



# Cambridge IGCSE™

CANDIDATE  
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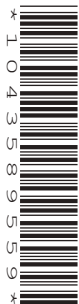
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**MATHEMATICS**

**0580/31**

Paper 3 (Core)

**October/November 2023**

**2 hours**

You must answer on the question paper.

You will need: Geometrical instruments

## INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For  $\pi$ , use either your calculator value or 3.142.

## INFORMATION

- The total mark for this paper is 104.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

- 1 (a) Write the number six and a half million in figures.

..... [1]

- (b) Write 37 508 correct to the nearest thousand.

..... [1]

- (c)                    6    9     $\sqrt{100}$     28    31     $\sqrt{1000}$     32    36

From this list of numbers, write down

- (i) a factor of 18

..... [1]

- (ii) a multiple of 12

..... [1]

- (iii) a square number

..... [1]

- (iv) a prime number

..... [1]

- (v) an irrational number.

..... [1]

- (d) Put one pair of brackets in each statement to make it correct.

(i)  $24 - 4 \times 3 + 2 = 62$  [1]

(ii)  $24 - 4 \times 3 + 2 = 4$  [1]

- (e) Write  $\frac{3}{4}$  as a decimal.

..... [1]

(f) Work out  $\frac{3}{7}$  of 126.

..... [1]

(g) Write down the value of the reciprocal of 0.5 .

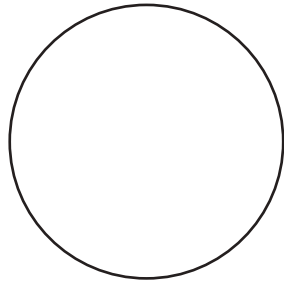
..... [1]

(h) **Without using a calculator**, work out  $5\frac{2}{3} - 2\frac{1}{5}$  .

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

2 (a) The diagram shows a circle.



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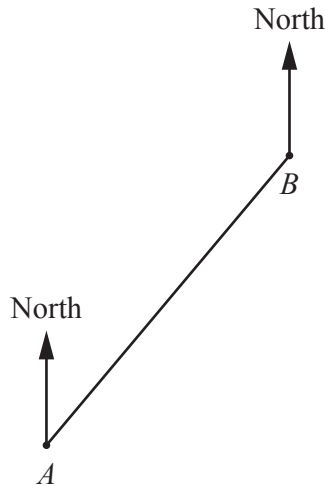
(i) The diameter of this circle is 168 mm.

Write down the radius of this circle.

..... mm [1]

(ii) On the diagram, draw a chord of this circle. [1]

(b) The scale drawing shows the position of ship *A* and the position of ship *B*.  
The scale is 1 cm represents 6 km.



Scale : 1 cm to 6 km

Another ship, *C*, is 45 km from ship *B* on a bearing of  $124^\circ$ .

(i) On the scale drawing, mark the position of ship *C*. [2]

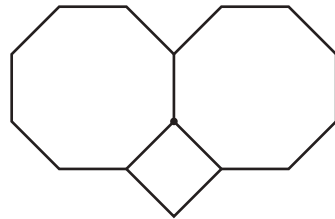
(ii) Find the actual distance of ship *C* from ship *A*.

..... km [2]

- (c) (i) Show that the interior angle of a regular octagon is  $135^\circ$ .

[1]

(ii)

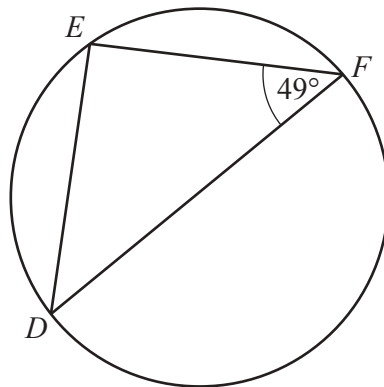


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Show that two regular octagons and a square meet at a point without any gaps.

