Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

9146027290

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 π, 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.

DC (LK/CB) 186453/2

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.

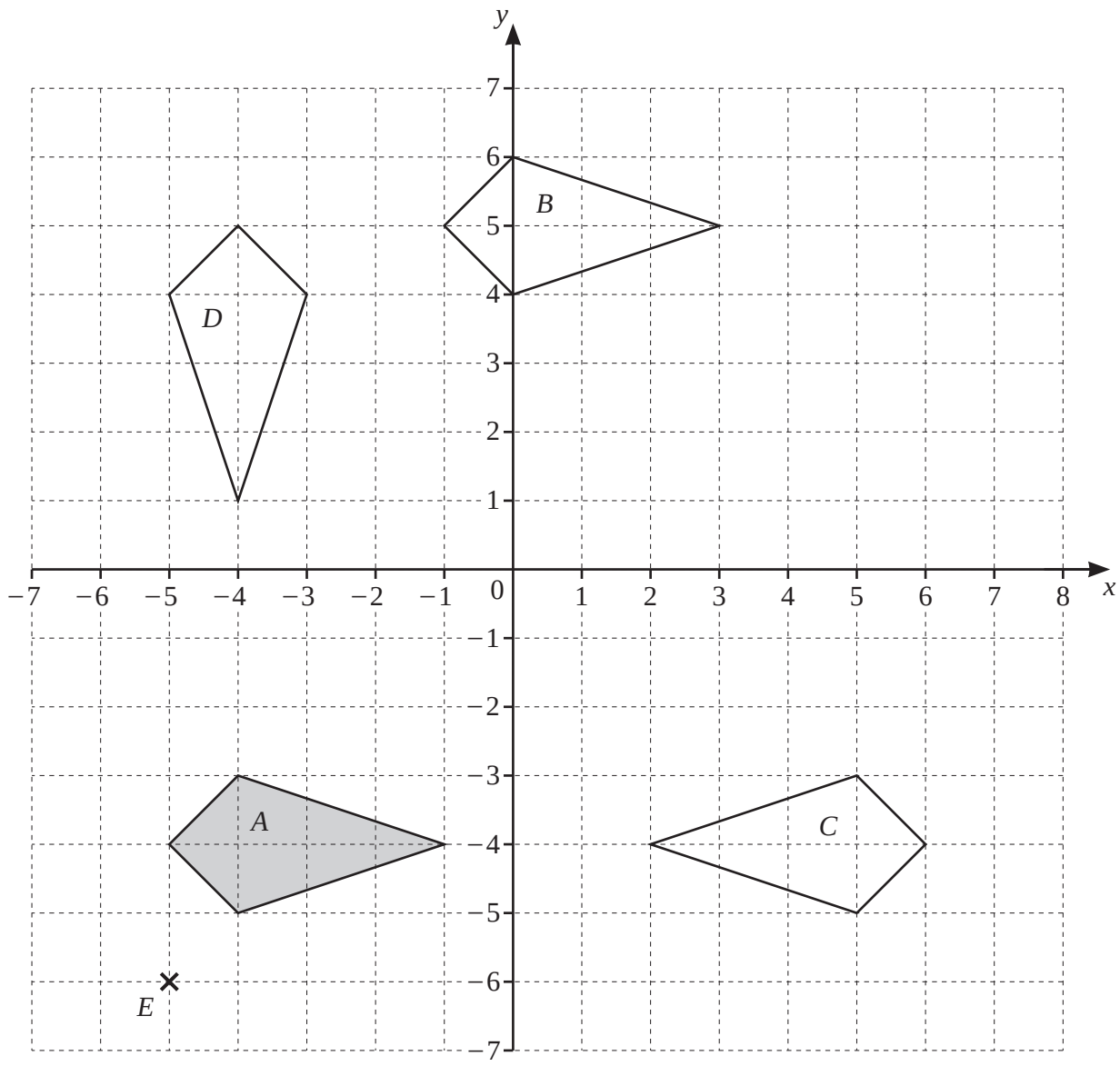
$ ..... [3]

(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*.

