Surname	Centre Number	Candidate Number
Other Names		0

GCSE

C300UB0-1

S18-C300UB0-1

MATHEMATICS – Component 2
Calculator-Allowed Mathematics
HIGHER TIER

THURSDAY, 7 JUNE 2018
– MORNING

2 hours 15 minutes

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

C300UB01
01

ADDITIONAL MATERIALS

A calculator will be required for this examination.

A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

You may use a pencil for graphs and diagrams only.

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.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

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.

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:

Curved surface area of a cone = πrl

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

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

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:

$$v = u + at$$

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

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

Examiner only

1. Three friends, Jane, Caroline and Eddie, each throw the **same** dice 40 times.
Their results are shown in the table below.

	Score on the dice					
	1	**2**	**3**	**4**	**5**	**6**
Jane	8	4	8	8	4	8
Caroline	8	5	7	7	5	8
Eddie	8	2	9	9	4	8

(a) Do you think this dice is fair?
You must give a reason for your answer. [1]

Yes ☐ No ☐ Don't know ☐

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(b) What is the best estimate of the probability of scoring a 2 on this dice? [2]

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(c) Using Jane's, Caroline's and Eddie's results, how many times would you expect a score greater than 4 to occur in 480 throws of this dice? [2]

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Examiner only

2. *(a)* Factorise $a^2 + 5a - 14$. [2]

(b) Factorise $b^2 - 25$. [1]

(c) Solve $\frac{d}{5} + 2 = 12$. [2]

Examiner only

3.

1 AU is 1 astronomical unit.
1 AU = $1{\cdot}496 \times 10^8$ km, which is the distance from the Sun to Earth.

The distance between the planet Mercury and Earth can vary from 0·515 AU to 1·48 AU.

Complete the statement below.
Use kilometres written in standard form correct to **2 significant figures**.

'The distance between the planet Mercury and Earth can vary from ..... km to ..... km.' [3]

Examiner only

4. *(a)* A bronze statue is made mainly from copper, with 12% tin and some nickel.

The quantity of nickel is $\frac{1}{6}$ of the quantity of tin.

What is the ratio copper : tin : nickel in this statue?
Give your answer in its simplest form. [4]

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Copper	:	Tin	:	Nickel
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Examiner only

(b) A different statue in a museum is made from copper, tin and zinc in the ratio 65 : 14 : 9.

There are 27 kg of zinc in the statue.

The museum crane cannot lift more than $\frac{1}{4}$ tonne.

Is it possible for this crane to lift this statue?

You must show all your working and give a reason for your answer. [3]

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Reason:

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Examiner only

5. The tourist office in Trofenberg displays the snowfall data each month in a table.

The table shows snowfall in Trofenberg for each day during January.

Snowfall, s (cm)	**Number of days**
$0 \leqslant s < 20$	1
$20 \leqslant s < 40$	8
$40 \leqslant s < 60$	9
$60 \leqslant s < 80$	7
$80 \leqslant s < 100$	6

(a) Calculate an estimate for the mean daily snowfall in Trofenberg for January.
You must show all your working. [4]

(b) There were 9 days when the snowfall was between 40 cm and 60 cm.
On each of these days, the snowfall was actually between 57 cm and 59 cm.

Explain why the estimate for the mean daily snowfall in January may still be fairly accurate. [1]

Examiner only

6.