[1]

(d)



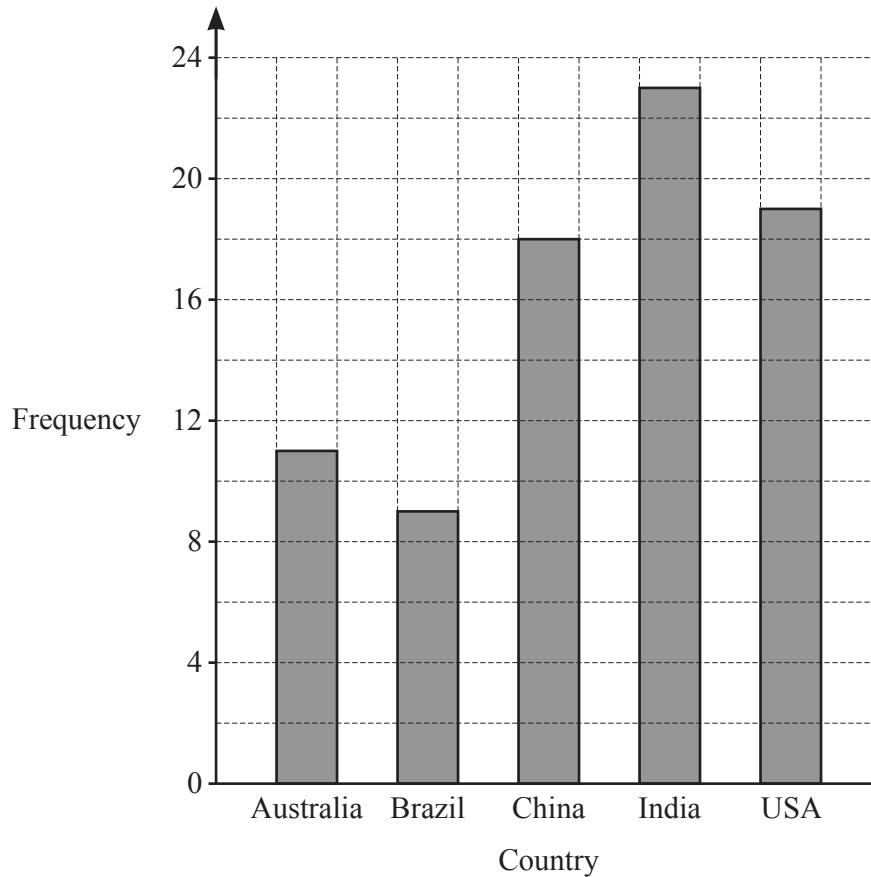
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The diagram shows points  $D$ ,  $E$  and  $F$  on the circumference of a circle.  
 $DF$  is a diameter of the circle.

Find angle  $EDF$ .

Angle  $EDF = \dots\dots\dots$  [2]

- 3 (a) The bar chart shows the country in which each of 80 students live.



- (i) How many of these students live in Brazil?

..... [1]

- (ii) In which country do the largest number of these students live?

..... [1]

- (iii) How many more of these students live in China than live in Australia?

..... [1]

- (iv) Find the percentage of these students who live in the USA.

.....% [2]

(b) In Hobart, the temperature at 8 am was  $-3^{\circ}\text{C}$  and the temperature at 3 pm was  $7^{\circ}\text{C}$ .

(i) Find the difference in the temperatures between 8 am and 3 pm.

.....  $^{\circ}\text{C}$  [1]

(ii) The temperature at 10 pm was  $12^{\circ}\text{C}$  lower than at 3 pm.