.....

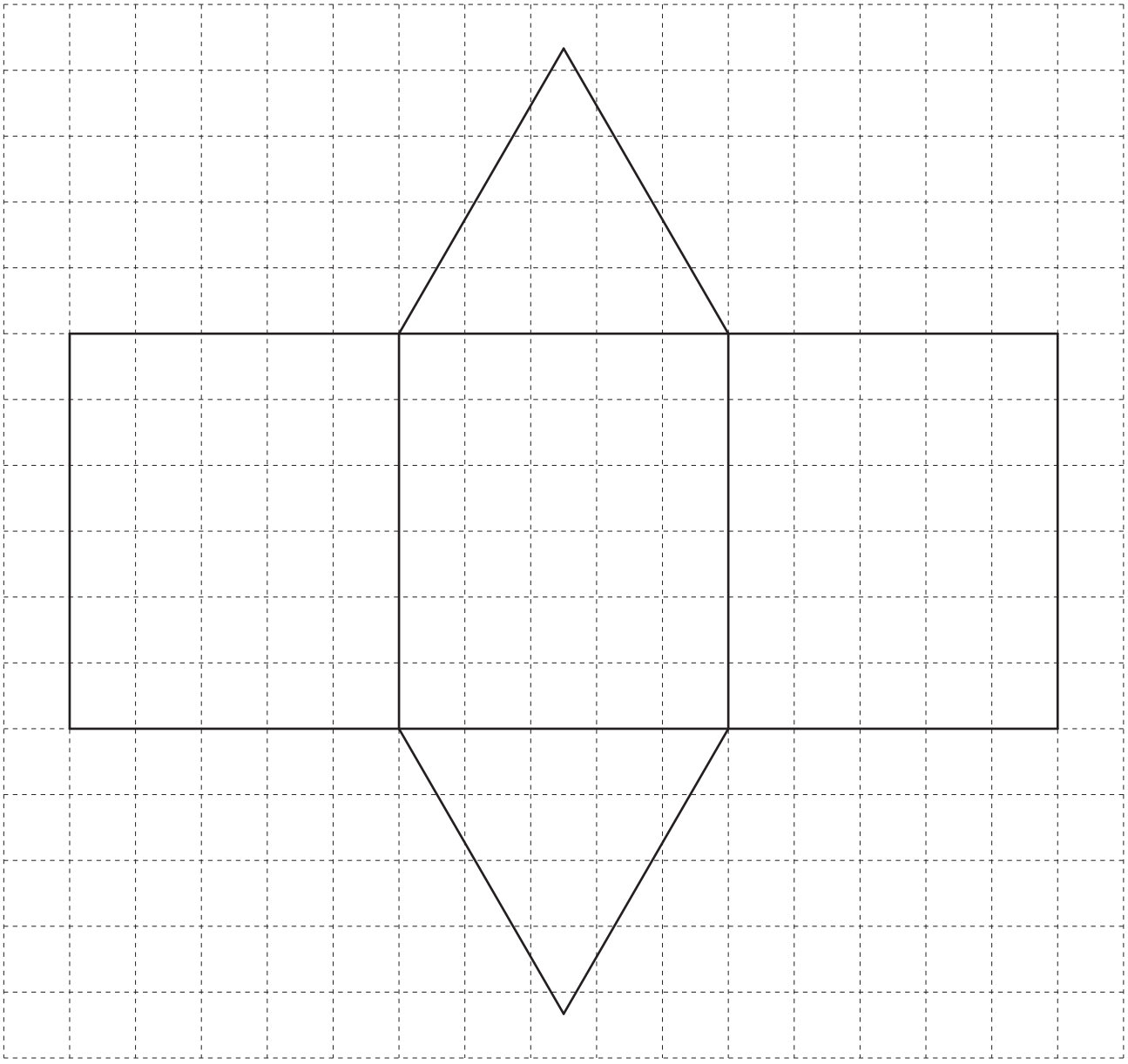
..... [3]

(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 $1\,cm^2$ 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^2 [2]

(iii) Calculate the volume of the triangular prism.

