



FOUNDED 1900

THE ENGLISH SCHOOL  
A SECOND CENTURY OF EXCELLENCE

## **YEAR 4 MID-PROGRAMME ENTRY EXAMINATIONS 2018**

**MATHEMATICS**

**SATURDAY 2<sup>nd</sup> JUNE 2018**

**Time allowed: 2 hours**

### **Instructions to candidates**

Answer the questions in the spaces provided – *there may be more space than you need.*  
Without sufficient working, correct answers may be awarded no marks.

### **Information to candidates**

This paper has 28 questions.

There are 19 pages in this question paper.

There is one blank page at the end of this question paper. You may use this for any additional work.

Full marks may be obtained for answers to all questions.

The total marks for this paper is 120.

The marks for each question are shown in round brackets, e.g. (2)

**Calculators may be used.**

### **Advice for candidates**

Write your answers neatly and in good English.

Work steadily through the paper.

Do not spend too long on one question.

Show all stages in any calculations.

### **Materials required for the paper**

Calculator, ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

1. Calculate, giving your answer in standard form correct to 3 significant figures.

$$\frac{\sqrt{256^{16}}}{4.06 \times 10^{-6} - 7.09 \times 10^{-8}}$$

Answer..... (1)

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2. Simplify:

a)  $2^5 t^6 \div (2^2 t^3)$

Answer..... (2)

b)  $\frac{(8a^2)^2 \times a^6}{(2a^3 + 2a^3)^3}$

Answer..... (3)

c)  $\frac{49}{x-9} \div \frac{245}{x^2-9x} =$

Answer..... (2)

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3. At a concert, the ratio of children to adults is 2:3. There are 80 children at the concert. Each adult ticket costs £8 and each child ticket costs a quarter of the adult ticket. Work out the total money made from the ticket sales.

Answer: = £..... (3)

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4. a) The Highest Common Factor (HCF) of two numbers is 15.  
The Lowest Common Multiple (LCM) of the same two numbers is 91 times their HCF.  
Both numbers are larger than the HCF.  
What are the two numbers?

**Answer ..... and ..... (3)**

- b) There are 150 pupils in Year 1, 156 pupils in Year 2 and 120 pupils in Year 3.  
Each year group is to be divided into groups for a school competition, so that all groups  
(across all lower school) are the same size and no people are left over.  
What is the largest possible group size?

**Answer ..... (2)**

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5. a) The price of a hat falls from £40 to £15. What percentage change is this?

**Answer ..... (2)**

- b) In a sale, the price of a computer is reduced by 20%. At this reduced price the shopkeeper  
still makes a profit of 20%. What would have been his percentage profit if the computer  
had been sold at full price?

**Answer .....% (2)**

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6. Expand and simplify these:

a)  $(3x-1)^2 - 2x(5-3x) =$

Answer ..... (2)

b)  $(x-2)(x+3)(x+7) =$

Answer ..... (2)

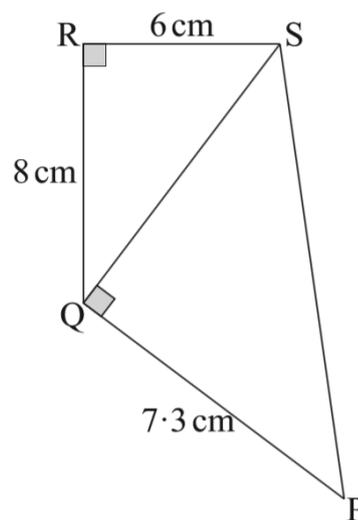
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7. A carton of orange juice contains 2 litres of juice, correct to the nearest 10 millilitres. A certain type of cup holds 210 millilitres, correct to the nearest 5 millilitres. Determine the largest number of cups that can be filled from 10 cartons of orange juice.

..... cups (4)

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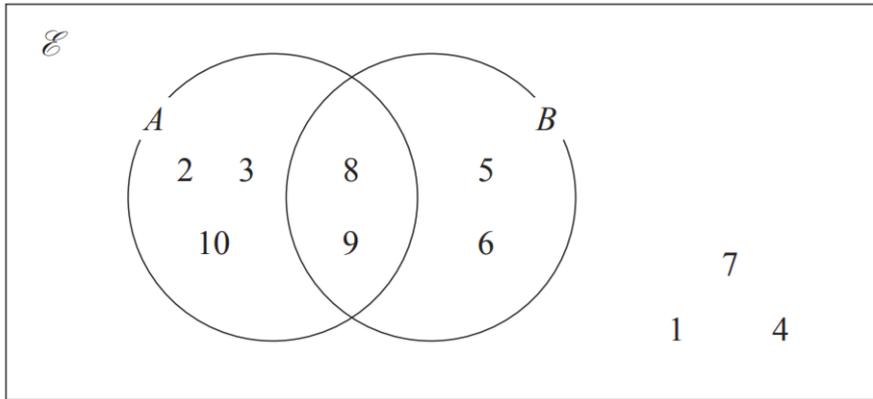
8. In the diagram, RSQ and SQP are right angled triangles. RS = 6 cm, RQ = 8 cm and QP = 7.3 cm. Find angle RSP. Give your answer correct to 3 significant figures.



Answer..... ° (4)

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9. The Venn diagram below, shows all of the elements in sets  $A$ ,  $B$  and  $\mathcal{E}$ .



a) Write down the elements in  $A'$ .

Answer ..... (1)

b) Find  $n(A \cap B)'$ .

