



# Cambridge IGCSE™

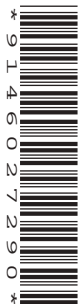
CANDIDATE  
NAME

CENTRE  
NUMBER

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**MATHEMATICS**

**0580/31**

Paper 3 (Core)

**May/June 2020**

**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. Blank pages are indicated.

1 Gabriela designs the seating layout for a new theatre.  
There are three sections of seats, A, B and C.

- (a) Section A has 152 seats.  
Section B has 12.5% more seats than Section A.  
Section C has  $\frac{3}{8}$  of the number of seats in Section A.

(i) Show that the number of seats in Section B is 171.

[1]

(ii) Show that the total number of seats is 380.

[2]

(b) Write down and simplify the ratio of the number of seats in each section A : B : C.

A : B : C = ..... : ..... : ..... [2]

(c) In Section A:

- There are 12 seats in the front row.
- Each row has 2 more seats than the row in front of it.

Work out the number of rows for the 152 seats in Section A.

..... rows [2]

(d) For a concert in the theatre, the ticket prices are in the ratio

$$A : B : C = 9 : 7 : 4.$$

A ticket for Section C costs \$6.

(i) Show that a ticket for Section B costs \$10.50 .

[1]

(ii) Find the cost of a ticket for Section A.

\$ ..... [1]

(iii) The table shows the number of tickets sold in each section.

Section	Number of tickets sold
A	120
B	136
C	30

Calculate the total amount received from the ticket sales.

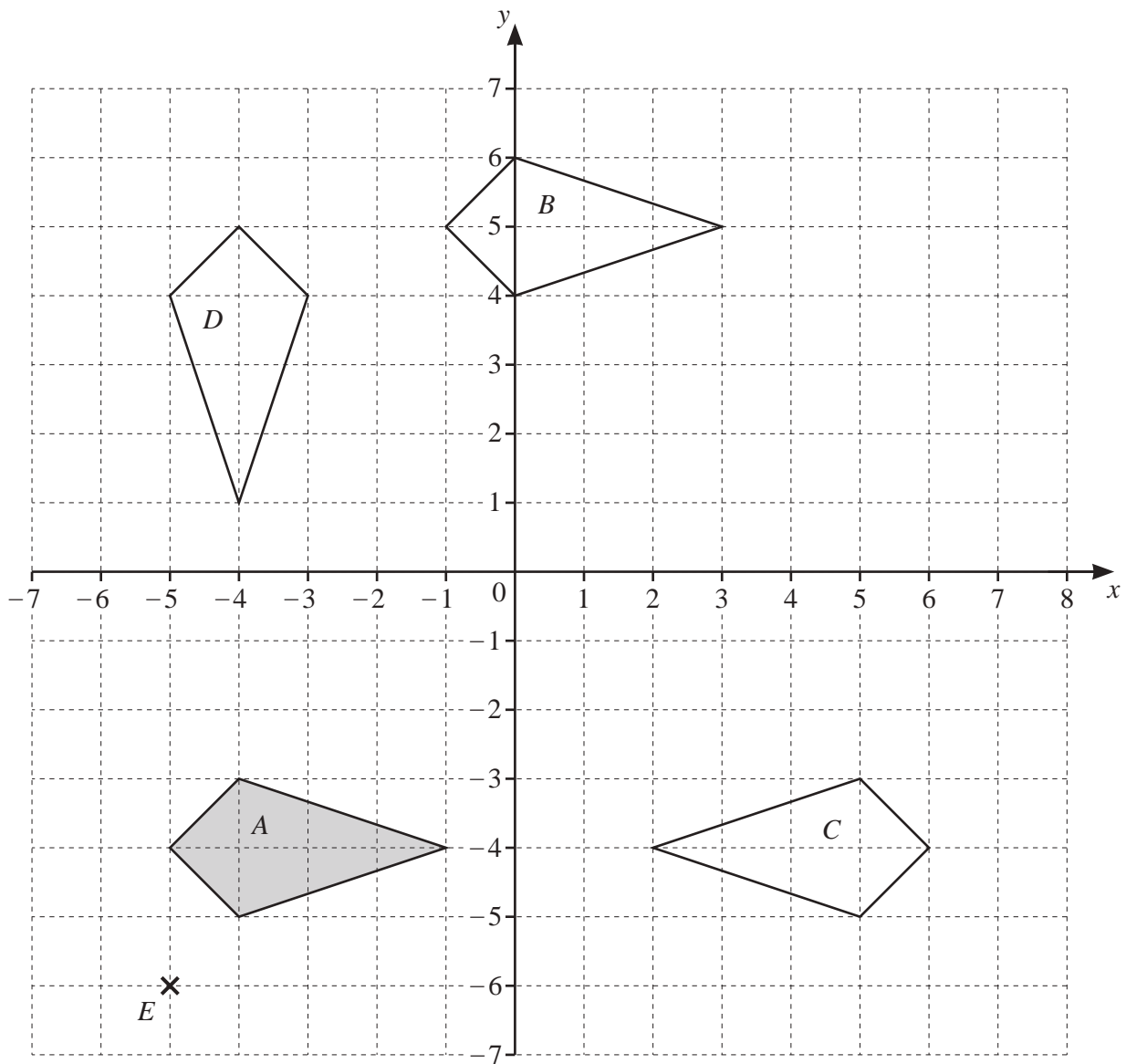
\$ ..... [3]