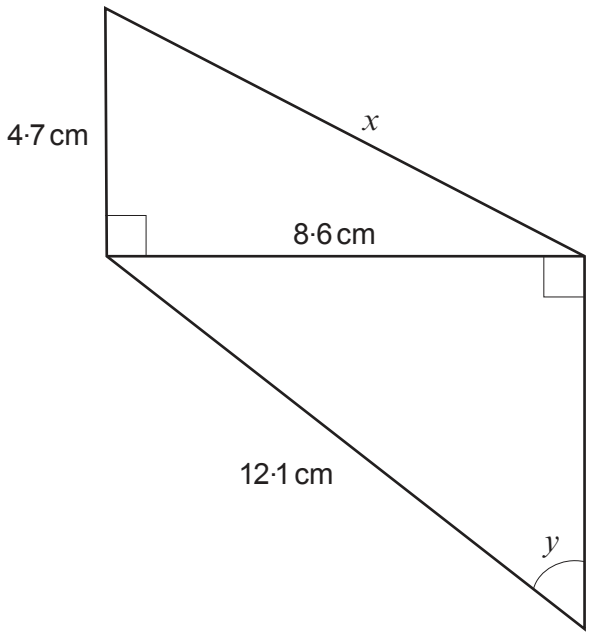


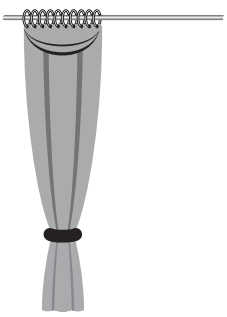
Diagram not drawn to scale

(a) Calculate the length x. [3]

(b) Calculate the size of angle y. [3]

Examiner only

7. *Alpha Bathrooms* sells only one size of shower curtain and one size of rail.



Sunita is buying shower curtains and rails for her guest house.
She needs more shower curtains than rails.

6 shower curtains and 3 rails would cost her £24.60.
5 shower curtains and 2 rails would cost her £18.60.

Calculate how much change Sunita would get from £40 when buying
7 shower curtains and 5 rails.
You must use an algebraic method. [6]

Examiner only

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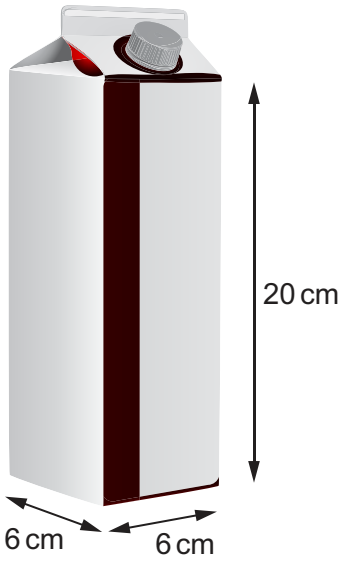
Sunita's change from £40 would be .....

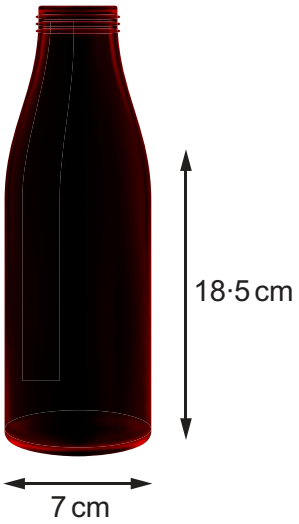
Examiner only

8. Aled decides to pour milk from a full carton into an empty bottle.
The measurements for the carton and the bottle are shown below.

Milk carton



Milk bottle



Diagrams not drawn to scale

(a) Is it possible to pour all the milk from the full carton into the bottle?
You must show all your working and give a reason for your answer. [5]

Yes ☐ No ☐

Reason:

Examiner only

(b) (i) When evaluating your result in part *(a)*, what assumption did you make? [1]

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(ii) If your assumption were **not** true, what impact would this have on your answer? [1]

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Examiner only

9. Adanna wants to buy a ring.

The ring she wants has a mass of 12 g when made from gold.
The density of the gold in the ring is 19·32 g/cm^3.

The same ring could also be made from silver.
The density of the silver in the ring would be 10·48 g/cm^3.

Calculate the difference in the masses of the two rings. [4]

Difference in mass is ..... g

Examiner only

10. Filbert rides his bike at x km/h for 15 minutes.
He then rides at $(x + 2)$ km/h for half an hour.
The last section of his ride takes a further 15 minutes at $(x - 4)$ km/h.