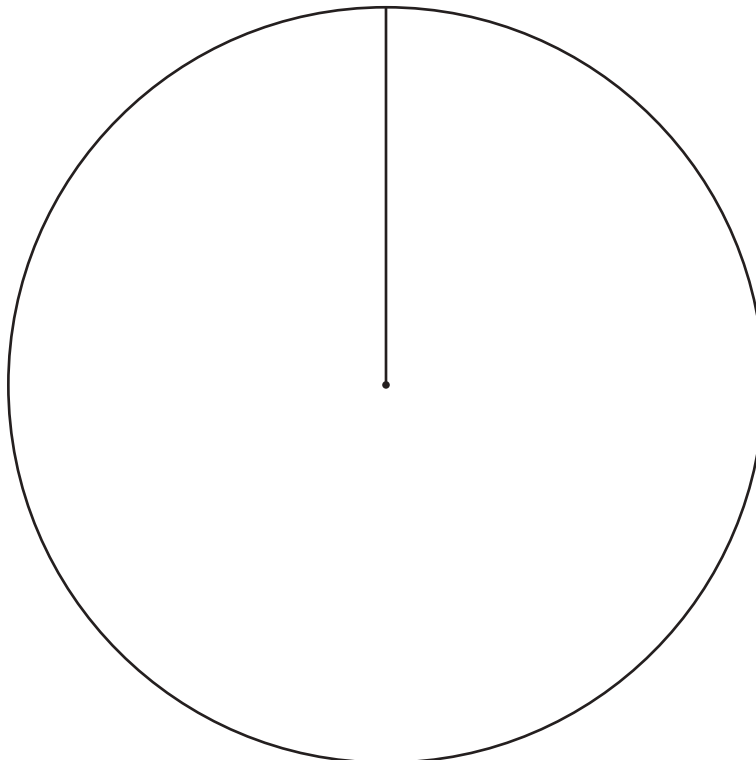
Find the temperature at 10 pm.

.....  $^{\circ}\text{C}$  [1]

(c) The table shows the favourite language that each of 80 students studies.

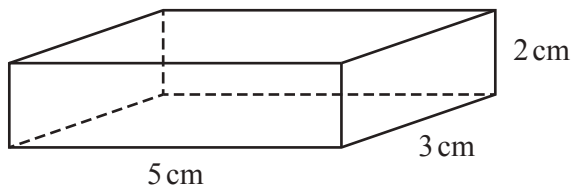
Language	Frequency
French	12
Spanish	26
English	42
Total	80

Complete the pie chart to show this information.



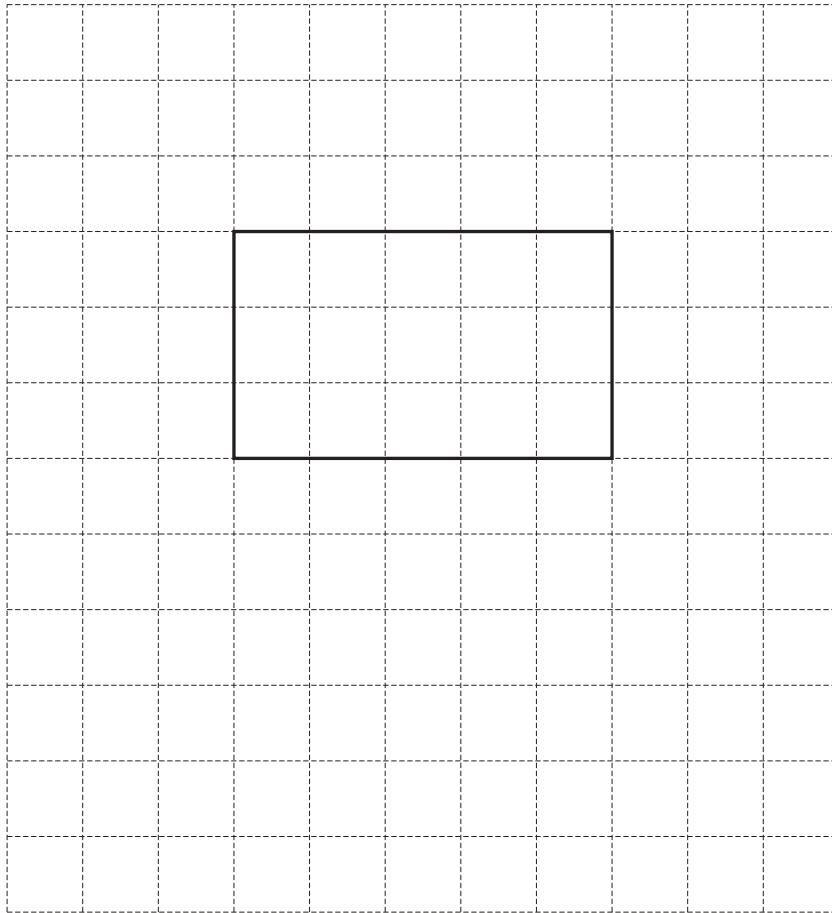
[4]