(iv) The concert costs \$4500 to organise.

Calculate the amount received from the ticket sales as a percentage of the \$4500.

..... % [1]

2 The grid shows a point  $E$  and four quadrilaterals,  $A$ ,  $B$ ,  $C$  and  $D$ .



(a) Write down the mathematical name of shape  $A$ .

..... [1]

(b) Describe fully the **single** transformation that maps

(i) shape *A* onto shape *B*,

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

(ii) shape *A* onto shape *C*,

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

(iii) shape *A* onto shape *D*.

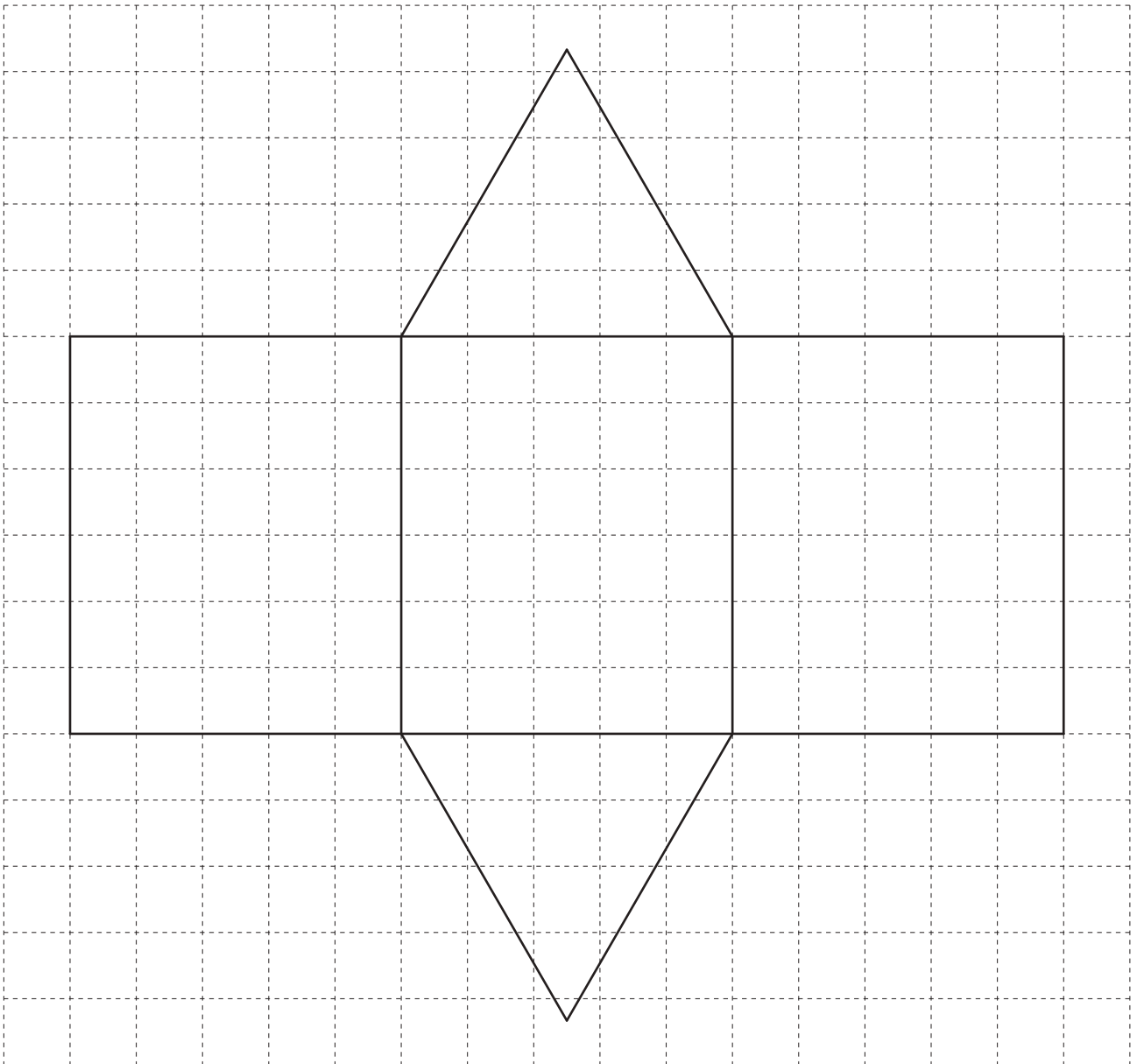
.....  
..... [3]

