \times 10^{-5}$ (c) $1{\cdot}5 \times 10^{9}$	B1 B1 B2 (4)	1.2 1.2 1.3b (4)AO1 (0)AO2 (0)AO3	B1 for correct value not in standard form e.g. 15×10^{8} or 1500 000 000
3. Correctly engaging with ratios to find values that can be used on the graph e.g. Finding the ratio of red : white to be 4 : 5 OR *Reducing* the ratio of 4 : 9 to enable use on graph e.g. 2 : 4·5 or 1 : 2·25 Using a value for white paint to find a non-zero value of red paint. **e.g.** 2 litres of white paint gives 1·6 litres of red paint. OR (4·5 – 2 =) 2·5 litres of white paint gives 2 litres of red paint. OR 1·25 litres of white paint gives 1 litre of red paint. Using the red paint value found to fill in one of the non-zero values required on the red paint axis. e.g. 1·6 found from conversion, then 1·5 indicated on the axis. (The values are 0·5, 1, 1·5, 2, 2·5.) Correctly filling in all the remaining numbers on the red paint axis: 0, 0·5, 1, 1·5, 2, 2·5	M1 M1 A1 A1 (4)	2.3a 3.1b 3.1b 2.3b (0)AO1 (2)AO2 (2)AO3	Seen or implied. Ignore incorrect use of 4 : 9 as red : white for this M1 The value must be one that can be read off the graph. This may be implied from markings on the diagram but the value does not need to be indicated on the diagram. Do NOT F.T. from incorrect interpretation of 4 : 9 as red paint : white paint This mark depends on both previous M marks. Some correct working must be shown. (This could be in the diagram.) C.A.O.
4.(a) Correctly completing the tree diagram 0·6, 0·3. 0·3, 0·7 (b) $0{\cdot}4 \times 0{\cdot}7$ $= 0{\cdot}28$ (c) $0{\cdot}6 \times 0{\cdot}7$ $= 0{\cdot}42$	B2 M1 A1 M1 A1 (6)	2.3b 2.3a 1.3a 2.3a 1.3a (2)AO1 (4)AO2 (0)AO3	B1 for any one pair of branches correct (total 1) Or other complete method. F.T. for their P(walk to college) ×P(walk home) correctly evaluated, or by alternative method

Specimen Assessment Materials Non-calculator Higher	**Mark**	**Elements linked to AOs**	**Comments**
5. Method to find prime factors 2, 2, 2, 2, 3, 3, 5, 5 $2^4 \times 3^2 \times 5^2$	M1 A1 B1 (3)	1.1 1.3a 1.2 (3)AO1 (0)AO2 (0)AO3	2 correct before 2nd error Ignore 1s for A1, but not for B1 F.T. provided index >1. Accept "."
6. Method to form two correct equations and eliminate one variable First variable found correctly Substitute to find the second variable Tin = £5 and Brush = £2	M1 A1 m1 A1 (4)	3.1d 1.3a 3.1d 3.3 (1)AO1 (0)AO2 (3)AO3	Allow 1 error in one term, not one with equal coefficients Tin = £5 or Brush = £2. F.T. 'their first variable'
7. An arc, centre P, of radius 5 cm Correctly constructing a perpendicular bisector Correct shading	B1 B2 B1 (4)	2.3a 2.3a 2.3b (0)AO1 (4)AO2 (0)AO3	Allow $\pm$ 0·2cm B1 for drawing by eye or using a protractor F.T. for an arc centre P and a line crossing PQ. Shading needs to be on both sides of line PQ
8. 5 parts = (£)30 OR 30 ÷ 5 OR $7x - 2x = 30$ OR equivalent (1 part) = (£)6 (Amount shared =) 6 × 9 =(£)54	M1 A1 m1 A1 (4)	3.1d 1.3b 3.1d 1.3b (2)AO1 (0)AO2 (2)AO3	Accept 5/9 = 30 F.T their 1 part, provided M1 awarded Award M1A1m1A0 for answers of £12 and £42
9. (a) $2x(3x + 4)$ (b) $(x - 10)(x + 10)$	B2 B1 (3)	1.3a 1.3a (3)AO1 (0)AO2 (0)AO3	B1 for a correct partially factorised expression OR sight of $2x(3x \ldots\ldots)$ or $2x(\ldots\ldots+4)$

Specimen Assessment Materials Non-calculator Higher	**Mark**	**Elements linked to AOs**	**Comments**
10. Setting up one of two models (needing 3 strips along 8m or 5 strips along 13m)	S1	3.1d	For the strategy and finding the need for 3 or 5 strips of carpet as appropriate
(Cost along 8 m side =) $13 \times 3 \times$ (£) 25	M1	3.1d	Finding the cost of the carpet for their model F.T. their number of strips
(Cost along 13 m side =) $8 \times 5 \times$ (£) 25	M1	3.1d	Finding the cost of the carpet for their model F.T. their number of strips
(£) 975 AND (£) 1000	A1	1.3a	
8 m method is cheaper by (£) 25	A1	3.4b	F.T. for their costs provided at least S1 awarded. Must state which method is cheaper for their costs
	(5)	(1)AO1 (0)AO2 (4)AO3	
11. Attempt to find vector **EF** e.g. **ED** + **DF** or $-$**DE** + **DF**	M1	3.1b	Accept intention, i.e. missing brackets e.g. $-3\mathbf{a} - 2\mathbf{b}$ instead of $-3\mathbf{a} + 2\mathbf{b}$
$= -\mathbf{a} + 7\mathbf{b}$	A1	1.3a	C.A.O.
EF $\times -3$	M1	2.3a	F.T. 'their $-\mathbf{a} + 7\mathbf{b}$' $\times -3$ M1 for sight of $-3\mathbf{a} + 21\mathbf{b}$ or $\mathbf{a} - 7\mathbf{b}$ or $-3(-\mathbf{a} + 7\mathbf{b})$
$3\mathbf{a} - 21\mathbf{b}$	A1	1.3a	
	(4)	(2)AO1 (1)AO2 (1)AO3	

Specimen Assessment Materials Non-calculator Higher	**Mark**	**Elements linked to AOs**	**Comments**
12. (a) $24 \times \frac{45}{30}$	M1	3.1c	Or equivalent.
$\times \frac{10}{15}$	M1	3.1c	Or equivalent (the 24 must have been used). M1 for correctly using two of the operators '×45', '÷30', '×10' and '÷15' with the 24.
= 24 (workers)	A1	1.3a	C.A.O. Do not penalise pre-approximations as long as 24 is given as the final answer. *Alternative presentation:* *Area Time Workers* *30 10 24* *….Award M1 for correct step(s) to 45* *….Award M1 for correct step(s) to 15* *…. …. ….* *45 15* ***24*** *A1 C.A.O.*
(b) Stating one assumption made e.g. 'similar work will be carried out on the other site' or 'all workers will work at the same rate' or similar.	E1	3.4a	
Stating an impact e.g. 'if the work is harder or the workers are slower, then more workers will be needed.'	E1 (5)	3.5 (1)AO1 (0)AO2 (4)AO3	
13.(a)(i) $m_1 = -3$	B2	2.3a	B1 for evidence of interpreting the graph to find the gradient e.g. $(9-0)/(0-3)$ or equivalent or stating $m_1 = 3$
(ii) $m_2 = \frac{1}{3}$	B1	1.1	F.T. as long as $m_1 \times m_2 = -1$
(b) Method to find the intercept of line L_2 e.g. substituting m_2, 1, 6 into $y = mx + c$	M1	3.1b	
$c = \frac{17}{3}$ or equivalent	A1	1.3a	
Finding the equation of L_2 e.g. substituting m_2 and c into $y = mx + c$ to give $y = \frac{1}{3}x + \frac{17}{3}$ or equivalent	M1	3.1b	
$x - 3y + 17 = 0$	A1 (7)	1.3a (3)AO1 (2)AO2 (2)AO3	

Specimen Assessment Materials Non-calculator Higher	**Mark**	**Elements linked to AOs**	**Comments**
14. (Distance =) 3×40 $= 120$ (miles) (Time =) $120 \div 30$ $= 4$ (hrs) (average speed =) $\frac{120 + 120}{3 + 4}$ $= 34(\cdot 2\ldots)$mph) 'So not correct'.	M1 A1 M1 A1 M1 A1 (6)	2.2 1.3a 2.2 1.3a 2.2 2.5a (2)AO1 (4)AO2 (0)AO3	F.T. 'their calculated values'. OR 7×35 M1 OR $240 / 35$ M1 $= 245$ (miles) A1 $= 6(\cdot 8..)$(hrs) A1 Calculation AND statement required.
15. (For triangles *BCP* and *CBQ*) $P\hat{C}B = Q\hat{B}C$ (or equivalent) Base angles of an isosceles triangle. (So) $P\hat{B}C = Q\hat{C}B$ Angles were bisected. Side *BC* is common ($BC = BC$) Reasons given (So triangles *BCP* and *BCQ* are congruent) ASA	B1 B1 B1 E1 B1 (5)	2.4b 2.4b 2.4b 2.4b 2.1a (0)AO1 (5)AO2 (0)AO3	The first two reasons noted above must be given for E1 to be awarded. For correctly giving the condition for congruence.