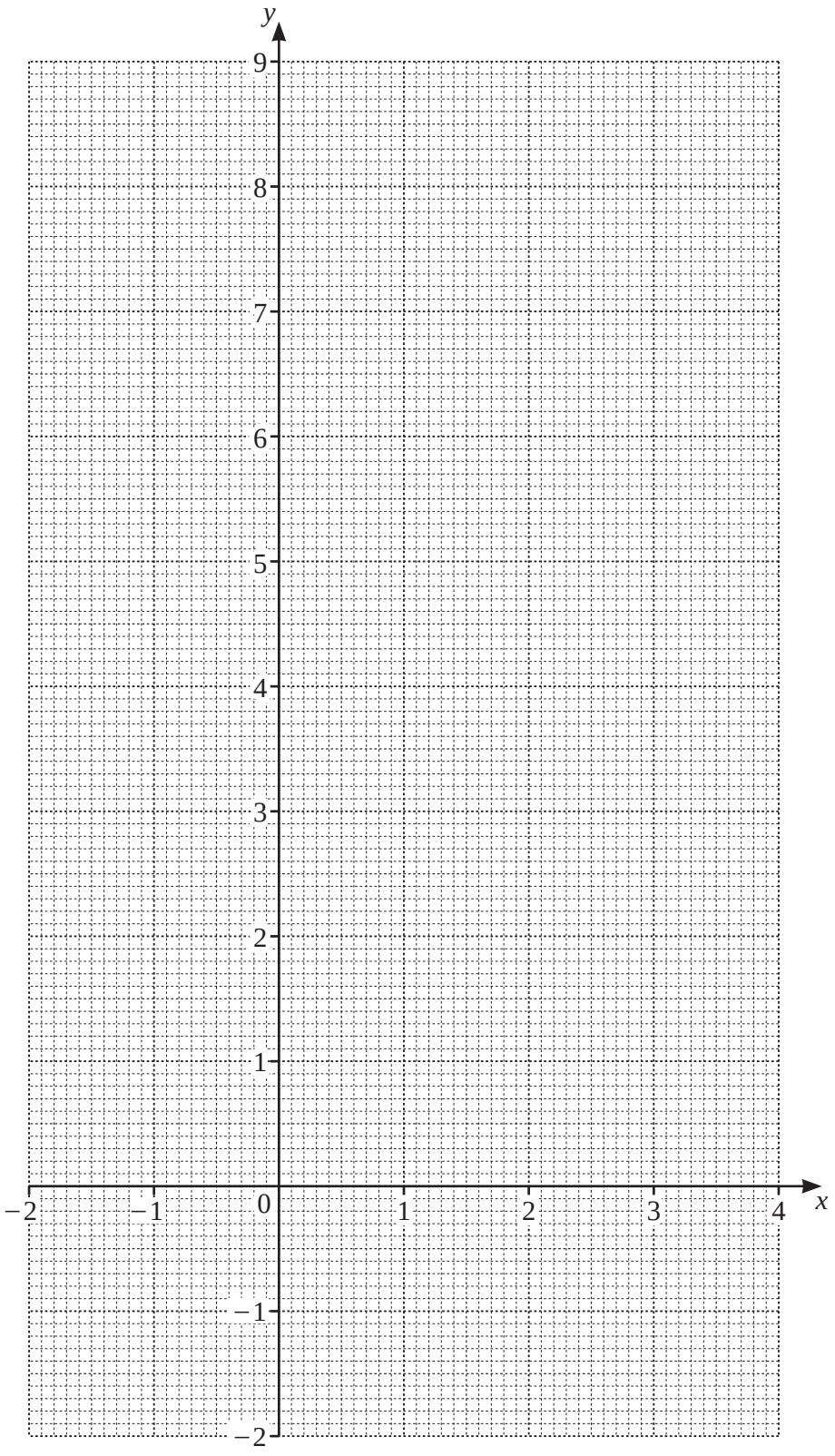
..... cm^3 [2]

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 $-2 \leqslant x \leqslant 4$.