Show that the total distance of Filbert's bike ride is x km.
You must show all your working. [4]

Examiner only

11. *(a)* Wayne says,

'6·5 m^2 is the same as 650 cm^2, because there are 100 cm in 1 metre.'

Maria says,

'6·5 m^2 is the same as 65 000 cm^2.'

Explain why Maria is correct. [1]

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(b) (i) The area of the water surface of Maria's pond is 6·5 m^2.
She measures the depth of the pond in 5 different places using a measuring stick.
The 5 depths recorded by Maria are 120 cm, 120 cm, 130 cm, 140 cm and 140 cm.

Maria buys a liquid treatment for pond water.
The instructions state:

> Use 0·5 litres of this treatment for every 1800 litres of pond water.

Calculate an **approximate** value for the quantity of the liquid treatment Maria needs to use in her pond.
You must give units at each stage of your working and give your answer in litres.
You must show all your working. [5]

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Examiner only

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(ii) Explain any decision you made in calculating an approximate value for the quantity of the liquid treatment needed.
What could be done to improve the accuracy of this value? [2]

Explanation of decision:

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Improvement:

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Examiner only

12. In a sale the prices of all jackets are reduced by 22%.
In the final week of the sale, all jackets are reduced by a further 15% of the sale price.

Abigail buys a jacket in the final week of the sale for £42.50.

What was the original price of the jacket?
Give your answer correct to the nearest penny. [4]

Examiner only

13. The mass of an empty crate is 720 g, **correct to the nearest 10 g**.
The crate holds 4 bottles.
Each full bottle weighs 310 g, **correct to the nearest 10 g**.

Calculate the minimum mass of the crate containing 4 full bottles.
You must show all your working. [3]

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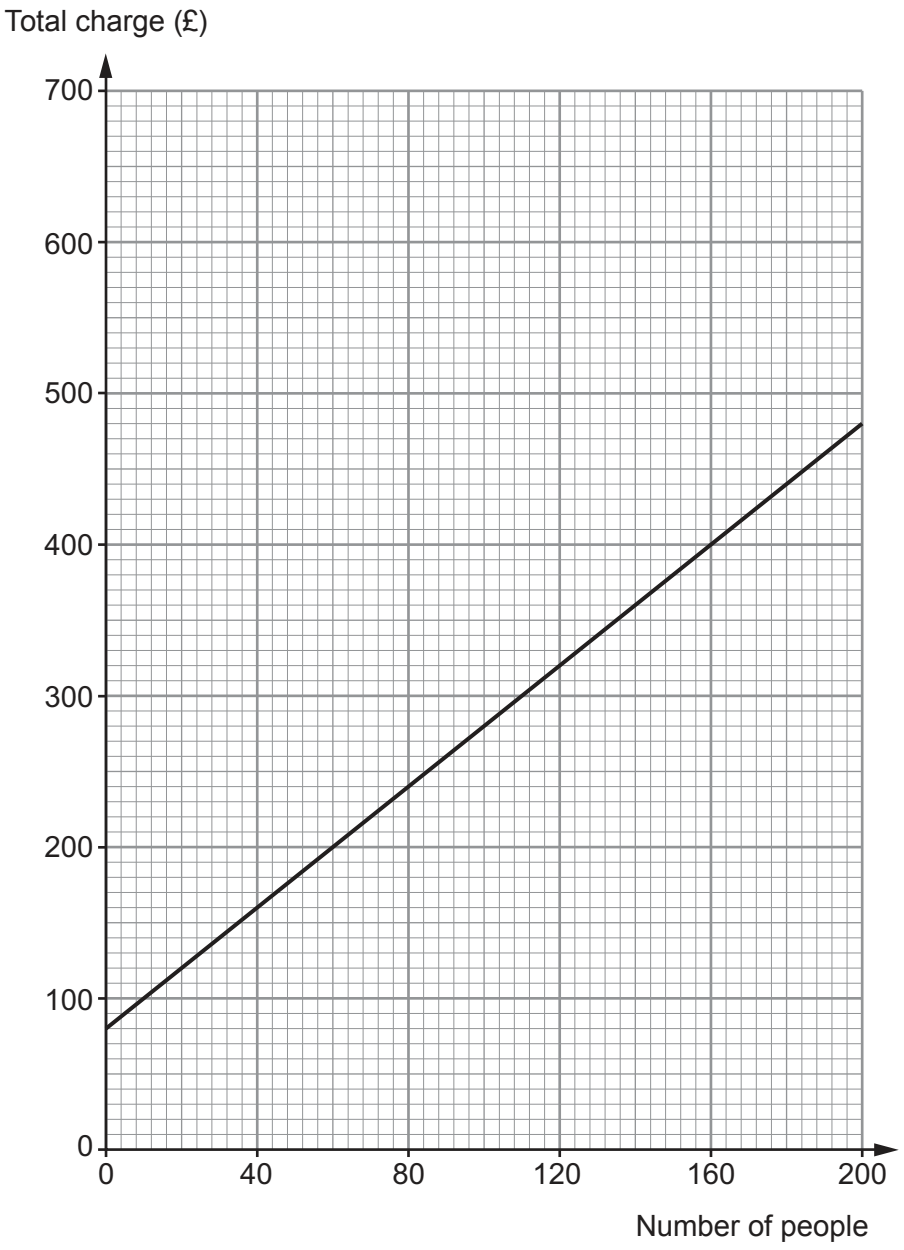
Minimum mass is ..... g