(c) (i) Write down the coordinates of the point *E*.

( ..... , ..... ) [1]

(ii) On the grid, draw the image of shape *A* after an enlargement by scale factor 3, centre *E*. [2]

- 3 The diagram shows the net of a triangular prism on a  $1\text{ cm}^2$  grid.



- (a) Write down the mathematical name for the type of triangle shown on the grid.

..... [1]

(b) (i) Measure the perpendicular height of the triangle.

..... cm [1]

(ii) Calculate the area of the triangle.

..... cm<sup>2</sup> [2]

(iii) Calculate the volume of the triangular prism.

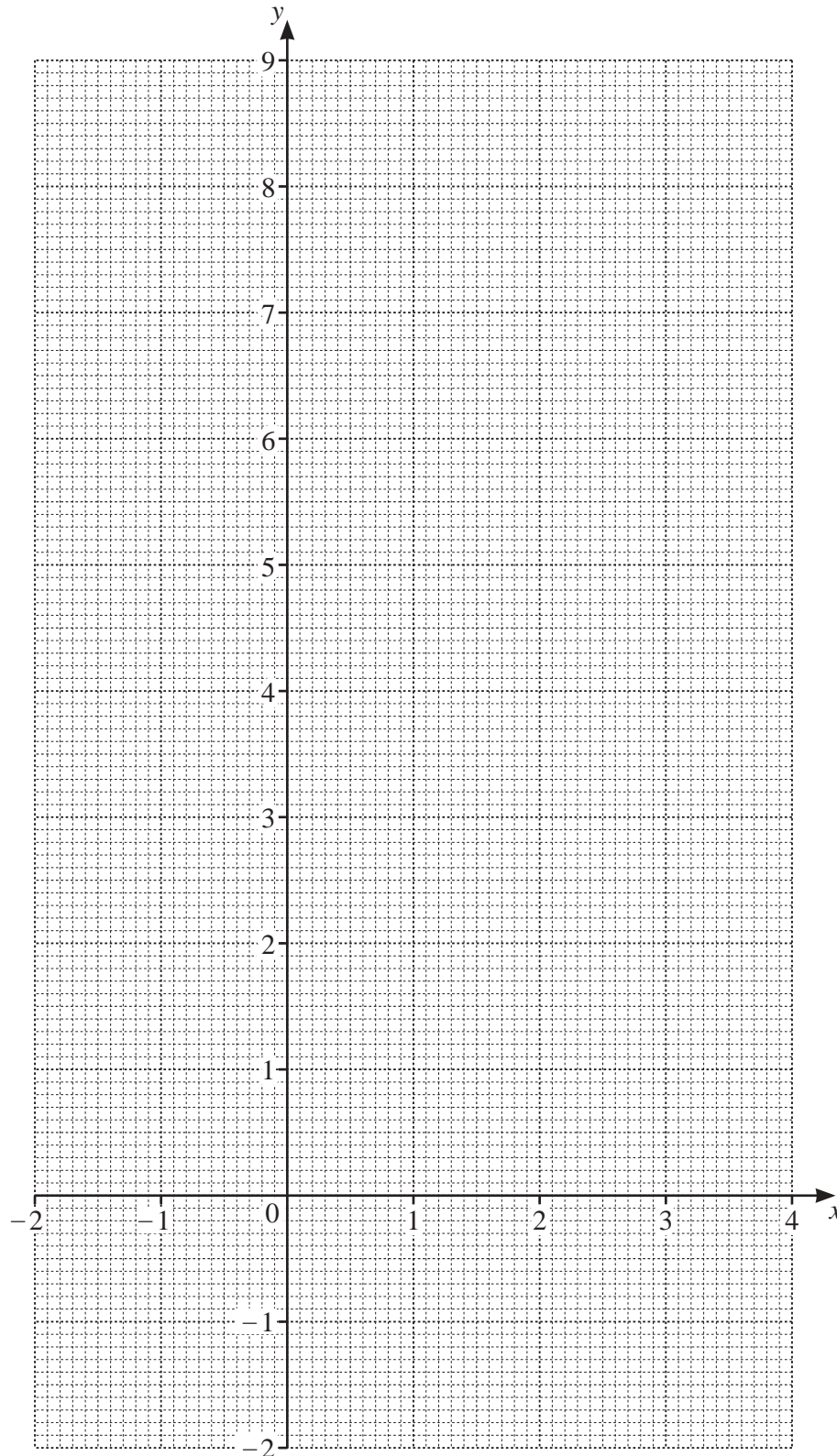
..... cm<sup>3</sup> [2]