- 4 (a) The diagram shows a cuboid.



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- (i) On the  $1\text{cm}^2$  grid, complete the net of the cuboid.  
One face has been drawn for you.



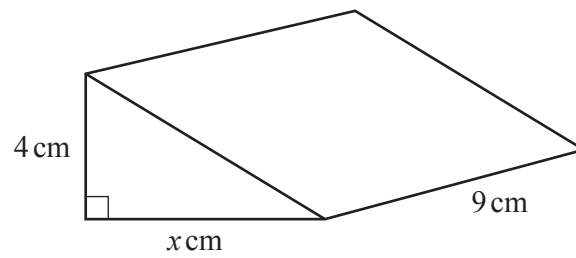
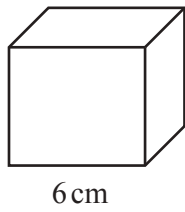
[3]

- (ii) Calculate the surface area of the cuboid.

.....  $\text{cm}^2$  [2]



(b) The diagram shows two solids: a cube and a right-angled triangular prism.



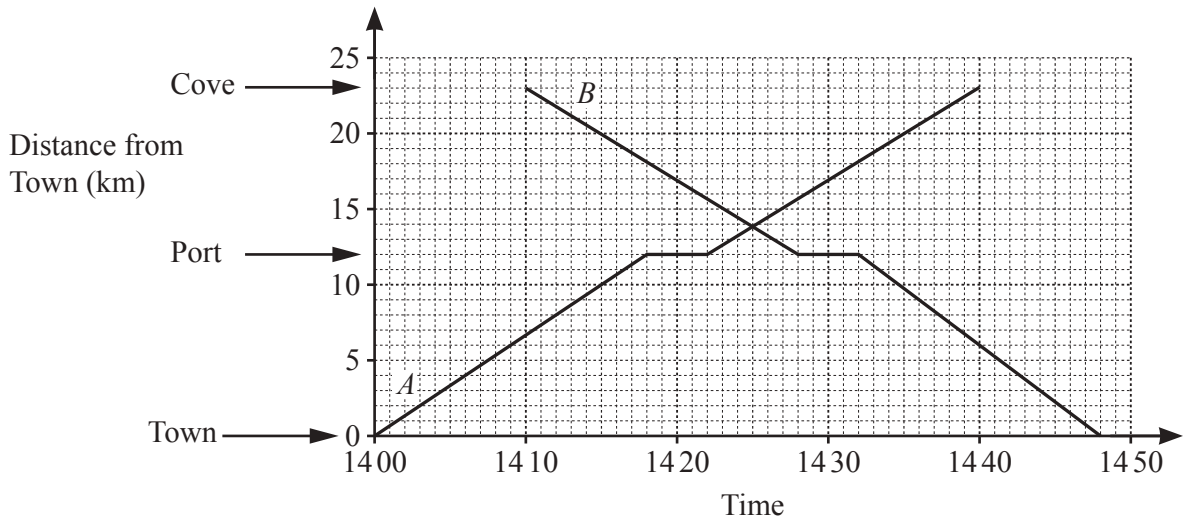
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Both solids have the same volume.