Examiner only

14. Lewis is organising a music festival for up to 200 people.

He has investigated the charges for booking bands.
The band *Rightjet* gives its charges using a graph, as shown below.



Examiner only

(a) Find the gradient of the graph and state the units of your answer. [2]

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(b) (i) The band *Draigetal* charges a fee of £60 and an additional £3 per person. On the same axes as *Rightjet*, draw a graph to show *Draigetal's* total charges for up to 200 people. [2]

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(ii) Let t represent the total charge, in pounds, and p represent the number of people. Hence, write down the equation of the line you have drawn in part *(b)*(i). [1]

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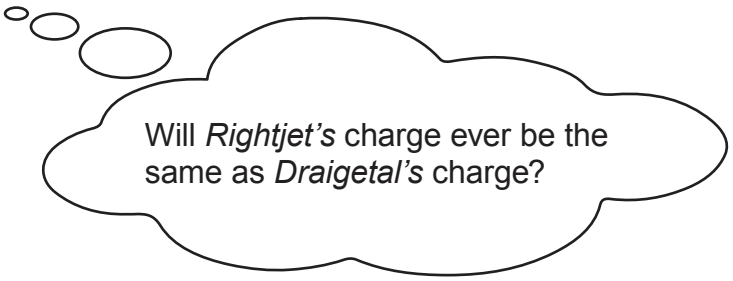
(c) Lewis wonders,



Complete the following statement.

'If ..... people attend, the charge would be the same for having the band *Rightjet* or the band *Draigetal*. This charge would be £ .....' [2]

Examiner only

15. *(a)* £500 was invested in a savings account for Harry when he was born.
The compound interest paid on this account was 2·1% per annum.
On his 18th birthday he was given the full amount from the savings account.

How much money did Harry receive?
Give your answer correct to the nearest penny. [3]

(b) Mina was given £x, which she invested in an account paying y% compound interest per annum.
How much will Mina's investment be worth after 6 years?
Give your answer as an expression in terms of x and y. [2]

Examiner only

16. In an experiment it is found that $C = \frac{2340}{B}$ and $A = \frac{52}{\sqrt{B}}$.

Find the value of C when $A = 130$. [2]

17. Find the nth term of the following sequence.

3, 7, 13, 21, 31, 43, …. [2]

Examiner only

18. *(a)* Show that $x = 13 - \frac{9}{x}$ is a rearrangement of $x^2 - 13x + 9 = 0$.