Specimen Assessment Materials Non-calculator Higher	**Mark**	**Elements linked to AOs**	**Comments**
16.(a) Entries 30, 30, 40, 35, 5	B2	2.3a	B1 for any 3 correct entries F.T. for their entries for M marks only in (b)
(b) (Number of cars exceeding limit = 40/100 × 140 =) 56 cars	B1	3.1d	Accept 60/100 × 140 = 84.
56 – 35 – 5 = 16 cars in 30-40 group. (OR 84 – 30 – 30 = 24)	M1	3.2	For attempting to identify the number of 'cars fined' (or not fined) in the correct single group.
16/40 × 10 = 4 mph (OR 24 /40 × 10 = 6 mph)	M1	3.1d	F.T. 'their 56' or 'their 84'. For translating this number into a speed. F.T. their number of cars
Estimate of speed = 40 – 4 = 36 mph (OR 30 + 6 = 36 mph)	A1	1.3a	
(c) 3, 4, 2, 1·5, 0·5	B1	1.3a	
Axes correct and labelled, no gaps between bars	M1	2.3b	Histogram needs to be attempted.
Correct histogram	A1	2.3b	F.T. candidate's frequency density if table completed incorrectly but the idea of frequency density is used. SC1 if correct but not labelled.
(d) Yes, with reason e.g. 'there were more slower speeds recorded'.	B1	2.1b	F.T from their histogram in (c) if necessary. Other reasons could include: '40 cars exceeded 40mph before but only 20 afterwards.' '80 cars exceeded 30mph before but only 40 afterwards.' 'Only 28% exceeded 36mph instead of 40%.'
	(10)	(2)AO1 (5)AO2 (3)AO3	
17. Sight of $y \propto \frac{1}{x}$ or $y = \frac{k}{x}$	B1	1.1	May be implied in further work
$16 = \frac{k}{1/2}$	M1	1.3b	
$k = 8$	A1	1.3b	
$y = \frac{8}{x}$	A1	1.3b	F.T, 'their 8'
	(4)	(4)AO1 (0)AO2 (0)AO3	

Specimen Assessment Materials Non-calculator Higher	**Mark**	**Elements linked to AOs**	**Comments**
18. $\dfrac{3\sqrt{7}}{4+\sqrt{7}} = \dfrac{3\sqrt{7}\left(4-\sqrt{7}\right)}{\left(4+\sqrt{7}\right)\left(4-\sqrt{7}\right)}$ Numerator $12\sqrt{7}-21$ Denominator 9 $\dfrac{4\sqrt{7}-7}{3}$	M1 A1 A1 A1 (4)	1.3b 1.3b 1.3b 1.3b (4)AO1 (0)AO2 (0)AO3	C.A.O.
19. $a = 6$ $b = -22$	B1 B1 (2)	1.3a 1.3a (2)AO1 (0)AO2 (0)AO3	.
20.(a) x = 0·7878…**and** $100x$ = 78·78.. with an attempt to subtract. $\underline{78}$ (= $\underline{26}$) 99 (33) (b) 1/9 × 3 = 0·333…	M1 A1 B2 B1 (5)	1.3a 1.3a 1.3a 1.1 (5)AO1 (0)AO2 (0)AO3	Or equivalent method. B1 for each. Must be convincing as a recurring decimal.
21. Interpreting diagram to get formula for area of either rectangle e.g. $x(x+2) = y$ or equivalent OR $12(4+x) = 4y$ or equivalent Equating formulae e.g. $x(x+2) = 12 + 3x$ OR $12(4+x) = 4x(x+2)$ OR equivalent Deriving a quadratic equation e.g. $x^2 - x - 12 = 0$ OR $4x^2 - 4x - 48 = 0$ Factorising and solving their quadratic equation e.g. $(x+3)(x-4) = 0$ $x = -3$ or $x = 4$ Statement about ignoring $x = -3$ as it leads to negative lengths Dimensions 4 (cm) and 6 (cm)	B1 M1 A1 M1 A1 E1 A1 (7)	2.3a 3.1b 1.3b 3.1b 1.3b 3.4b 3.3 (2)AO1 (1)AO2 (4)AO3	This B1 mark maybe implied by the correct quadratic, hence if M1 awarded also award this B1 mark. ISW Allow 1 error, e.g. missing brackets, or from incorrect expansion. FT provided equivalent level of difficulty Must equate to zero FT provided equivalent level of difficulty Must have both solutions F.T provided on +ve and one –ve solution

Specimen Assessment Materials Non-calculator Higher	**Mark**	**Elements linked to AOs**	**Comments**
22.(a) Concave down curve translated left Point (−7,0) shown. Point (1, 0) shown. (b) Concave down curve symmetrical about the *y*-axis. Stationary points at (0, 3). (c) A comment regarding no scale or coordinates shown.	 B1 B1 B1 B1 B1 B1 (6)	 2.3a 2.3b 2.3b 2.3a 2.3b 2.5b (0)AO1 (6)AO2 (0)AO3	*Allow appropriate marking of axes if coordinates not given.*
23.(a) (i) $0{\cdot}7 \times 0{\cdot}7 \times 0{\cdot}3$ $= 0{\cdot}147$ (ii) Indicates three possible situations e.g.HMM or MHM or MMH $0{\cdot}441$ Less than a 50% chance. (b) (i) Evaluating the method used e.g. Indicates that the first ball selected is returned to the box before the second ball is selected or 2 attempts are independent. (ii) Stating how the results would be different e.g. if the first ball was not returned then the probability of winning would be less than 1/16.	M1 A1 M1 A1 A1 E1 E1 (7)	3.1c 1.3a 3.1c 1.3a 2.1a 3.4a 3.5 (2)AO1 (1)AO2 (4)AO3	 May be indicated by $0{\cdot}3{\times}0{\cdot}7{\times}0{\cdot}7 \times 3$ or equivalent. F.T. 'their $0{\cdot}147' \times 3$ F.T. 'their $0{\cdot}441$'.
24. $\frac{1}{2}\, x\, (x + 3)\sin 60° = \sqrt{300}$ $\frac{1}{2}\, x\, (x + 3)\, \frac{\sqrt{3}}{2} = \sqrt{300}$ $x^2 + 3x - 40 = 0$ $(x + 8)(x - 5) = 0$ $x = 5$ $BA^2 = 8^2 + 5^2 - 2 \times 8 \times 5 \cos 60$ Sight of $\cos 60° = \frac{1}{2}$ BA = 7 (cm)	M1 m1 A1 M1 A1 M1 B1 A1 (8)	3.1d 3.2 3.2 1.3a 3.3 3.2 1.1 1.3a (3)AO1 (0)AO2 (5)AO3	Allow missing brackets Or similar progress F.T. 'their $\sin 60°$' Accept $BA^2 = (x+3)^2 + x^2 - 2 \times x \times (x+3)\cos 60°$.

COMPONENT 1: NON-CALCULATOR MATHEMATICS, FOUNDATION TIER

GENERAL INSTRUCTIONS for MARKING GCSE Mathematics

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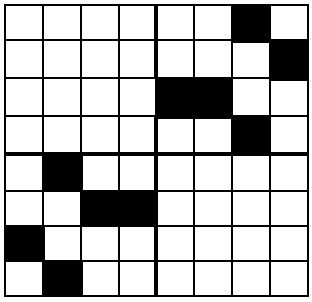
COMPONENT 1: NON-CALCULATOR MATHEMATICS, FOUNDATION TIER

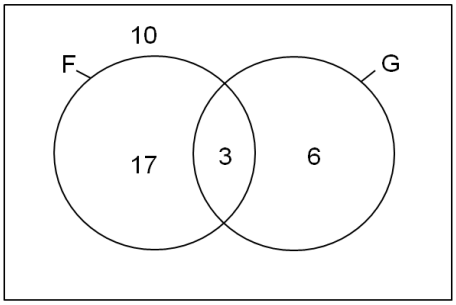
Specimen Assessment Materials Non-calculator Foundation	Mark	Elements linked to AOs	Comments
1. 10 13 27 8	B1 B1 B1 B1 (4)	1.1 1.1 1.1 1.1 (4)AO1 (0)AO2 (0)AO3	
2. Seven million five hundred thousand 9000 3687	B1 B1 B1 (3)	1.2 1.1 1.3a (3)AO1 (0)AO2 (0)AO3	Accept seven and a half million Or 9 thousand. Accept thousand(s) but not 1000(s)
3. (a) Showing '20 to 24' AND '25 (to 29)' Showing (6) 8 5 13 (b) Uniform scale for the frequency axis starting at 0. Four bars at correct heights.	B1 B1 B1 B1 (4)	2.1a 1.3a 2.3b 2.3b (1)AO1 (3)AO2 (0)AO3	 F.T. their intervals, provided not overlapping. For the 8, 5 and 13. B0 for ambiguous placement of scale numbers. F.T. their numbers in (a). If no scale shown, assume intervals of 1 from 0 to 15. Penalise uneven bar widths −1.
4. (a) 2190 54 000 (b) Sensible estimates that would lead to single digit multiplication. Correct answer from their estimates.	B1 B1 M1 A1 (4)	1.1 1.1 1.3a 1.3a (4)AO1 (0)AO2 (0)AO3	 Accept $50\times3{\cdot}9$, 51×4 or 50×4 Award M1 A1 for unsupported answers of 200, 195 or 204 Award M0 A0 for (51 × 3.9 =) 198.9