Calculate the value of  $x$ .

$$x = \dots\dots\dots [4]$$

- 5 A railway line has three stations, Town, Port and Cove.  
 Train *A* leaves Town for Cove and train *B* leaves Cove for Town.  
 Both trains stop at Port.



- (a) Write down the time that train *B* leaves Cove.

..... [1]

- (b) Write down how long train *A* stops at Port.

..... min [1]

- (c) How many more minutes does train *A* take to complete the whole journey than train *B*?

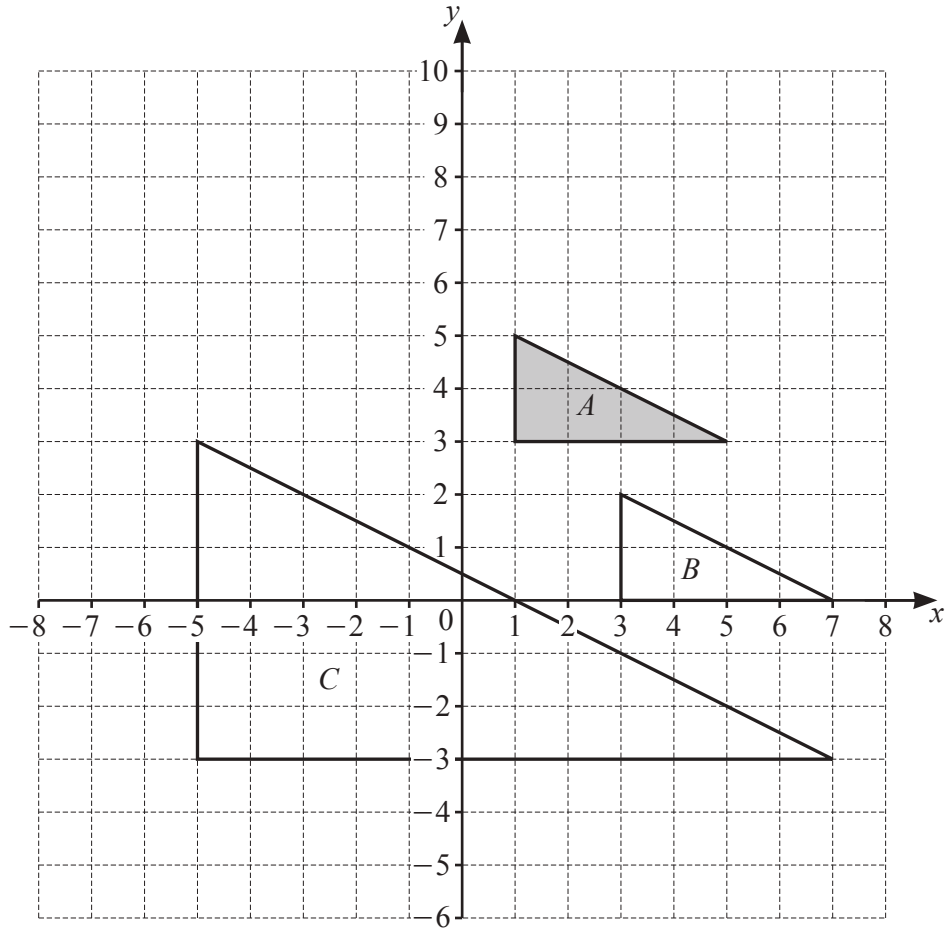
..... min [2]

- (d) Write down the time that the two trains pass each other.

..... [1]

- (e) Work out the average speed of train *A* between Town and Cove in kilometres per hour.

..... km/h [3]



(a) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

.....  
 ..... [2]

(b) Describe fully the **single** transformation that maps triangle *A* onto triangle *C*.

.....  
 ..... [3]

(c) On the grid, draw the image of triangle *A* after a reflection in the line  $y = 6$ . [2]

7 (a) Simplify.

$$5a + 3b + 2a - 4b$$

..... [2]

(b)  $P = 8x + 3y$

Find the value of  $x$  when  $P = 21$  and  $y = -5$ .