[4]

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

..... [1]

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

$x =$ ..... or $x =$ ..... [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 °C in January and −11 °C in March.

(i) Find the difference between these temperatures.

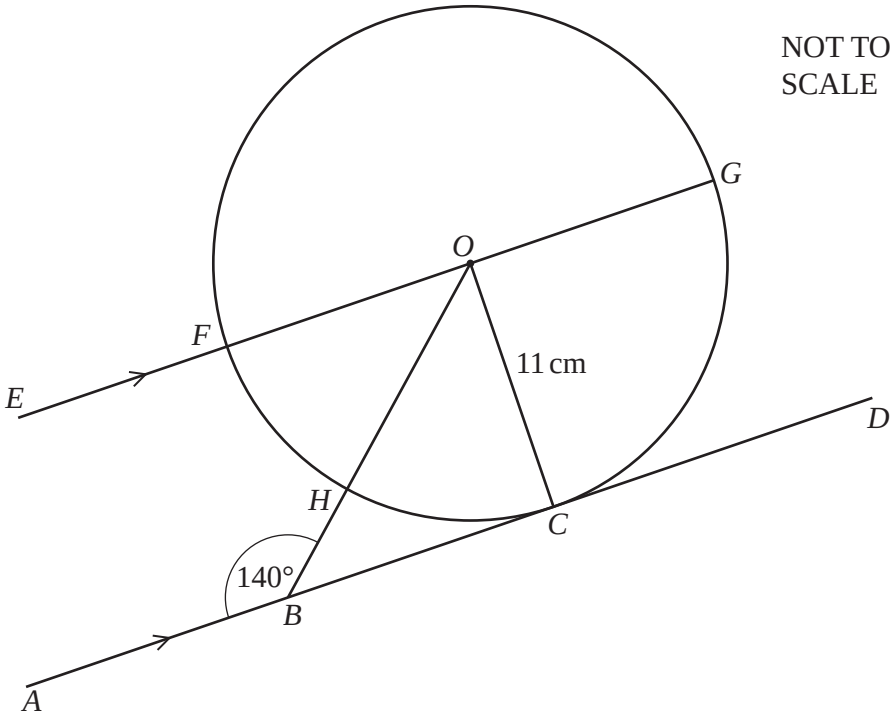
..... °C [1]

(ii) The average temperature in July is 28 °C higher than the average temperature in March.

Find the average temperature in July.

..... °C [1]

6



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 $ABO = 140°$.

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

..... [1]

(b) (i) Find, in terms of π, 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°.

..... [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]