- 4 (a) Complete the table of values for  $y = 7 + 2x - x^2$ .

$x$	-2	-1	0	1	2	3	4
$y$	-1			8	7		-1

[2]

- (b) On the grid, draw the graph of  $y = 7 + 2x - x^2$  for  $-2 \leq x \leq 4$ .



[4]



(c) Write down the equation of the line of symmetry of the graph.

..... [1]

(d) Use your graph to solve the equation  $7 + 2x - x^2 = 0$ .

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [2]

5 (a) Using the integers from 60 to 75 only, find

(i) a multiple of 17,

..... [1]

(ii) the prime numbers.

..... [2]

(b) Find

(i) the square root of 4489,

..... [1]

(ii)  $4^3$ ,

..... [1]

(iii)  $\sqrt[3]{274\,625}$ ,

..... [1]

(iv)  $2^{-3} \times 24^2$ .

..... [1]

(c) Write down the reciprocal of 7.

..... [1]

(d) Write 3.72194 correct to 3 decimal places.

..... [1]

(e) Find the lowest common multiple (LCM) of 8 and 14.

..... [2]

(f) The average temperature at the North Pole is  $-23^{\circ}\text{C}$  in January and  $-11^{\circ}\text{C}$  in March.

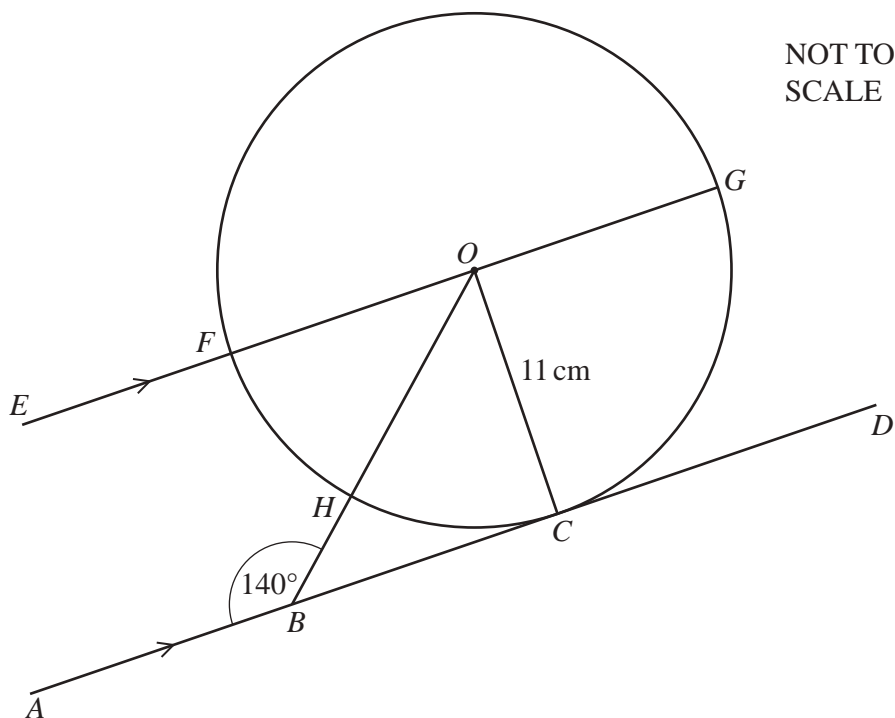
(i) Find the difference between these temperatures.