You must show each stage of your working. [1]

(b) Use the iteration formula

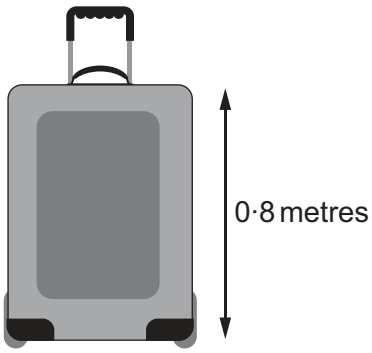
$$x_{n+1} = 13 - \frac{9}{x_n} \text{ and } x_1 = 12$$

to find a solution of $x^2 - 13x + 9 = 0$ correct to 2 decimal places.
You must give all your calculated values of x_{n+1}. [3]

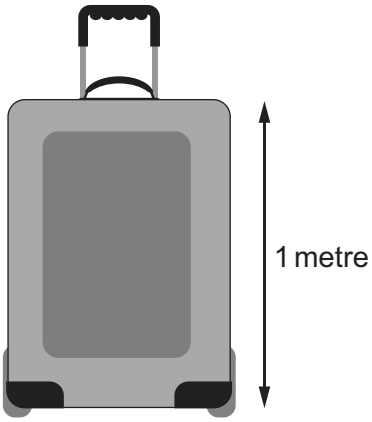
Examiner only

19. Kai and his mum have mathematically similar suitcases.
Kai's suitcase is smaller than his mum's suitcase.

Kai's suitcase



His mum's suitcase



Diagrams not drawn to scale

The label on Kai's suitcase says it holds 66 litres.
What should the label on his mum's suitcase say it holds? [2]

His mum's suitcase holds ..... litres.

Examiner only

20. The diagram below shows a composite shape made by joining two rectangles.

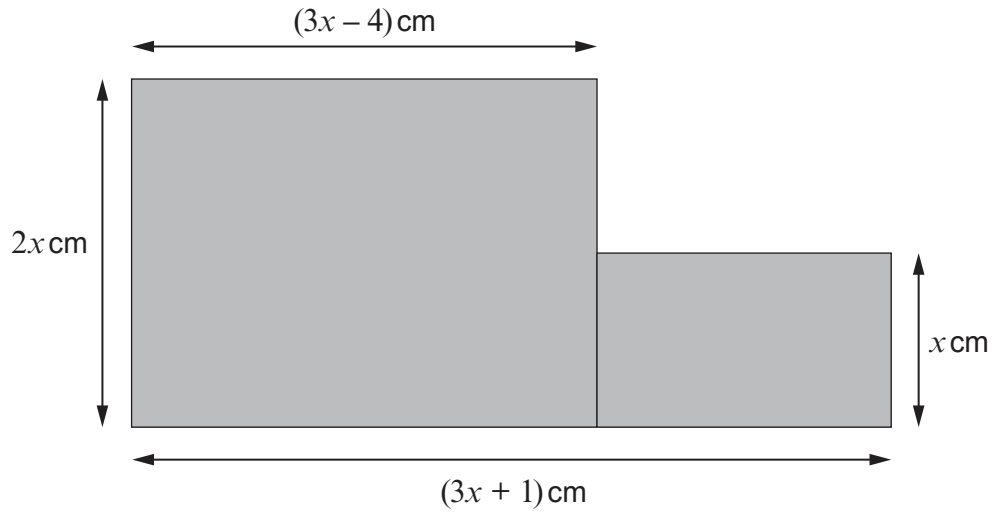


Diagram not drawn to scale

(a) The total area of the composite shape is 47 cm^2.
Show that $6x^2 - 3x - 47 = 0$. [3]

(b) Use the quadratic formula to solve $6x^2 - 3x - 47 = 0$.
Give **both** of your answers correct to 2 decimal places. [3]

Examiner only

(c) Calculate the perimeter of the composite shape.
You must give a reason for any decision that you make. [3]

Decision:

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Reason:

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Working:

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Perimeter is ..... cm.