Specimen Assessment Materials Non-calculator Foundation	**Mark**	**Elements linked to AOs**	**Comments**
5. 	B2 (2)	1.3a (2)AO1 (0)AO2 (0)AO3	B1 for each quadrant
6. (a) 262	B1	1.3a	
(b) Thursday Tuesday	B2	2.3a	B1 for each. Allow SC1 if reversed.
(c) Comment regarding some cars leaving and others taking their place.	E1	2.4a	Accept valid and relevant equivalent comments.
(d) (Total number of cars Mon-Fri) 538	B1	1.3b	F.T. 800 – 'their (a)'
(538 × 2 =) (£)1076	B1	1.3b	F.T. 'their 538'
			<u>Alternative method:</u> *104×2 + 43×2 + 112×2 + 163×2 + 116×2* *M1 (must show intent to add for the M1)* *(£)1076 A1*
(e) (¼ of 800 =) 200	B1	1.3a	
(Charge =)(800-200) ×(£)1.5(0)	M1	3.1d	F.T. (800 – 3 × 'their 200') ×(£)1.50 F.T. their number of cars only if less than 800.
Less and (£)900	A1	2.1b	F.T. their values.
(f) One assumption stated e.g. "the car parking pattern was the same each week" OR "the week considered was typical" OR "the same amount was collected each week" OR "the car park was open for 52 weeks"	E1	3.4a	
Stating how the results would be different e.g. "If the car park was not open for 52 weeks the total could be lower" OR "some weeks could be much busier so the total would be more"	E1	3.5	
	(11)	(4)AO1 (4)AO2 (3)AO3	
7. A = 14	B1	1.3a	
B = 15	B1	1.3a	
C = 6	B1	1.3a	
	(3)	(3)AO1 (0)AO2 (0)AO3	

Specimen Assessment Materials Non-calculator Foundation	**Mark**	**Elements linked to AOs**	**Comments**
8. (a) Line measured as 7·6 (cm) Evidence of multiplying by 10. 76 km (b) Sight of 2 × 40 or 80 or 76/40 or 1·9 YES and explanation e.g. because 2 × 40 > 76 or 76/40 < 2 or 1·9 < 2	B1 M1 A1 B1 E1 (5)	1.3b 1.3b 1.3b 2.4a 2.4a (3)AO1 (2)AO2 (0)AO3	Allow $\pm$ 0·2 cm F.T. 'their length'. Must show units. Any equivalent convincing argument. F.T. 'their 76'.
9. (a) Rounded values **Item** / **Cost** Chicken curry / £3 Pizza / £3 Washing Powder / £6 or £6.10 Butter / £1 or £1.50 Bread / £1 or 90p Approximate total = £14 or £13.90 or £14.10 or £14.50 or £14.60 or £14.40 (b)Suitable explanation e.g. "shopkeeper added £89 not 89p".	B2 B1 E1 (4)	1.3a 1.3a 2.5a (3)AO1 (1)AO2 (0)AO3	Award B2 for all 5 values rounded. Award B1 for 3 or 4 values rounded. F.T. their approximated values if at least B2 awarded. If prices are added to give £14.12 and approximate value of £14 given, award final B1. Accept "he forgot the decimal point for the 89 pence"
10. (32 – 18) ÷ 2 7 (cm)	M1 A1 (2)	3.1c 1.3a (1)AO1 (0)AO2 (1)AO3	Or equivalent
11. (a) $9a + 8b$ (b) $3y - 6$ (c) $6y^2$ (d) y^4	B2 B1 B1 B1 (5)	1.3a 1.3a 1.2 1.2 (5)AO1 (0)AO2 (0)AO3	B1 for $9a + kb$ or B1 for $ka - 2b$.
12. Missing side segment = 4 (Perimeter=) 7+3+7+4+3+7+3+4+7+3 = 48 (cm)	B1 M1 A1 (3)	2.3a 3.1a 1.3a (1)AO1 (1)AO2 (1)AO3	May be implied by correct working Attempt to all 10 sides of the shape F.T. their '4' but M0 if 7 OR 3 used instead of 4 CAO

Specimen Assessment Materials Non-calculator Foundation	**Mark**	**Elements linked to AOs**	**Comments**
13. 2×60 + 1 OR 60 + 61 or equivalent = 121	M1 A1 (2)	3.1a 2.1a (0)AO1 (1)AO2 (1)AO3	
14. (a) 720 – ½ × 720 – 2/5 × 720 or equivalent Sight of (£)288 (Amount left) (£)72	M1 B1 A1	1.3b 1.3b 1.3b	*<u>Alternative method:</u>* *(1 – 1/2 – 2/5) × 720 or equivalent M2* *Award M1 for sight of 1/10 or equivalent* *= (£)72 A1* For A1, F.T. (£)720 – 'their (£)360' – 'their (£)288' Two amounts must be subtracted from (£)720.
(b) 72 / 720 × 100 = 10(%)	M1 A1 (5)	1.3a 1.3a (5)AO1 (0)AO2 (0)AO3	F.T. 'their £72' *<u>Alternative method:</u>* *100(%) – 50(%) – 40(%) M1* *= 10(%) A1*
15. (a) 10(:00) 1(:00) 4(:00) OR 10(:)00 13(:)00 16(:)00 Correct notation 'a.m./p.m.'	B1 B1	1.3a 1.2	Ignore notation for this B1
(b) 9(°C)	B1	1.3a	CAO
(c) (14 + 18 + 23 + 19 + 16) / 5 = 18(°C)	M1 A1	1.3a 1.3a	
(d) Any statement that refers to other possible temperatures, apart from the five recorded.	E1 (6)	2.4a (5)AO1 (1)AO2 (0)AO3	Must refer to other temperatures. 'It was done every 3 hours' is not sufficient (E0).
16. (Area =) ½(4 + 5) × 6 or equivalent 27(m^2) (Cost =) $\frac{27}{18}$ × 60 or equivalent = (£)90	M1 A1 M1 A1 (4)	3.1d 1.3a 3.2 1.3a (2)AO1 (0)AO2 (2)AO3	 F.T. 'their area'.

Specimen Assessment Materials Non-calculator Foundation	**Mark**	**Elements linked to AOs**	**Comments**
17. $A\hat{B}C = 50^{(°)}$ $B\hat{A}C = 180^{(°)} - 80^{(°)} - 50^{(°)}$ $= 50^{(°)}$ Convincing statement	 B1 M1 A1 E1 (4)	 2.2 2.2 2.2 2.2 (0)AO1 (4)AO2 (0)AO3	Look for angles shown on diagram. F.T $180^{(°)} - 80^{(°)}$ – 'their $50^{(°)}$'
18.(a) (i) A comment that states or implies that we do not know the actual numbers. (ii) A comment that states or implies that we do not know the pass rate between 2005 and 2010. (b) False AND a counter example given.	B1 B1 B1 (3)	2.5b 2.5b 2.5a (0)AO1 (3)AO2 (0)AO3	
19. Attempt to repeatedly divide by 2 105 cm or 52·5 cm seen from correct working After 4 bounces.	M1 A1 A1 (3)	3.1c 1.3a 3.3 (1)AO1 (0)AO2 (2)AO3	At least 2 divisions needed for M1
20. (a) (i) Area of B = (4 × 3) × 3 36 (cm^2) Two values whose product is 36 (ii) Two different values whose product is 36. (b) NO (because) their sides are not in a common ratio.	M1 A1 B1 B1 E1 (5)	3.2 1.3a 3.1a 1.3a 2.4a (2)AO1 (1)AO2 (2)AO3	 F.T. 'their area for B'. F.T. 'their area for B'. Accept convincing statement.

Specimen Assessment Materials Non-calculator Foundation	**Mark**	**Elements linked to AOs**	**Comments**
21. Setting up a Venn diagram with a rectangle containing two intersecting circles and placing either 17 or 6 correctly. Finding the other of 6 or 17. Neither French nor German = 10 Probability (neither) = $\frac{10}{36}$  	M1 M1 A1 A1 (4)	3.1c 3.1c 1.3a 1.3a (2)AO1 (0)AO2 (2)AO3	Accept alternative appropriate diagram. *<u>Alternative method (without a diagram)</u>:* *20 – 3 = 17 OR 9 – 3 = 6 M1* *17 + 9 = 26 OR 20 + 6 = 26 OR 17 + 3 + 6 = 26 M1* F.T. 'their 10'
22. (a) $2x(3x + 4)$ (b) $(x - 10)(x + 10)$	B2 B1 (3)	1.3a 1.3a (3)AO1 (0)AO2 (0)AO3	B1 for a correct partially factorised expression OR sight of $2x(3x \ldots\ldots)$ or $2x(\ldots\ldots+4)$
23. (a) 2400 ÷ 8 ÷ 10 or equivalent. Statement that 30 bulbs must have been used (b) 2400 ÷ 400 or equivalent 6p or £0.06 (c) Correct conclusion e.g. 'the cost of a bulb must be between 6p and 8p'.	M1 A1 M1 A1 E1 (5)	3.1d 2.1b 3.1d 1.3a 2.1a (1)AO1 (2)AO2 (2)AO3	Accept 30 × 10 × 8p = 2400 Unsupported 30 is awarded M1A0 Units required. F.T their '6p'
24.(a) Correctly completing the tree diagram 0·6, 0·3. 0·3, 0·7 (b) 0·4 × 0·7 = 0·28 (c) 0·6 × 0·7 = 0·42	B2 M1 A1 M1 A1 (6)	2.3b 2.3a 1.3a 2.3a 1.3a (2)AO1 (4)AO2 (0)AO3	B1 for any one pair of branches correct (total 1) Or other complete method. FT for their P(walk to college) ×P(walk home) correctly evaluated, or by alternative method