$x =$  ..... [2]

(c) Make  $v$  the subject of the formula  $S = kv^2$ .

$v =$  ..... [2]

(d) Multiply out and simplify.

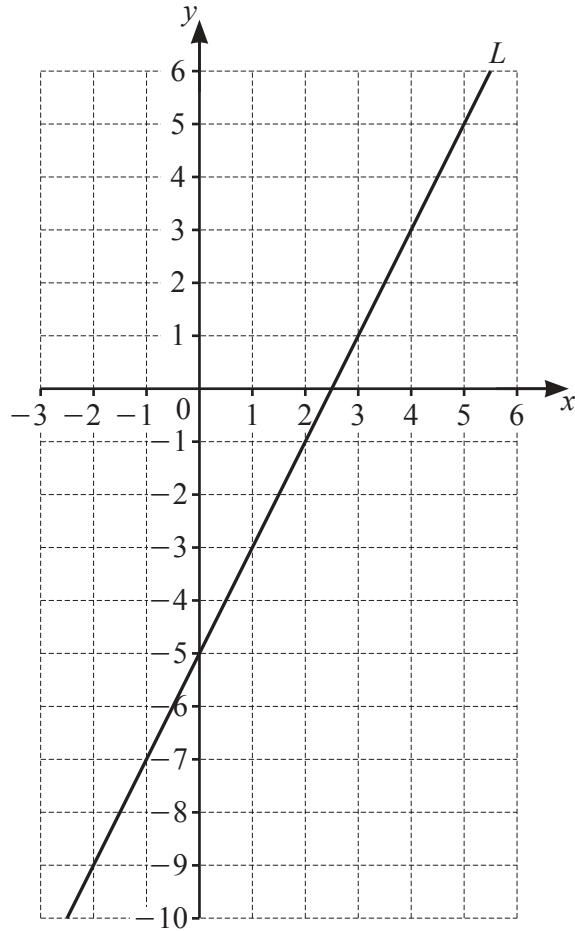
$$(x - 3)(x + 5)$$

..... [2]

- (e) Nasser has  $x$  marbles.  
Selina has 15 more marbles than Nasser.  
Hanif has 3 times as many marbles as Selina.  
In total they have 150 marbles.

Find the value of  $x$ .

$$x = \dots\dots\dots [5]$$



(a) Find the equation of line  $L$  in the form  $y = mx + c$ .

$y = \dots\dots\dots$  [2]

(b) (i) On the grid, draw the line  $y = x$ . [1]

(ii) Write down the coordinates of the point where the line  $y = x$  intersects line  $L$ .