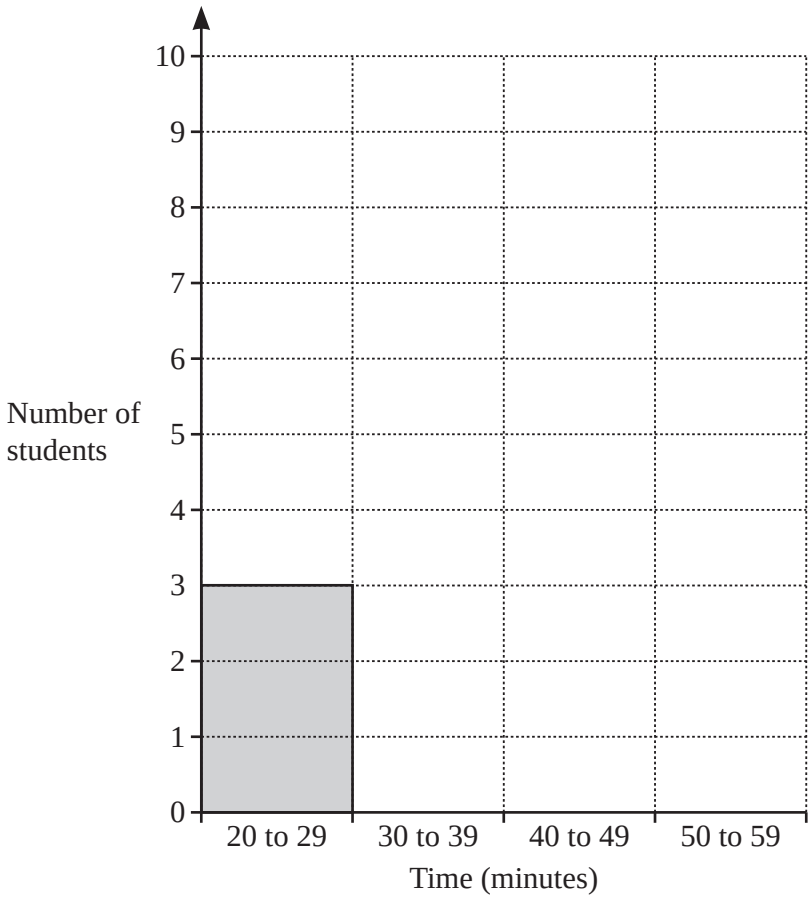
(ii) Find the range of the times.

..... min [1]

(iii) Find the median of the times.

..... min [1]

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

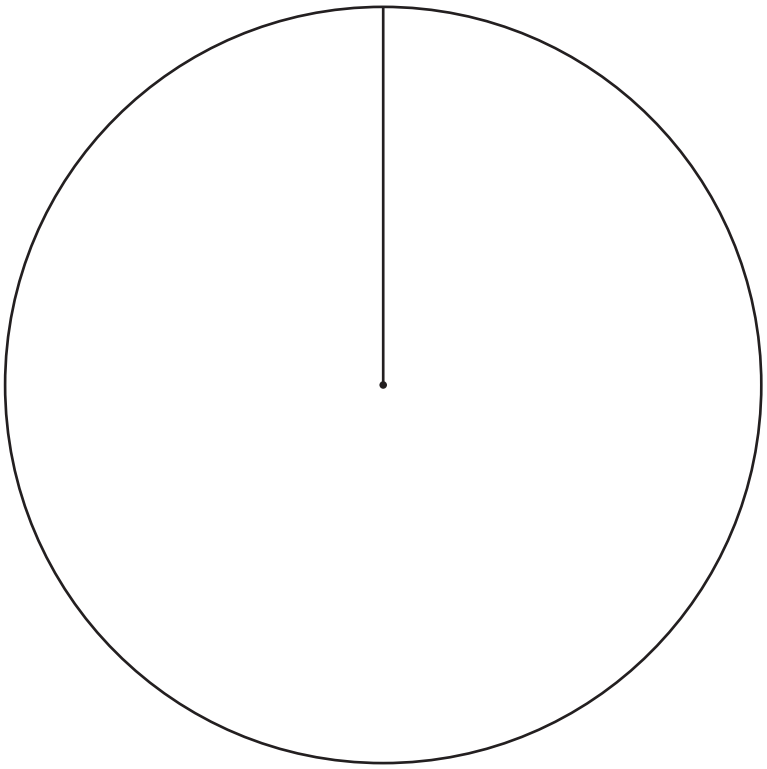


[2]

(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.

.....