Specimen Assessment Materials Non-calculator Foundation	**Mark**	**Elements linked to AOs**	**Comments**
25. Correctly engaging with ratios to find values that can be used on the graph e.g. Finding the ratio of red : white to be 4 : 5 OR *Reducing* the ratio of 4 : 9 to enable use on graph e.g. 2 : 4·5 or 1 : 2·25	M1	2.3a	Seen or implied. Ignore incorrect use of 4 : 9 as red : white for this M1
Using a value for white paint to find a non-zero value of red paint. e.g. 2 litres of white paint gives 1·6 litres of red paint. OR (4·5 – 2 =) 2·5 litres of white paint gives 2 litres of red paint. OR 1·25 litres of white paint gives 1 litre of red paint.	M1	3.1b	The value must be one that can be read off the graph. This may be implied from markings on the diagram but the value does not need to be indicated on the diagram. Do NOT F.T. from incorrect interpretation of 4 : 9 as red paint : white paint
Using the red paint value found to fill in one of the non-zero values required on the red paint axis. e.g. 1·6 found from conversion, then 1·5 indicated on the axis. (The values are 0·5, 1, 1·5, 2, 2·5.)	A1	3.1b	This mark depends on both previous M marks. Some correct working must be shown. (This could be in the diagram.)
Correctly filling in all the remaining numbers on the red paint axis: 0, 0·5, 1, 1·5, 2, 2·5	A1 (4)	2.3b (0)AO1 (2)AO2 (2)AO3	CAO
26. Method to form two correct equations and eliminate one variable First variable found correctly Substitute to find the second variable Tin = £5 and Brush = £2	M1 A1 m1 A1 (4)	3.1d 1.3a 3.1d 3.3 (1)AO1 (0)AO2 (3)AO3	Allow 1 error in one term, not one with equal coefficients Tin = £5 or Brush = £2. F.T. 'their first variable'

Specimen Assessment Materials Non-calculator Foundation	**Mark**	**Elements linked to AOs**	**Comments**
27. Setting up one of two models (needing 3 strips along 8m or 5 strips along 13m)	S1	3.1d	For the strategy and finding the need for 3 or 5 strips of carpet as appropriate
(Cost along 8 m side =) 13 × 3 × (£) 25	M1	3.1d	Finding the cost of the carpet for their model F.T. their number of strips
(Cost along 13 m side =) 8 × 5 × (£) 25	M1	3.1d	Finding the cost of the carpet for their model F.T. their number of strips
(£) 975 AND (£) 1000	A1	1.3a	
8 m method is cheaper by (£) 25	A1	3.4b	F.T. for their costs provided at least S1 awarded. Must state which method is cheaper for their costs
	(5)	(1)AO1 (0)AO2 (4)AO3	
28. $1{\cdot}5 \times 10^9$	B2	1.3b	B1 for correct value not in standard form e.g. 15×10^8 or 1500 000 000
	(2)	(2)AO1 (0)AO2 (0)AO3	
29. (a) $24 \times \frac{45}{30}$	M1	3.1c	Or equivalent.
$\times \frac{10}{15}$	M1	3.1c	Or equivalent (the 24 must have been used). M1 for correctly using two of the operators '×45', '÷30', '×10' and '÷15' with the 24.
= 24 (workers)	A1	1.3a	C.A.O. Do not penalise pre-approximations as long as 24 is given as the final answer. *Alternative presentation:* *Area Time Workers* *30 10 24* *….Award M1 for correct step(s) to 45* *….Award M1 for correct step(s) to 15* *…. …. ….* *45 15* ***24*** *A1 C.A.O.*
(b) Stating one assumption made e.g. 'similar work will be carried out on the other site' or 'all workers will work at the same rate' or similar.	E1	3.4a	
Stating an impact e.g. 'if the work is harder or the workers are slower, then more workers will be needed.'	E1	3.5	
	(5)	(1)AO1 (0)AO2 (4)AO3	

COMPONENT 2: CALCULATOR-ALLOWED MATHEMATICS, HIGHER TIER

GENERAL INSTRUCTIONS for MARKING GCSE Mathematics

1. The mark scheme should be applied precisely and no departure made from it. Marks should be awarded directly as indicated and no further subdivision made. When a candidate follows a method that does not correspond to the methods explicitly set out in the mark scheme, marks should be awarded in the spirit of the mark scheme. In such cases, further advice should be sought from the Team Leader or Principal Examiner.

2. Marking Abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

CAO = correct answer only
MR = misread
PA = premature approximation
bod = benefit of doubt
oe = or equivalent
si = seen or implied
ISW = ignore subsequent working

F.T. = follow through ( indicates correct working following an error and  indicates a further error has been made)

Anything given in brackets in the marking scheme is expected but, not required, to gain credit.

3. Premature Approximation

A candidate who approximates prematurely and then proceeds correctly to a final answer loses 1 mark as directed by the Principal Examiner.

4. Misreads

When the data of a question is misread in such a way as not to alter the aim or difficulty of a question, follow through the working and allot marks for the candidates' answers as on the scheme using the new data.
This is only applicable if a wrong value, is used consistently throughout a solution; if the correct value appears anywhere, the solution is not classed as MR (but may, of course, still earn other marks).

5. Marking codes

- 'M' marks are awarded for any correct method applied to appropriate working, even though a numerical error may be involved. Once earned they cannot be lost.
- 'm' marks are dependant method marks. They are only given if the relevant previous 'M' mark has been earned.
- 'A' marks are given for a numerically correct stage, for a correct result or for an answer lying within a specified range. They are only given if the relevant M/m mark has been earned either explicitly or by inference from the correct answer.
- 'B' marks are independent of method and are usually awarded for an accurate result or statement.
- 'S' marks are awarded for strategy
- 'E' marks are awarded for explanation
- 'U' marks are awarded for units
- 'P' marks are awarded for plotting points
- 'C' marks are awarded for drawing curves

COMPONENT 2: CALCULATOR-ALLOWED MATHEMATICS, HIGHER TIER

Specimen Assessment Materials Calculator-allowed Higher	Mark	Elements linked to AOs	Comments
1. (a) 28416/38400) × 100 74(%) (b) 766 + 766 × 12/100 OR 766 × 1.12	M1 A1 M1 A1 (4)	1.3a 1.3a 1.3a 1.3a (4)AO1 (0)AO2 (0)AO3	Or equivalent full method Or equivalent full method
2. (a) Reason, e.g. 'outside the juice bar', 'mostly younger people use juice bars' (b) Two appropriate criticisms e.g. 'No under 15s', '30 appears in two boxes', 'may object to giving their age'	E1 E2 (3)	2.5b 2.5b (0) AO1 (3) AO2 (0) AO3	
3. $6x - 2 = 4x + 5$ $2x = 7$ $x = 7/2$ (3.5) Length of side of square = 4 × 3.5 + 5 or 6 × 3.5 - 2 =19 (cm)	B1 B1 B1 M1 A1 (5)	2.2 1.3a 1.3a 2.2 1.3a (3) AO1 (2) AO2 (0) AO3	
4.(a) Reasonable straight line of best fit by eye, some points above and below (b) Suitable description of the relationship e.g. 'higher the number of visitors, higher the donations' (c) Indicates Sunday (12, 100) (d) (i) Valid explanation e.g. "By using the line of best fit" or "By using the relationship shown in the graph" (ii) Valid explanation e.g "You can't say for definite how many donations the centre will receive on a particular day"	B1 B1 B1 E1 E1 (5)	1.3a 2.1b 2.3a 2.1a 2.5a (1) AO1 (4) AO2 (0) AO3	 Accept 'positive correlation' but not just 'positive'

Specimen Assessment Materials Calculator-allowed Higher	**Mark**	**Elements linked to AOs**	**Comments**
5. (a) (x =) ¼ or 0·25 or equivalent	B1	1.3a	Accept embedded answers in (a) and (b) Accept 3/12. Mark final answer
(b) $9x - 4 = 7x + 14$ $2x = 18$ or equivalent $x = 9$	B1 B1 B1	1.3b 1.3b 1.3b	FT until 2nd error
	(4)	(4) AO1 (0) AO2 (0) AO3	
6.(a) $7n - 1$	B2	1.3a	B1 for $7n \pm \ldots$ Allow change of letter
(b) $a+a+7+a+14+a+21=6$ or equivalent $a = -9$ or lowest number = –9	M1 A1	3.1a 1.3a	
–9, –2, 5, 12	B1	1.3a	OR sight of at least 3 trials keeping to either difference criterion or sum criterion
	(5)	(4) AO1 (0) AO2 (1) AO3	
7. (Height of tree =) Tan 56° × 19 + 1·8(m)	M3	3.1d	Award M2 for tan 56° × 19 OR sight of 28·168658….(m) Award M1 for tan 56° = opposite/19 Accept rounded or truncated from working
(Height of tree =) 29·968658….. (m)	A1	1.3b	Accept rounded or truncated from working F.T from their rounded or truncated 28·168…
	(4)	(1) AO1 (0) AO2 (3) AO3	
8.(a) Midpoints 52, 56, 60 and 64	B1	1.3b	
52×12 + 56×32 + 60×14 + 64×2 (=3384)	M1	1.3b	F.T. their midpoints, provided within interval
/60	m1	1.3b	
56.4 (cm)	A1	1.3b	F.T. their sum of products, division by 60
(b) Strategy to look back that 32 out of 60 are size 2, e.g. '(table shows) about half customers are size 2	S1	2.5a	
Conclusion to give Salesman is correct	E1	2.5a	
	(6)	(4) AO1 (2) AO2 (0) AO3	