21. Use the method of completing the square to find the coordinates of the turning point of the curve $y = x^2 + 12x + 57$. [4]

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Coordinates of the turning point (..... , ...)

Examiner only

22. A number of girls and boys with part-time jobs answered an online survey.
One of the questions asked how long they each spent working last Friday.
Histograms of these results are shown on the opposite page.

(a) Calculate an estimate for the number of **girls** who worked for 45 minutes or less last Friday. [2]

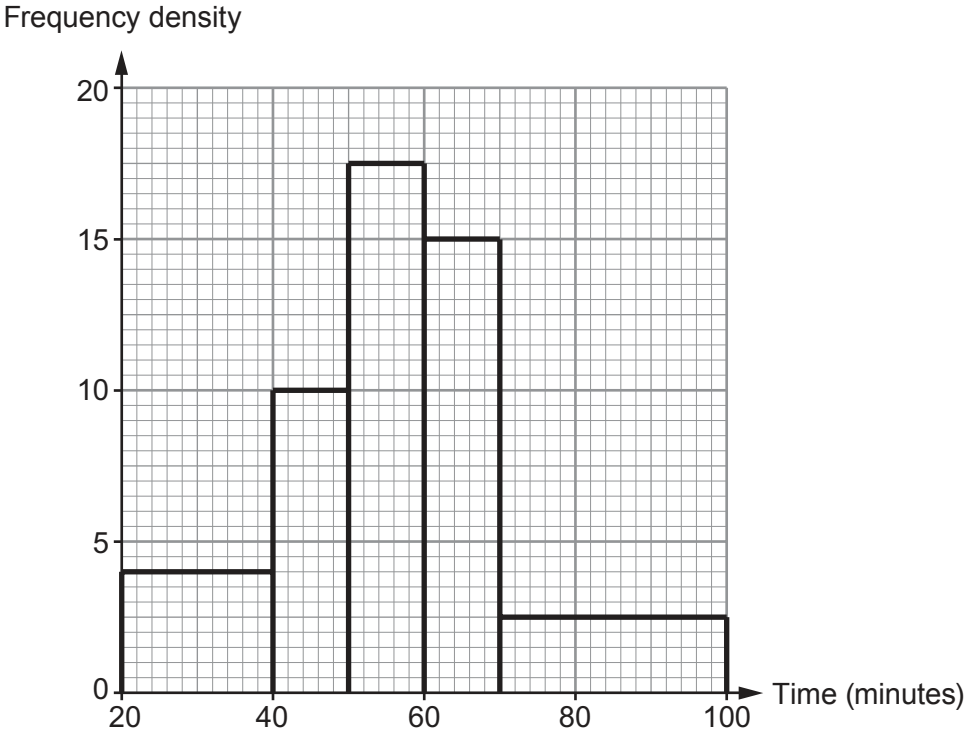
(b) Fred uses the results of the survey to compare the percentages of girls and boys who worked 1 hour or more last Friday.

580 girls took part in the survey.