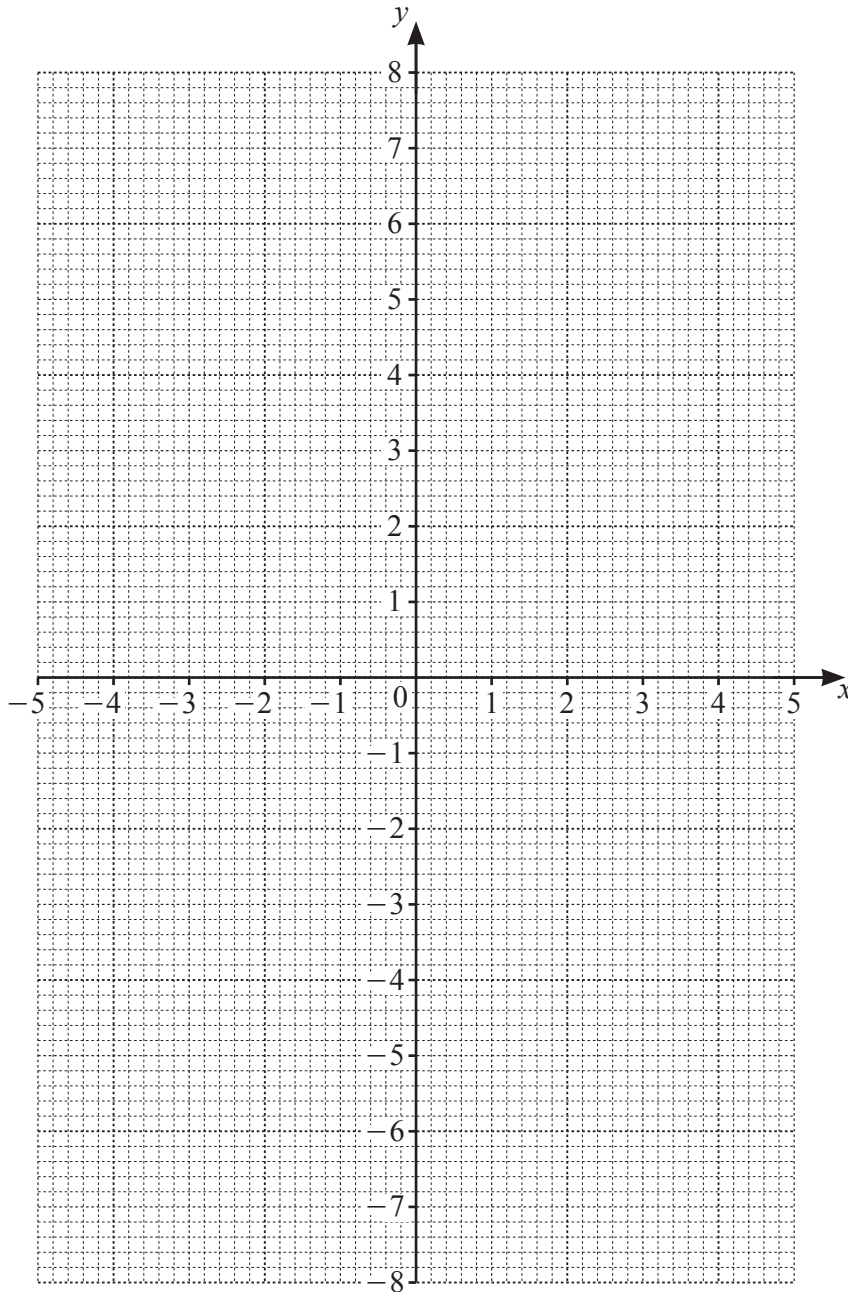
( $\dots\dots\dots$ ,  $\dots\dots\dots$ ) [1]

- (c) (i) Complete the table of values for  $y = \frac{8}{x}$ .

$x$	-5	-4	-3	-2	-1		1	2	3	4	5
$y$	-1.6		-2.7						2.7		1.6

[3]

- (ii) On the grid, draw the graph of  $y = \frac{8}{x}$  for  $-5 \leq x \leq -1$  and  $1 \leq x \leq 5$ .



[4]

- 9 (a) Pure gold costs \$42 per gram.

The fraction of pure gold in an object is measured in carats.

One carat means  $\frac{1}{24}$  of the mass of an object is pure gold.

Henry buys a 9-carat gold bracelet weighing 16 g.

The price of the bracelet is \$204.

Is the price of the bracelet more or less than the cost of the pure gold in it?  
You must show your working.

[4]

- (b) A clock made of metals has a mass of 1080 g.  
The mass of each metal in the clock is in the ratio  
copper : zinc : other metals = 21 : 14 : 1.

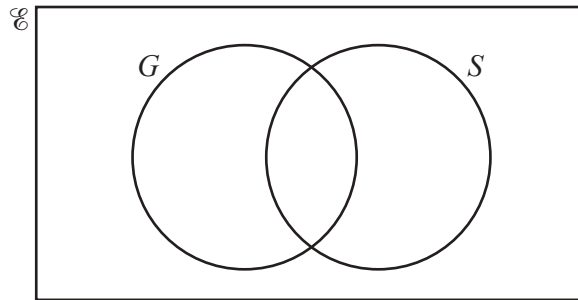
Calculate the mass of copper in this clock.