Specimen Assessment Materials Calculator-allowed Higher	**Mark**	**Elements linked to AOs**	**Comments**
9.(a) 8 (mm)	B1	2.3a	
(b) (i) Method e.g. increase in L / increase in M	M1	1.3a	Or idea of alternative complete method Accept sight of quotient based on misread of the scale for M1 only.
e.g. 12/150 (= 0·08)	A1	1.3a	Mark final answer.
(ii) Full explanation, e.g. 'rate of change of length with mass', 'for every 1 g increase 0·08 mm increase'	E1	2.3a	
(c) Plausible explanation, e.g. 'no more data recorded', 'spring snaps', 'broken spring', 'spring now completely straight', etc	E1	2.3a	
	(5)	(2) AO1 (3) AO2 (0) AO3	
10. Straight lines parallel to all 4 sides and 3cm away (±2mm)	B2	2.3b	B1 for straight lines parallel to 2 sides and 3cm away (±2mm), OR straight lines parallel to all 4 sides but not at 3cm
Arcs with radius 3cm (±2mm) at all 4 vertices joining the straight lines	B2	2.3b	B1 for arcs with radius 3cm (±2mm) at least 2 vertices but not joined to straight lines, OR arcs at all 4 vertices but not at 3cm or not joined to straight lines
	(4)	(0) AO1 (4) AO2 (0) AO3	
11. (a) $x + 3x + 16x = 1$ x = 1/20 or 0·05 or equivalent ISW	M1 A1	1.1 1.3a	Use of 'total probability = 1' Accept 5% only if specified as a **percentage.**
(b) (Statement that Stephen is incorrect **and**) a correct explanation e.g. fraction (proportion) of tickets bought would be the same.	E1	2.5a	Accept alternative explanations such as 'It may decrease his chance of winning a prize as more people may be tempted to buy tickets'
	(3)	(2) AO1 (1) AO2 (0) AO3	

Specimen Assessment Materials Calculator-allowed Higher	**Mark**	**Elements linked to AOs**	**Comments**
12.(a) All three stages of the appropriate calculation $560 \times (4{\cdot}55 \div 37{\cdot}8) \times 1{\cdot}48$	M3	3.1d	M2 for sight of $560 \times 455 \div 37{\cdot}8$, OR M1 for sight of $560 \div 37{\cdot}8$, $4{\cdot}55 \div 37{\cdot}8$, $37{\cdot}8 \div 4{\cdot}55$, or $4{\cdot}55 \times 1{\cdot}48$ Note: $560 \div 37{\cdot}8$ (= 14·814814… gallons) $\times 4{\cdot}55$ (= 67·407… litres) Use of 14·8 gives 67·34, use of 15 gives 68·25
(£)99.76	A2	1.3a	Depends on M3 A1 for (£)99.7629.. or 99.6632 or 101.01 or other amount from premature approximation
(b) 560 / 10·75 or 560 / 10 ¾	M2	3.1d	M1 for 560/10·45 or 560/675 or 560/645
52(·093 mph)	A1	1.3a	C.A.O
C selected or implied with a reason, e.g. 'C because 52 mph average means travels fast'	E1 (9)	2.1b (3) AO1 (1) AO2 (5) AO3	Only F.T. provided $50 \leq$ their average speed ≤ 70
13.(a) $2{\cdot}3 \times 10^{30} / 2^5$ or equivalent	M2	3.1c	M1 for an attempt to divide $2{\cdot}3 \times 10^{30}$ by 2 more than once
$7{\cdot}2 \times 10^{28}$	A1	1.2	
(b) $r = 0{\cdot}75^t \times x$	B3 (6)	2.3a (1) AO1 (3) AO2 (2) AO3	B2 for correct expression $0{\cdot}75^t \times x$ B1 for $0{\cdot}75x$, $x - 1/4\,x$, $0{\cdot}75^2x$, … *SC2 for $r = 0.25^t \times x$ or SC1 for $0{\cdot}25^t \times x$ or equivalent*
14 (a) 45 / 120 (×100) 37·5(%) rounded or truncated	M1 A1	1.3b 1.3b	Accept values from 44 to 46 inclusive leading to 36·66.. to 38·33..(%) rounded or truncated.
(b) 70 seconds means ≈ 100 × 85/120 OR 80% calls means (0·8 × 120 =) 96 calls	M1	3.1c	(OR 100 × 84/120 = 70%). 70 seconds gives 84 to 86 inclusive so accept 70% to 72%.
70·833..% OR 71% OR ≈75 seconds AND interpretation 'No' (target not met stated or implied)	A1	2.1b	*<u>Alternative solution to (b)</u>:* *'You can't tell', with full supported working for reasoning, gains M1 A1.* *e.g. percentage of calls answered in 70 seconds could be anything between 50% and 91.6666…%* *Assumption: e.g. 'you don't know how the calls are distributed in the 60-80 group' gains E1.*
Stating an assumption made e.g. " assumed that the times between 60 and 80 are evenly distributed"	E1 (5)	3.4a (2) AO1 (1) AO2 (2) AO3	

Specimen Assessment Materials Calculator-allowed Higher	**Mark**	**Elements linked to AOs**	**Comments**
15. **Use** of A : B is 2 : 3 or sight of 2/5 Area circle = $\pi \times 1{\cdot}5^2$ Area A = $(2/5) \times \pi \times 1{\cdot}5^2$ = 2·8(27.. cm^2)	B1 B1 M1 A1 (4)	3.1a 1.1 3.2 1.3a (2) AO1 (0) AO2 (2) AO3	
16. $x = \left[-3 \pm \sqrt{(3^2 - (4\times 2) - 3)}\right] / (2\times 2)$ $= \left[-3 \pm \sqrt{33}\right] / 4$ 0·69 and –2·19	M1 A1 A1 (3)	1.3a 1.3a 1.3a (3) AO1 (0) AO2 (0) AO3	Allow one slip CAO. Must be correct to 2 decimal places
17. (a) Sight of 305(cm) or 3·05(m) AND 3·95(cm) or 0·0395(m) $\frac{305}{3{\cdot}95}$ or $\frac{3{\cdot}05}{0{\cdot}0395}$ = 77 (b) (If container has height=) 295(cm) or 2·95(m) AND (each metal plate has thickness=) 4·05(cm) or 0·0405(m) $\frac{295}{4{\cdot}05}$ or $\frac{2{\cdot}95}{0{\cdot}0405}$ = 72·8...	B1 M1 A1 B1 M1 A1 (6)	3.1d 3.1d 1.3a 2.4a 2.4a 2.4a (1) AO1 (3) AO2 (2) AO3	*The B1 may be awarded if these values are seen in (a) or in (b) and need not be of the same units.* F.T. 'their 305', provided it is > 300 and $\leq$ 310 AND 'their 3·95', provided it is $\geq$ 3 and < 4 77·2.... is A0. *The B1 may be awarded if these values are seen in (a) or in (b) and need not be of the same units.* F.T. 'their 295', provided it is $\geq$ 290 and < 300 AND 'their 4·05', provided it is > 4 and $\leq$ 5 *Alternative methods:* 73 × 4·05 M1 = 295·6(5) AND 'this is >295' A1 OR 295/73 M1 = 4·04 AND 'this is less than 4·05' A1

Specimen Assessment Materials Calculator-allowed Higher	**Mark**	**Elements linked to AOs**	**Comments**
18. (a) (x =) 35° Angles in same segment, (angles in triangle)	B1 E1	2.3a 2.3a	 Dependent on B1, unless correct workings seen but with 1 error in their calculation Accept, e.g. 'angles from same chord'
(b) 40° Angle at the centre is twice the angle at circumference	B1 E1	2.3a 2.3a	 Dependent on B1, unless correct workings seen but with 1 error in their calculation
(c) Angle *CAB* = x AND stating alternate segment theorem	B1	2.4b	May be indicated on the diagram
Stating triangle CAB isosceles AND $(180 - x)/2$	B1 (6)	2.4b (0) AO1 (6) AO2 (0) AO3	
19. Radius of the cylinder = 0.5 cm OR diameter = 1 cm	B1	3.1d	Maybe shown on the diagram
Idea height of cylinder approximately circumference of ring	S1	3.1d	Maybe internal, external or somewhere in between. Accept sight of $8\times\pi$ or $9\times\pi$ for S1
Ring C = $2\times\pi\times$ value between 8 and 9 inclusive	M1	3.1d	
Volume = $\pi\times 0{\cdot}5^2\times$ ring C	M1	3.1d	
Volume in the range 39·5 to 44·4 (cm^3) inclusive	A1	1.3a	C.A.O. E.g. 41·95 (cm^3) from use of 8·5
Statement about assumption, e.g. volume of cylinder used to calculate volume of dog toy, use of mid value for radius.	E1	3.5	Accept 'circumference of the ring is the same as the length of plastic', 'radius doesn't change as bend around'
Justification e.g. used smaller radius so volume will be greater, or used larger radius so volume will be less, or used 8·5 cm as height of cylinder is clearly between 8 cm and 9 cm.	E1 (7)	3.4a (1) AO1 (0) AO2 (6) AO3	Do not accept 'radius is 0.5'
20.(a) Sight of $h \propto u^2$ or $h = ku^2$	B1	3.1d	May be implied in later working
$5 = k \times 10^2$	M1	3.1d	F.T. non-linear only in all parts
$k = 0{\cdot}05$	A1	1.3a	Or equivalent. Ignore incorrect use of $\propto$. NOTE: working for finding k (first three marks) may be seen in (b) not (a). Award the marks in (a) if this is the case.
$h = 0{\cdot}05 \times 12^2$	M1	3.1d	F.T. 'their k '
$h = 7{\cdot}2$ (m) or equivalent	A1	1.3a	
(b) $16 / 0{\cdot}05 = u^2$ (=320)	M1	1.3a	
u = 17·88854… (m/s)	A1 (7)	1.3a (4) AO1 (0) AO2 (3) AO3	Accept rounded or truncated