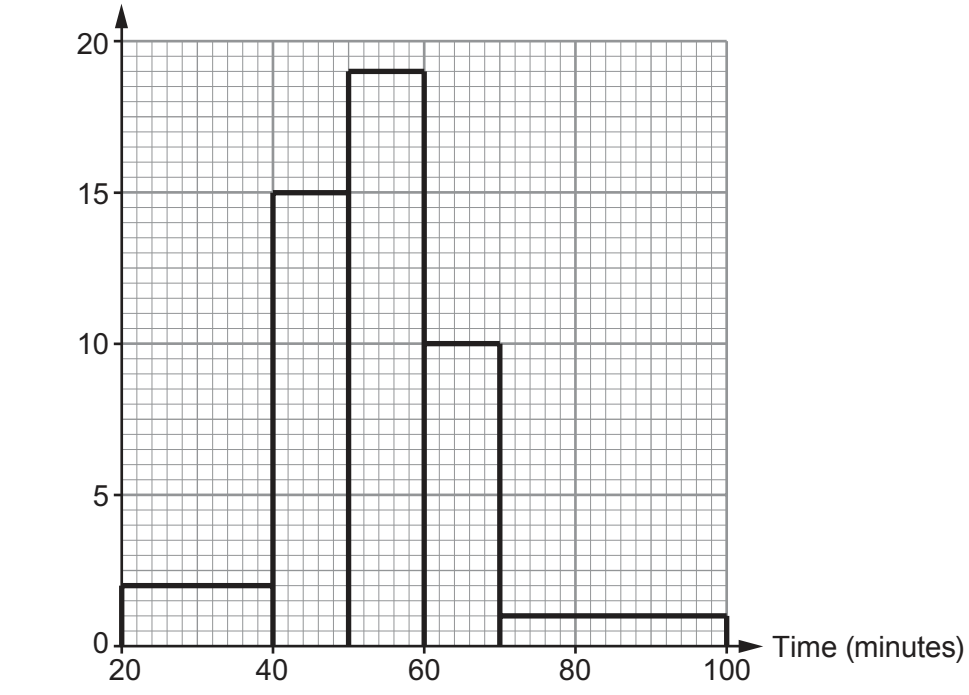
Complete the following statement.

..... % of girls compared with ..... % of boys worked for 1 hour or more last Friday. [6]

Girls



Boys



Examiner only

23. Mark's little sister Lucy has lost a piece of her jigsaw puzzle.
Mark has recorded some of the measurements of the gap left in the jigsaw by this missing piece.

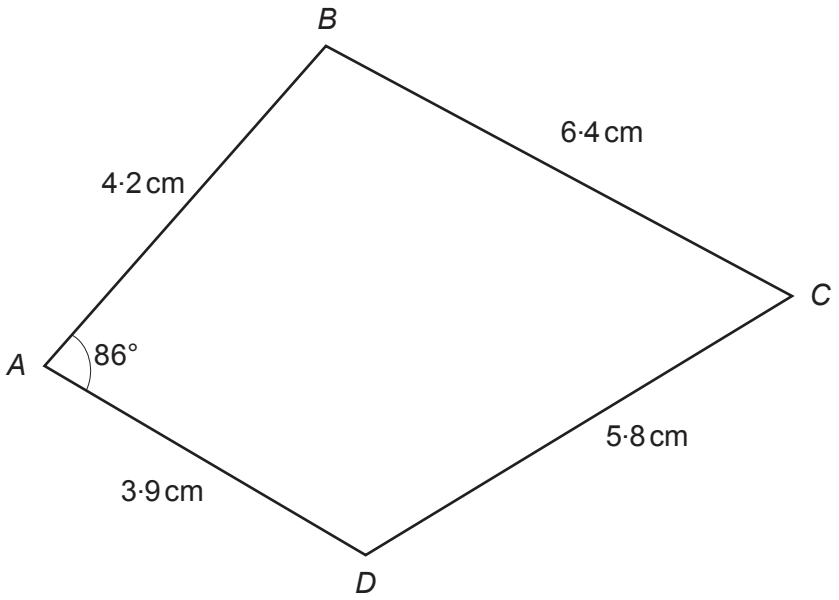


Diagram not drawn to scale

Mark agrees to make a replacement jigsaw piece for Lucy.

One face of the replacement jigsaw piece is to be painted gold.
It cost Mark £3.59 to buy a small pot of gold paint.
The label on the pot states there is enough paint in the pot to cover an area of 60 cm^2.

He says Lucy has to pay for the share of the gold paint he uses to make the missing jigsaw piece.

- Calculate the size of $B\hat{C}D$.
- Hence calculate how much Mark should charge Lucy.

You must show all your working. [10]

Examiner only

Mark should charge Lucy £ .....

END OF PAPER

Examiner only

For continuation only.