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

(ii) The average temperature in July is  $28^{\circ}\text{C}$  higher than the average temperature in March.

Find the average temperature in July.

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



NOT TO SCALE

The diagram shows a circle, centre  $O$ , radius 11 cm.  
 $C, F, G$  and  $H$  are points on the circumference of the circle.  
 The line  $AD$  touches the circle at  $C$  and is parallel to the line  $EG$ .  
 $B$  is a point on  $AD$  and angle  $ABO = 140^\circ$ .

(a) Write down the mathematical name of the straight line  $AD$ .

..... [1]

(b) (i) Find, in terms of  $\pi$ , the circumference of the circle.

..... cm [2]

(ii) Work out angle  $FOH$ .

Angle  $FOH =$  ..... [2]

(iii) Calculate the length of the minor arc  $FH$ .

..... cm [2]

- (c) (i) Give a reason why angle  $BCO$  is  $90^\circ$ .

..... [1]

- (ii) Show that  $BC = 13.11$  cm, correct to 2 decimal places.

[3]

- (iii) Calculate  $BH$ .

$BH =$  ..... cm [3]

- 7 (a) 20 students from College A each run 5 km.  
The times, correct to the nearest minute, are recorded.

32    51    25    40    47    21    37    32    48    36  
46    39    30    29    44    39    53    35    40    31

- (i) Complete the stem-and-leaf diagram.

2	
3	
4	
5	

Key: 3 | 4 represents 34 minutes

[2]

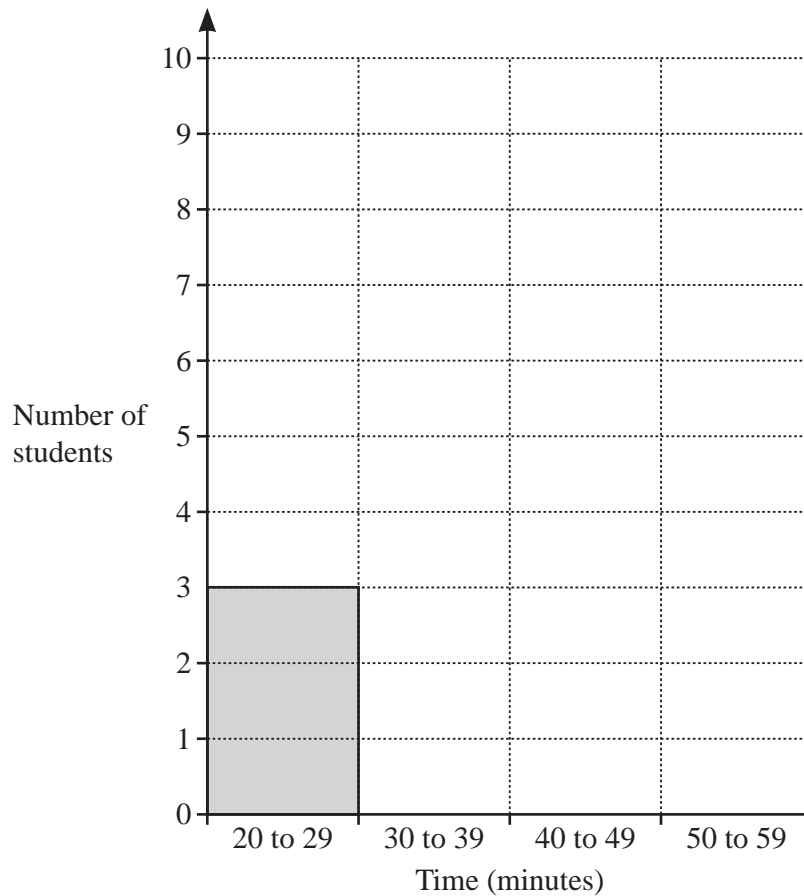
- (ii) Find the range of the times.