Specimen Assessment Materials Calculator-allowed Higher	**Mark**	**Elements linked to AOs**	**Comments**
21. Use of scale factor 1·5 or 2/3 as appropriate, or angles in ABC correctly as (60,) 80 and 40	M1	3.1b	
DE/sin 60 = 9/sin 40 or AB/sin60 = 6/sin40	M1	3.2	
DE = 9 × sin60/sin40 or AB = 6 ×sin60/sin40	m1	1.3a	DE = 12(·126 cm)
AB = 8(·084 cm) or 8.1(cm)	A1	1.3a	
			C.A.O. *Alternative:* *M1 CD/sin80 = 9/sin40* *or CD = sin80×9/sin40* *OR AC/sin80 = 6/sin40* *or AC = sin80×6/sin40* *M1 AC = ⅔CD or AC =9.19* *(CD=13·79)* *m1* $AB^2 = 6^2 + AC^2 - 2\times6\times AC\times\cos60$ *(F.T. their AC but not their CD used)* *A1 AB = 8(·084cm) or 8·1(cm) C.A.O.*
	(4)	(2) AO1 (0) AO2 (2) AO3	
22.(a) Reasonable tangent drawn Gradient = difference *v* / difference *t* Calculated gradient for **their tangent** Units given m/s^2 or ms^{-2}	S1 M1 A1 U1	2.3a 1.3a 1.3a 1.1	 With or without tangent (Answers may be in the range 25 to 37) Independent of other marks
(b) Attempt to find area by splitting up.	S1	3.1c	
Suitable area sections with at least 2 correct areas.	M2	3.1c	M1 Suitable area sections with at least 1 correct area. *Allow tolerance in reading the velocity, as estimation required.* Units not required
Answers in the range 134 (m) to 158 (m) from correct working	A1	1.3a	
(c) Appropriate improvement suggested e.g. "working with more trapeziums of narrower widths"	E1	3.4a	
	(9)	(4) AO1 (1) AO2 (4) AO3	

Specimen Assessment Materials Calculator-allowed Higher	**Mark**	**Elements linked to AOs**	**Comments**
23. (a) $f(4) = 8$ $gf(4) = 19$	B1 B1	1.3a 1.3a	F.T 'their $f(4)$' Alternative method: $gf(x) = 3 + 2(2x)$ OR $3 + 4x$ *B1* $gf(4) = 19$ *B1*
(b) $fg(x) = 2(3 + 2x)$ $fg(x) = 6 + 4x$ $6 + 4x = 14$ $x = 2$	M1 A1 M1 A1	3.1b 1.3a 3.1b 1.3a	Allow F.T. from 'their $6 + 4x$', provided it is a linear expression, for M1 only C.A.O. *Alternative method*: $fg(x) = 2(3 + 2x)$ M1 $2(3 + 2x) = 14$ M1 $3 + 2x = 7$ A1 C.A.O. *or equivalent without brackets* $x = 2$ A1 C.A.O.
	(6)	(4) AO1 (0) AO2 (2) AO3	

COMPONENT 2:CALCULATOR-ALLOWED MATHEMATICS, FOUNDATION TIER

GENERAL INSTRUCTIONS for MARKING GCSE Mathematics

1. The mark scheme should be applied precisely and no departure made from it. Marks should be awarded directly as indicated and no further subdivision made. When a candidate follows a method that does not correspond to the methods explicitly set out in the mark scheme, marks should be awarded in the spirit of the mark scheme. In such cases, further advice should be sought from the Team Leader or Principal Examiner.

2. Marking Abbreviations
The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.
CAO = correct answer only
MR = misread
PA = premature approximation
bod = benefit of doubt
oe = or equivalent
si = seen or implied
ISW = ignore subsequent working

F.T. = follow through ($\surd$ indicates correct working following an error and $\surd\!\!\!\times$ indicates a further error has been made)

Anything given in brackets in the marking scheme is expected but, not required, to gain credit.

3. Premature Approximation
A candidate who approximates prematurely and then proceeds correctly to a final answer loses 1 mark as directed by the Principal Examiner.

4. Misreads
When the data of a question is misread in such a way as not to alter the aim or difficulty of a question, follow through the working and allot marks for the candidates' answers as on the scheme using the new data.
This is only applicable if a wrong value, is used consistently throughout a solution; if the correct value appears anywhere, the solution is not classed as MR (but may, of course, still earn other marks).

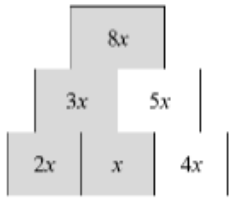
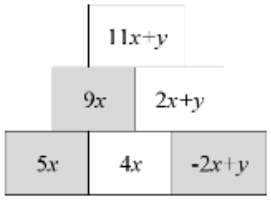
5. Marking codes

- 'M' marks are awarded for any correct method applied to appropriate working, even though a numerical error may be involved. Once earned they cannot be lost.
- 'm' marks are dependant method marks. They are only given if the relevant previous 'M' mark has been earned.
- 'A' marks are given for a numerically correct stage, for a correct result or for an answer lying within a specified range. They are only given if the relevant M/m mark has been earned either explicitly or by inference from the correct answer.
- 'B' marks are independent of method and are usually awarded for an accurate result or statement.
- 'S' marks are awarded for strategy
- 'E' marks are awarded for explanation
- 'U' marks are awarded for units
- 'P' marks are awarded for plotting points
- 'C' marks are awarded for drawing curves

COMPONENT 2:CALCULATOR-ALLOWED MATHEMATICS, FOUNDATION TIER

Specimen Assessment Materials Calculator-allowed Foundation	Mark	Elements linked to AOs	Comments
1. (a) (£)8.5(0) and (£)23.85	B1	1.3a	
(£)9.96	B1	1.3a	
(£)42.31	B1	1.3a	F.T their values, provided that units are consistent
(b) (£)7.67	B1	1.3a	F.T 50 – 'their 42.31'
(c) 6 × 1.99	M1	3.1c	Or equivalent
(£)11.94	A1	1.3a	SC1 for (9 × 1.99=)(£)17.91
	(6)	(5)AO1 (0)AO2 (1)AO3	
2. 12 and 24 indicated	B2	1.1	B1 for 2 correct and 1 incorrect OR 1 correct and no more than 1 incorrect
	(2)	(2)AO1 (0)AO2 (0)AO3	
3. (a) 5/7	B1	1.3a	In Q3 as a whole, penalise -1 once only if consistent use of incorrect notation.
(b) 3/7	B1	1.3a	
	(2)	(2)AO1 (0)AO2 (0)AO3	
4. 390 ÷ 3	M1	1.3b	Award M1 for sight of 130 or 1950
× 5	m1	1.3b	Accept in either order × 5, ÷ 3
650	A1	1.3b	CAO
	(3)	(3)AO1 (0)AO2 (0)AO3	
5. Strategy attempting to add 5 to the x-coordinate or subtracting 5 from the y-coordinate e.g. B shown as $(6, y)$ or D shown as $(x, 3)$	M1	3.1a	Evidence on diagram or if at least 1 correct coordinate
(6, – 3)	A1	2.1a	
	(2)	(0)AO1 (1)AO2 (1)AO3	
6. Lisa = $x + 3$	B1	2.3b	Accept $2 \times x + 3$ or $x + 3 \times 2$.
Julian = $2(x + 3)$	B1	2.3b	F.T. 2 × 'their Lisa' if Lisa $ax + b$, where b $\neq$ 0
Expansion of bracket = $2x + 6$	B1	1.3a	F.T. if $2(ax \pm b)$
(Total number of pens = $x + x + 3 + 2x + 6$=) $4x + 9$	B1	1.3a	
	(4)	(2)AO1 (2)AO2 (0)AO3	

Specimen Assessment Materials Calculator-allowed Foundation	**Mark**	**Elements linked to AOs**	**Comments**
7. (2 × 1000) ÷ 400 5 (laps)	M1 A1 (2)	1.3a 1.3a (2)AO1 (0)AO2 (0)AO3	For conversion **and** division
8. (Cost of bracelets = 200 × 6.30) (£)1260 (number of bracelets sold at higher price) 60/100 × 200 OR 120 (sale of 120 bracelets =120 × (£)10 =) (£)1200 (sale of 80 bracelets = 80 × (£)4 =) (£)320 (Profit =) (£)1200 + (£)320 – (£)1260 (Profit of) (£)260	B1 B1 B1 B1 M1 A1 (6)	3.1d 3.1d 1.3a 1.3a 3.1d 1.3a (3)AO1 (0)AO2 (3)AO3	F.T. 'their 120' F.T. 200 –' their 120' but not 120 F.T. 'their 120 × (£)10' + 'their 80 (but not 120) × (£)4' – 'their (£)1260'
9. (a) $x = 4$ (b) $y = 20$ (c) $5a = 17 + 8$ $a = 5$	B1 B1 B1 B1 (4)	1.3a 1.3a 1.3a 1.3a (4)AO1 (0)AO2 (0)AO3	Allow embedded answers in all parts F.T. from 1 error for equation in the form $ma = n, m \neq 1$
10. (a) Suitable explanation e.g. "5 occurs more often than any other number" (b) For 2 correct values that give a range of 7 AND a median of 6.	E1 B2 (3)	1.1 2.1b (1)AO1 (2)AO2 (0)AO3	E.g. 5 is the most popular number 6 &10, 7&10, 8 &10, 9 &10,10 & 10 B1 for 2 values that either give a range of 7 or a median of 6
11. $20 = 50 – 10k$ OR $10k = p – 2q$ OR $2q – p = –10k$ $10k = 50 – 20$ OR $–10k = 20 – 50$ $k = 3$ (seconds)	M1 M1 A1 (3)	1.3a 1.3a 1.3a (3)AO1 (0)AO2 (0)AO3	20 must be evaluated if this method used. For isolating k term. 20 must be evaluated. FT their equation or formula, if of equivalent difficulty.