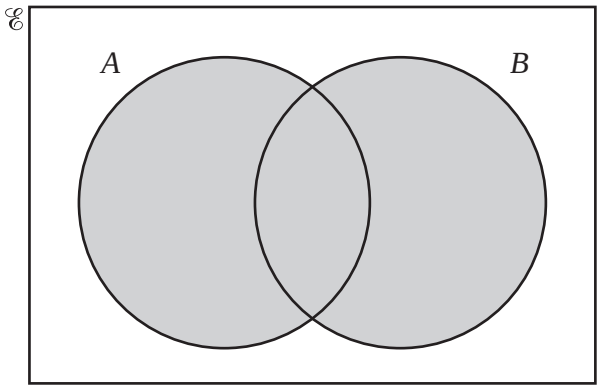
..... [2]

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

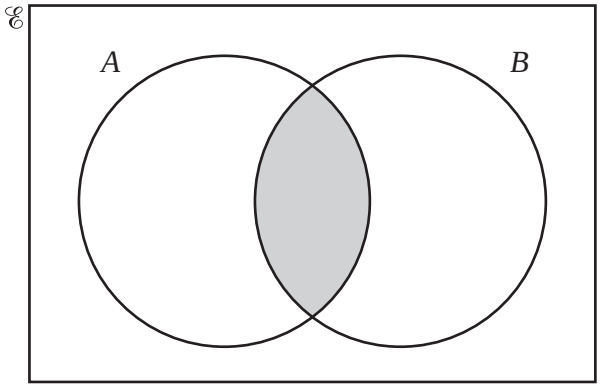
Alphonse ..... years old

Beatrice ..... years old [3]

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



.....

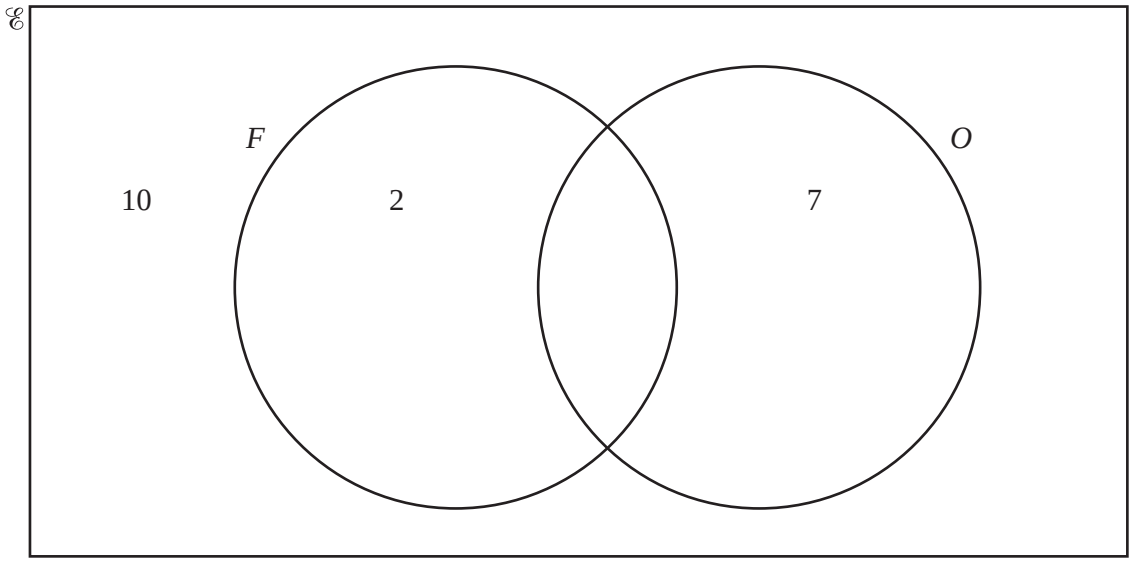


.....

[2]

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

(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 $\mathscr{E}$.

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°.

(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°.

Using a ruler and compasses only, construct triangle ABC.
Show all your construction arcs. [3]

(ii) Measure angle ACB.

Angle ACB = ... [1]