..... min [1]

- (iii) Find the median of the times.

..... min [1]

- (iv) Complete the bar chart for the times of the students.

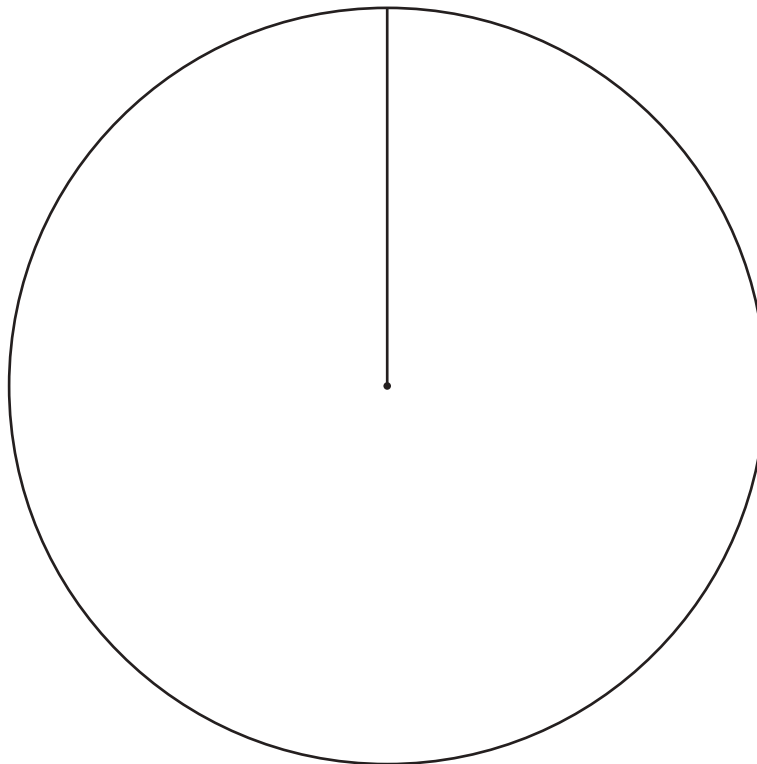


[2]

- (b) 20 students from College B each run 5 km.  
 Their times, correct to the nearest minute, are recorded and the results are shown in the table.

Time (minutes)	Number of students	Pie chart sector angle
30 to 39	5	90°
40 to 49	8	
50 to 59	7	

- (i) Complete the table. [2]



- (ii) Complete the pie chart. [2]

- (c) Write down two comments comparing the times of students from College A with the times of students from College B.

1 .....

.....

2 .....

..... [2]

8 (a) Simplify  $3c - 5d - c + 2d$ .

..... [2]

(b) Solve the equation  $12x - 7 = 23$ .

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

(c) Multiply out.

$$9(3 - x)$$

..... [1]

(d)  $A = \frac{(a+b)h}{2}$

Work out the value of  $h$  when  $A = 38.64$ ,  $a = 5.5$  and  $b = 3.7$ .

$h =$  ..... [3]



- (e) Alphonse is  $x$  years old and Beatrice is  $y$  years old.  
Three times Alphonse's age is equal to 5 times Beatrice's age.  
Twice Beatrice's age is 4 years more than Alphonse's age.

(i) Use this information to write down two equations in  $x$  and  $y$ .

.....

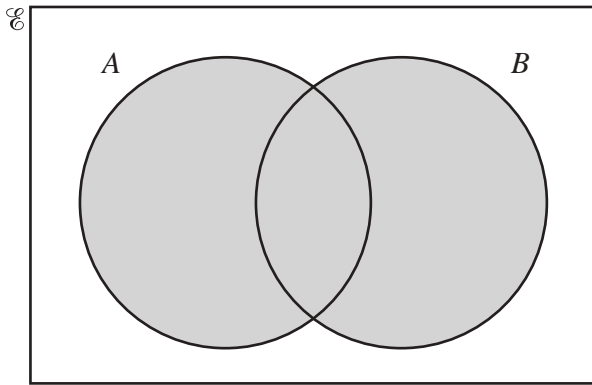
..... [2]

(ii) Find the age of Alphonse and the age of Beatrice.