Specimen Assessment Materials Calculator-allowed Foundation	**Mark**	**Elements linked to AOs**	**Comments**
12. Spinner 1 Suitable explanation e.g. "Ethan has 50% chance of a yellow & Kyle has 25% chance of a red" or "probability of yellow (½) > probability of red (¼)"	B1 E1 (2)	2.4a 2.4a (0)AO1 (2)AO2 (0)AO3	
13.(a) Uniform scale on kilometre axis Plotting at least two correct points **Correct** straight line through points (b) Full explanation given e.g. "he could find what 35 miles is in km and then double it" Approximately 112 (km)	B1 P1 L1 E1 B1 (5)	1.2 2.3b 2.3b 2.1b 1.3a (2)AO1 (3)AO2 (0)AO3	F.T. their graph or accept answers in the range 110 – 113 (km)
14. (a)  (b)  	B1 B1 B1 B1 B1 (5)	3.1a 1.3a 1.3a 1.3a 1.3a (4)AO1 (0)AO2 (1)AO3	For the $5x$ For the $4x$ F.T 'their $5x$' – x For the $4x$ For the $2x + y$ F.T 'their $4x$' – $2x + y$ For the $11x + y$ F.T $9x$ + 'their $2x + y$' Must be in the form $ax + by$	

Specimen Assessment Materials Calculator-allowed Foundation	**Mark**	**Elements linked to AOs**	**Comments**
15.(a) $84 - 0{\cdot}06 \times 84$ OR $0{\cdot}94 \times 84$ (= 78·96 kg or 79 kg)	M1	3.1d	
$78{\cdot}96 \times 0{\cdot}972$ OR $78{\cdot}96 - 0{\cdot}028 \times 78{\cdot}96$ OR $0.028 \times 0{\cdot}94 \times 84$	M1	3.1d	F.T. their 78·96 or 79 provided the value is < 84
76·7(4912 kg) or 76·7(88 kg) or 76·8(kg) or 77(kg)	A1	1.3a	Or 76·75 or 76·74 *If no marks, then SC1 for an answer of 76·6(08) from a reduction of 8·8%. No F.T. to (b)*
(b) $(84 - 76{\cdot}74912)/84 \times 100$ or equivalent full method	M1	1.3a	F.T. their '76.7', provided ≠ 76·6(08) from 8·8%
8·632% rounded or truncated from correct working	A1	1.3a	Accept an answer of 8·333..% from using 77kg, or 8·69…% from using 76·7, …
	(5)	(3)AO1 (0)AO2 (2)AO3	
16. For use of 9 hours	B1	3.1d	
(Fishing Boats R Us) 45 + 30 × 8	M1	3.1d	F.T. their whole number of hours. Award M0 A0 for use of 8.15
(£) 285	A1	1.3b	
(Ocean Blue Boats) (£)288	B1	1.3b	F.T. their whole number of hours. Award B0 for use of 8.15
Choice of company with valid reason e.g. "go with Fishing Boats R Us as they are cheaper " or "could use either as there's not much between them"	E1	3.4b	F.T. their prices for Fishing Boats R Us AND Ocean Blue Boats.
	(5)	(2)AO1 (0)AO2 (3)AO3	

Specimen Assessment Materials Calculator-allowed Foundation	**Mark**	**Elements linked to AOs**	**Comments**
17. He spends (£)100 on rent OR $\frac{1}{4}+\frac{2}{5}$ and (£)160 on food	M1	1.3b	
leaving (£)140 OR $\frac{13}{20}$	A1	1.3b	F.T. for second M1,A1
Frac. remaining 140/400 OR or $1-\frac{13}{20}$	M1	1.3b	
$\frac{7}{20}$ I.S.W.	A1	1.3b	*Decimals or % equivalents* *0·25 + 0·4(0) = 0·65* *1- 0·65 = 0·35 First M1, A1 possible* *F.T. for second M1,A1* *but must be fractions for second M1,A1.* $\frac{35}{100}$ *M1* $=\frac{7}{20}$ *A1* Incorrect method of Subtracting at each stage : Spends (£)100 on rent Leaving £300. 2/5 of £300 = 120 leaving (£)180 F.T. for second M1,A1 Frac. remaining $\frac{180}{400}=\frac{9}{20}$ Possible 4 marks then –1 if any A marks awarded
	(4)	(4)AO1 (0)AO2 (0)AO3	
18. (a) $\frac{95}{250}\times 100$	M1	1.3a	
38 (%)	A1	1.3a	
(b) Cost of newspapers = £29.04 – 4·12 × 6	M1	1.3b	Award M1 for sight of (£)4.32
Cost of 1 newspaper = (£29.04 – 4·12 × 6) ÷ 4	m1	1.3b	
= (£) 1.08	A1	1.3b	C.A.O
	(5)	(5)AO1 (0)AO2 (0)AO3	
19. 35 × 45 × 20	M1	3.1d	
31500	A1	1.3a	Seen or implied in further calculations
31500 ÷ (100 × 15)	M1	3.1d	F.T. their 31500
21 (cm)	A1	1.3a	
	(4)	(2)AO1 (0)AO2 (2)AO3	

Specimen Assessment Materials Calculator-allowed Foundation	**Mark**	**Elements linked to AOs**	**Comments**
20. (a) 48000 /16 /25 /8	M2	3.1c	M1 for dividing 48000 by two of 16, 25 or 8. *Accept alternative methods involving multiplication, e.g.* *25 x 16 = 400* *48000/400 (= 120)* *120/8 (M1 for 2 of the 3 steps)*
= 15	A1	1.3a	C.A.O.
Correct interpretation of their answer: e.g. (Assumption is) that each examiner works for 15 hours a day.	E1	3.3	
(b) **Reason**: e.g. It is unlikely that all examiners will work for as long as 15 hours in one day. OR It is unlikely that the examiners will be able to work at the same rate for 15 hours in one go. AND **Effect**: e.g. 8 days is too short a time to complete the marking.	E2	3.4b 3.5	F.T. 'their 15', if appropriate. Reason is AO3.4b, effect is AO3.5. E1 for reason only.
	(6)	(1)AO1 (0)AO2 (5)AO3	
21. No AND reason (both the same) 1/6	B1	2.5a	1/6 must be seen. Accept NO with appropriate sight of 1/6. Accept reference to 1/6 in words.
No AND reason (1/6 × 1/6=)1/36	B2	2.5a	B1 for No AND reason may be based on sample space or, gives 1/6×1/6 without stating 1/36, or, gives 1/6×1/6 with an incorrect response, e.g. 2/36 or, sight of 1/36 with no conclusion Do not accept incorrect probability with statement 'No' without working
	(3)	(0)AO1 (3)AO2 (0)AO3	
22. Calculating original amount e.g. sight of 492 × 100/ 60 OR '60% is 492'	M1	3.1b	
(£) 820	A1	1.3a	
0·98 × 'their 820'	M1	3.1b	
(£)803.6(0)	A1	1.3a	
	(4)	(2)AO1 (0)AO2 (2)AO3	

Amount	After a decrease of	
	40%	2%
£**820**	£492	£**803.6(0)**

Specimen Assessment Materials Calculator-allowed Foundation	**Mark**	**Elements linked to AOs**	**Comments**
23. (a) Valid reason or explanation, e.g. 'approximates to a rectangle with an area of 6×20'	E2	2.1b	Sight of the word rectangle and area of 6×20 for E2. Needs to be precise in reference to rectangle, not vague referring to edges or banks of the pond being extra. Award E1 for explanation without reference to 6×20.
(b) Correct strategy e.g. considers 2 semi-circles and a rectangle	S1	3.1d	
Method of calculating area	M1	3.1d	Idea of splitting up the area
Accuracy in establishing missing lengths / dimensions	M1	1.3b	e.g. $\pi r^2 + l \times w$ e.g. Sight of diameter 6m or radius 3m AND length of rectangle =20–3–3 20–6(=14)m, or $\pi \times 3^2 + 14 \times 6$
Value for their area	A1	1.3b	e.g. 112(.27… m^2)
Justification of their method e.g. "having a rectangle and 2 semi-circles is more like the sketch than using a rectangle as Eliza has done"	E1 (7)	3.4a (2)AO1 (2)AO2 (3)AO3	
24. (a) Reason, e.g. 'outside the juice bar', 'mostly younger people use juice bars'	E1	2.5b	
(b) Two appropriate criticisms e.g. 'No under 15s', '30 appears in two boxes', 'may object to giving their age'	E2 (3)	2.5b (0) AO1 (3) AO2 (0) AO3	
25. $6x - 2 = 4x + 5$ $2x = 7$ $x = 7/2$ (3·5) Length of side of square = $4 \times 3{\cdot}5 + 5$ or $6 \times 3{\cdot}5 - 2$ =19 (cm)	B1 B1 B1 M1 A1 (5)	2.2 1.3a 1.3a 2.2 1.3a (3) AO1 (2) AO2 (0) AO3	