..... g [2]



- (c) There are 110 people in a group.  
 $G = \{ \text{people who own gold jewellery} \}$   
 $S = \{ \text{people who own silver jewellery} \}$

18 people own both gold jewellery and silver jewellery.  
 46 people own gold jewellery.  
 11 people own no gold jewellery and no silver jewellery.

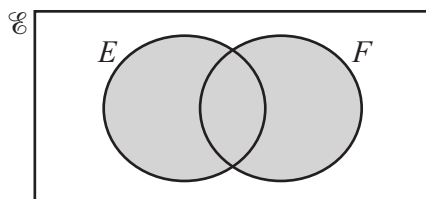


(i) Complete the Venn diagram. [2]

(ii) Write down  $n(G \cap S)$ .  
 ..... [1]

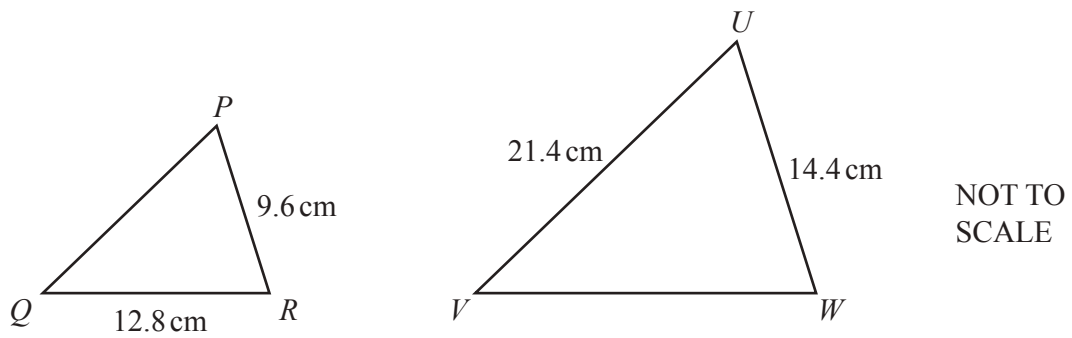
(iii) One of the 110 people is chosen at random.  
 Write down the probability that this person owns gold jewellery but not silver jewellery.  
 ..... [1]

(d)



Use set notation to describe the shaded region.  
 ..... [1]

10 (a)

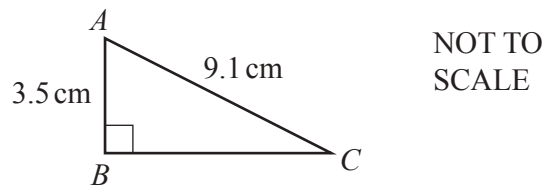


Triangle  $PQR$  is mathematically similar to triangle  $UVW$ .

Calculate  $VW$ .

$$VW = \dots\dots\dots \text{ cm [2]}$$

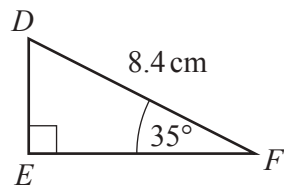
(b)  $ABC$  is a right-angled triangle.



Calculate  $BC$ .

$$BC = \dots\dots\dots \text{ cm [3]}$$

- (c)  $DEF$  is a right-angled triangle.

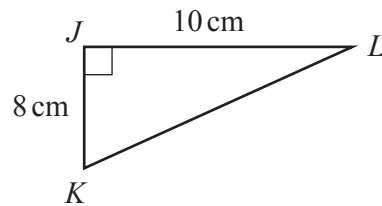


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Calculate  $EF$ .

$EF = \dots\dots\dots \text{cm}$  [2]

- (d)  $JKL$  is a right-angled triangle.



NOT TO  
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Calculate angle  $JKL$ .

Angle  $JKL = \dots\dots\dots$  [2]