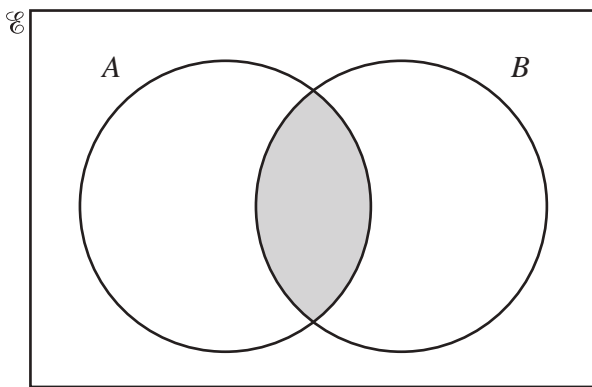
Alphonse ..... years old

Beatrice ..... years old [3]

9 (a) Use set notation to describe the shaded region in each Venn diagram.



.....

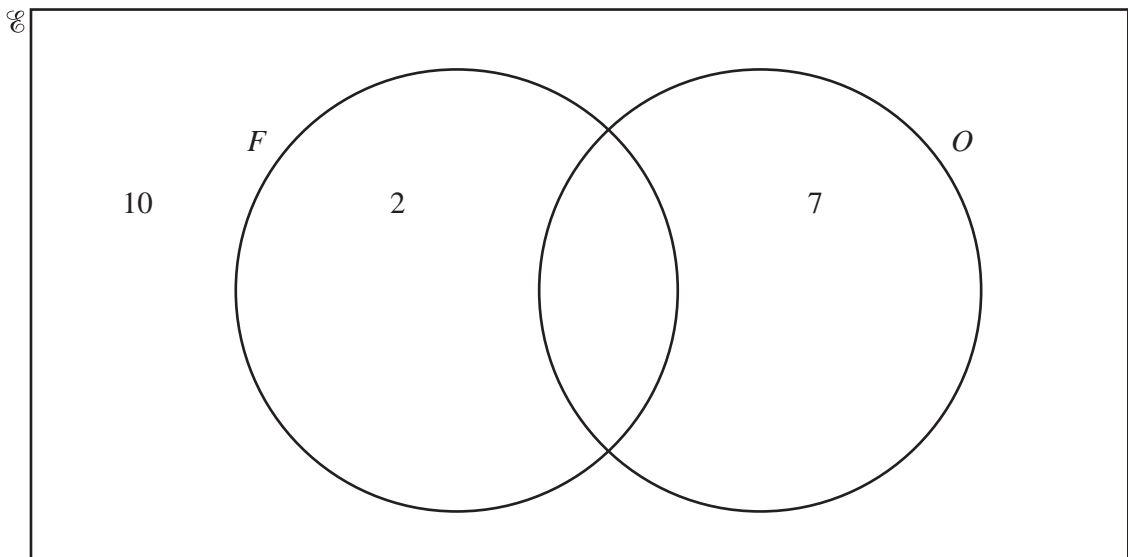


.....

[2]

- (b)  $E = \{x : x \text{ is a natural number } \leq 15\}$   
 $F = \{x : x \text{ is a factor of } 12\}$   
 $O = \{x : x \text{ is an odd number}\}$

(i) Complete the Venn diagram to show the elements of these sets.



[2]

(ii) Write down one number that is in set  $O$ , but not in set  $F$ .

..... [1]

(iii) Find  $n(F \cup O)$ .

..... [1]

(iv) A number is chosen at random from  $\mathcal{E}$ .

Work out the probability that this number is in set  $O$ .

..... [1]

**Question 10 is printed on the next page.**

10 Point  $B$  is 36 km from point  $A$  on a bearing of  $140^\circ$ .

(a) Using a scale of 1 centimetre to represent 4 kilometres, mark the position of  $B$ .



Scale: 1 cm to 4 km

[2]

(b) (i) Point  $C$  is 28 km from  $A$  and 20 km from  $B$ .  
The bearing of  $C$  from  $A$  is less than  $140^\circ$ .

**Using a ruler and compasses only**, construct triangle  $ABC$ .  
Show all your construction arcs.

[3]

(ii) Measure angle  $ACB$ .

Angle  $ACB = \dots\dots\dots$  [1]

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