Specimen Assessment Materials Calculator-allowed Foundation	**Mark**	**Elements linked to AOs**	**Comments**
26. $7n - 1$	B2 (2)	1.3a (2) AO1 (0) AO2 (0) AO3	B1 for $7n \pm \ldots$ Allow change of letter
27. (a) Midpoints 52, 56, 60 and 64 52×12 + 56×32 + 60×14 + 64×2 (=3384) /60 56.4 (cm) (b) Strategy to look back that 32 out of 60 are size 2, e.g. '(table shows) about half customers are size 2 Conclusion to give Salesman is correct	B1 M1 m1 A1 S1 E1 (6)	1.3b 1.3b 1.3b 1.3b 2.5a 2.5a (4) AO1 (2) AO2 (0) AO3	 F.T. their midpoints, provided within interval F.T. their sum of products, division by 60
28. Straight lines parallel to all 4 sides and 3cm away (±2mm) Arcs with radius 3cm (±2mm) at all 4 vertices joining the straight lines (4)	B2 B2 (0) AO1 (4) AO2 (0) AO3	2.3b 2.3b (0) AO1 (4) AO2 (0) AO3	B1 for straight lines parallel to 2 sides and 3cm away (±2mm), OR straight lines parallel to all 4 sides but not at 3cm B1 for arcs with radius 3cm (±2mm) at least 2 vertices but not joined to straight lines, OR arcs at all 4 vertices but not at 3cm or not joined to straight lines
29. (Height of tree =) Tan 56° × 19 + 1·8(m) (Height of tree =) 29·968658….. (m) (4)	M3 A1 (1) AO1 (0) AO2 (3) AO3	3.1d 1.3b (1) AO1 (0) AO2 (3) AO3	Award M2 for tan 56° × 19 OR sight of 28·168658….(m) Award M1for tan 56° = opposite/19 Accept rounded or truncated from working Accept rounded or truncated from working F.T from their rounded or truncated 28·168…
30. (a) 10/0·2 = 50 N/m^2 (b) 10/x (N/m^2) (4)	M1 A1 U1 B1 (4)	1.3a 1.3a 1.1 2.3b (3)AO1 (1)AO2 (0)AO3	

COMPONENT 1: NON-CALCULATOR, HIGHER TIER

Qu.	Topic	Max mark	Num	Alg	Ratio	Geom	Prob	Stats	AO1	AO2	AO3	Common
1	Substituting	3		3					3	0	0	
2	Standard form	4	4						4	0	0	2 (C1 FT Q28)
3	Cherry blossom paint ratio and graph	4			4				0	2	2	4 (C1 FT Q25)
4	Tree diagram – Andy going to college	6					6		2	4	0	6 (C1 FT Q24)
5	Prime factors in index notation	3	3						3	0	0	
6	Simultaneous equations – paint and brushes	4		4					1	0	3	4 (C1 FT Q26)
7	Loci	4				4			0	4	0	
8	Ratio problem	4			4				2	0	2	
9	Factorising	3		3					3	0	0	3 (C1 FT Q22)
10	Carpet	5	2			3			1	0	4	5 (C1 FT Q27)
11	Vectors	4				4			2	1	1	
12	Building site	5			5				1	0	4	5 (C1 FT Q26)
13	Gradients & perp. lines	7		7					3	2	2	
14	Speed	6			6				2	4	0	
15	Congruency	5				5			0	5	0	
16	Histogram	10						10	2	5	3	
17	Inverse proportion	4			4				4	0	0	
18	Surds	4	4						4	0	0	
19	Simplifying	2		2					2	0	0	
20	Recurring decimals & Indices	5	5						5	0	0	
21	Composite shape	7		7					2	1	4	
22	Transformation of graphs	6		6					0	6	0	
23	Probability	7					7		2	1	4	
24	Trigonometry, algebra and surds	8	1	2		5			3	0	5	
	Totals	**120**	**19**	**34**	**23**	**21**	**23**		**51**	**35**	**34**	**29**

COMPONENT 1: NON-CALCULATOR, FOUNDATION TIER

Qu.	Topic	Max mark	Num	Alg	Ratio	Geom	Prob	Stats	AO1	AO2	AO3	Common
1	Factors, primes, etc	4	4						4	0	0	
2	Place value	3	3						3	0	0	
3	Frequency table and bar graph	4						4	1	3	0	
4	Rounding and simple estimate	4	4						4	0	0	
5	Rotational symmetry	2				2			2	0	0	
6	Car parking	11	11						4	4	3	
7	Balancing weights	3		3					3	0	0	
8	Scale drawing	5			5				3	2	0	
9	Shopping estimate	4	4						3	1	0	
10	Piece of wood	2	2						1	0	1	
11	Simplifying	5		5					5	0	0	
12	Perimeter rectangle problem	3				3			1	1	1	
13	Sequences - diagrams	2		2					0	1	1	
14	Sharing money and percentage	5			5				5	0	0	
15	Temperature	6				2		4	5	1	0	
16	Painting	4			2	2			2	0	2	
17	Triangle	4				4			0	4	0	
18	Evaluating presentation and validation	3	1					2	0	3	0	
19	Bouncing ball	3			3				1	0	2	
20	Area ratio	5			3	2			2	1	2	
21	French German Venn	4					4		2	0	2	
22	Factorising	3		3					3	0	0	3 (C1 HT Q9)
23	Daffodil bulbs	5			5				1	2	2	
24	Tree diagram – Andy going to college	6					6		2	4	0	6 (C1 HT Q4)
25	Cherry blossom paint ratio and graph	4			4				0	2	2	4 (C1 HT Q3)
26	Simultaneous equations - paint and brushes	4		4					1	0	3	4 (C1 HT Q6)
27	Carpet	5	2			3			1	0	4	5 (C1 HT Q10)
28	Standard form	2	2						2	0	0	2 (C1 HT Q2)
29	Building site	5			5				1	0	4	5 (C1 HT Q12)
	Totals	**120**	**33**	**17**	**32**	**18**	**20**		**62**	**29**	**29**	**29**

COMPONENT 2: CALCULATOR-ALLOWED, HIGHER TIER

Qu.	Topic	Max mark	Num	Alg	Ratio	Geom	Prob	Stats	AO1	AO2	AO3	Common
1	Percentages	4	4						4	0	0	
2	Questionnaire	3						3	0	3	0	3 (C2 FT Q24)
3	Algebra square length	5		5					3	2	0	5 (C2 FT Q25)
4	Animal rescue scatter diagram	5						5	1	4	0	
5	Solving equations	4		4					4	0	0	
6	Linear sequence + sequence problem	5		5					4	0	1	2 (C2 FT Q26)
7	Trigonometry - man and tree	4				4			1	0	3	4 (C2 FT Q29)
8	Mean hat circumference data	6	2					4	4	2	0	6 (C2 FT Q27)
9	Spring graph interpretation	5		5					2	3	0	
10	Locus statue	4			1	3			0	4	0	4 (C2 FT Q28)
11	Probability	3					3		2	1	0	
12	Fuel consumption	9	4		5				3	1	5	
13	Bacteria growth decay rate	6	3	3					1	3	2	
14	Cumulative frequency customer service	5			2			3	2	1	2	
15	Ratio + circle	4			3	1			2	0	2	
16	Quadratic formula	3		3					3	0	0	
17	Lower and upper bounds - metal plates	6	6						1	3	2	
18	Circle theorems	6				6			0	6	0	
19	Dog toy	7				7			1	0	6	
20	Stone in the air	7		4	3				4	0	3	
21	Triangle between parallel lines	4			2	2			2	0	2	
22	Travel acceleration area distance	9		6	3				4	1	4	
23	Composite functions	6		6					4	0	2	
	Totals	**120**	**19**	**41**	**19**	**23**	**18**		**52**	**34**	**34**	**24**

COMPONENT 2: CALCULATOR-ALLOWED, FOUNDATION TIER

Qu.	Topic	Max mark	Num	Alg	Ratio	Geom	Prob	Stats	AO1	AO2	AO3	Common
1	Music bill question	6	6						5	0	1	
2	Multiples of 3 and 4	2	2						2	0	0	
3	Calculating probabilities	2					2		2	0	0	
4	Fraction of girls in a school	3	3						3	0	0	
5	Coordinates of a square	2		2					0	1	1	
6	Collection of pens	4		4					2	2	0	
7	Athletics track	2	2						2	0	0	
8	Bracelets	6	5		1				3	0	3	
9	Linear equations	4		4					4	0	0	
10	Netball averages	3						3	1	2	0	
11	Formula: Finding *k*	3		3					3	0	0	
12	Spinners	2					2		0	2	0	
13	Conversion graph	5			5				2	3	0	
14	Algebra pyramid	5		5					4	0	1	
15	Health weight loss	5			5				3	0	2	
16	Fishing boat trip	5	5						2	0	3	
17	Faizal's fractions	4	4						4	0	0	
18	Percentage and cost of comic	5	3		2				5	0	0	
19	Pouring water into cuboids	4				4			2	0	2	
20	Exam marking	6			6				1	0	5	
21	Probability statements	3					3		0	3	0	
22	Percentage change with reverse	4			4				2	0	2	
23	Pond shape area	7				7			2	2	3	
24	Questionnaire	3						3	0	3	0	3 (C2 HT Q2)
25	Algebra square length	5		5					3	2	0	5 (C2 HT Q3)
26	Linear sequence	2		2					2	0	0	2 (C2 HT Q6a)
27	Mean hat circumference data	6	2					4	4	2	0	6 (C2 HT Q8)
28	Locus statue	4			1	3			0	4	0	4 (C2 HT Q10)
29	Trigonometry - man and tree	4				4			1	0	3	4 (C2 HT Q7)
30	Pressure problem	4			4				3	1	0	
	Totals	**120**	**32**	**25**	**28**	**18**	**17**		**67**	**27**	**26**	**24**