Answer ..... (1)

c) Find the elements in  $(A \cap B) \cup (A \cup B)'$

Answer ..... (1)

d)  $A \cap C = \emptyset$   
 $B \cup C = \{5, 6, 7, 8, 9\}$   
 $n(C) = 3$   
 Write down the elements in  $C$ .

Answer ..... (1)

10. Factorise **completely** the following expressions:

a)  $12xyz^3 - 6x^2yz + 15xyz =$

Answer..... (1)

b)  $a^3 - 49a =$

Answer..... (2)

11. Solve the following equations.

a)  $\frac{2x+3}{7} - \frac{4+8x}{3} = 11$

$x = \dots\dots\dots$  (3)

b)  $\frac{5+\sqrt{3x+4}}{5} = 2$

$x = \dots\dots\dots$  (3)

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12. Solve the simultaneous equations

$$\begin{aligned} 3x + y &= 13 \\ x - 2y &= 9 \end{aligned}$$

Show clear algebraic working.

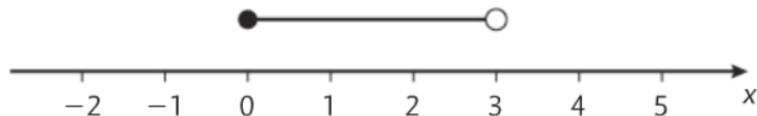
Answer:  $x = \dots\dots\dots$   $y = \dots\dots\dots$  (3)

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13.

a)

(i) Write down the single inequality represented by this number line.

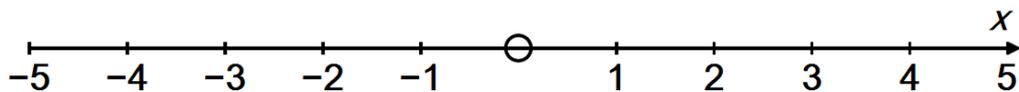


Answer..... (1)

(ii) What is the largest integer that satisfies your inequality?

Answer..... (1)

b) Solve the inequality  $-4 < 2\left(x - \frac{1}{2}\right) \leq 7$  and show the result on the number line.



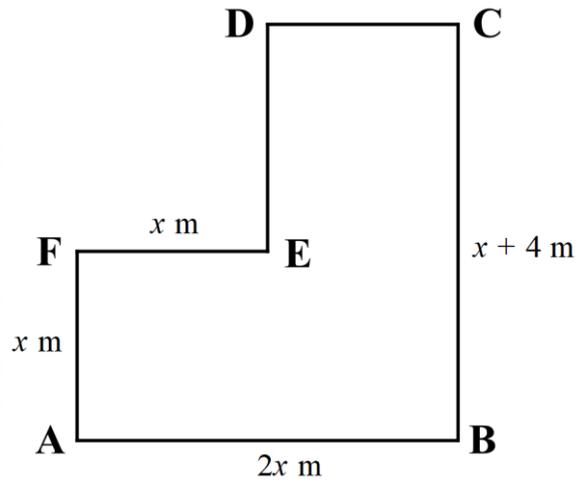
Answer..... (2)

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14. Make  $b$  the subject of  $P = \frac{1}{2}ab^2 + c$  where  $b$  is positive.

Answer:  $b =$  ..... (3)

15. The shape shown below has an area of  $48 \text{ m}^2$ .  $AB = 2x \text{ m}$ ,  $BC = x + 4 \text{ m}$ ,  $FE = x \text{ m}$  and  $FE = x \text{ m}$ .



- a) Show that  $2x^2 + 4x - 48 = 0$ .

- b) Find the value of  $x$  and hence the perimeter of the shape.

Answer.....m  
(5)

16. Here are the points that Carmelo scored in his last 11 basketball games.

23	20	14	23	17	24	24	18	16	22	21
----	----	----	----	----	----	----	----	----	----	----

(a) Find the interquartile range of these points.

Answer..... (3)

Kobe also plays basketball.

The median number of points Kobe has scored in his last 11 games is 18.5.

The interquartile range of Kobe's points is 10.

(b) Which of Carmelo or Kobe is the more consistent points scorer?

Give a reason for your answer.

.....  
 .....  
 (1)

17. The diagram shows two points, *S* and *T*.  
 The bearing of *T* from *S* is  $043^\circ$ .  
 Find the bearing of *S* from *T*.

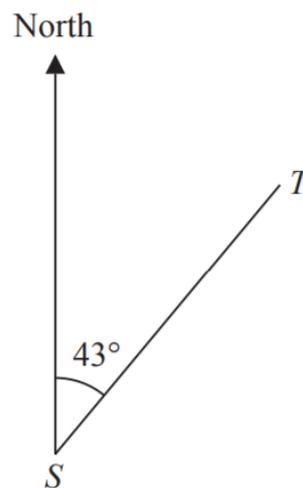


Diagram **NOT** accurately drawn

Answer.....° (2)

18. The diagram shows an incomplete regular polygon.

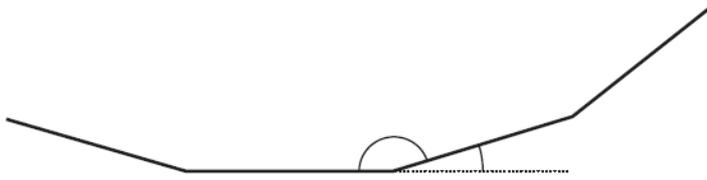


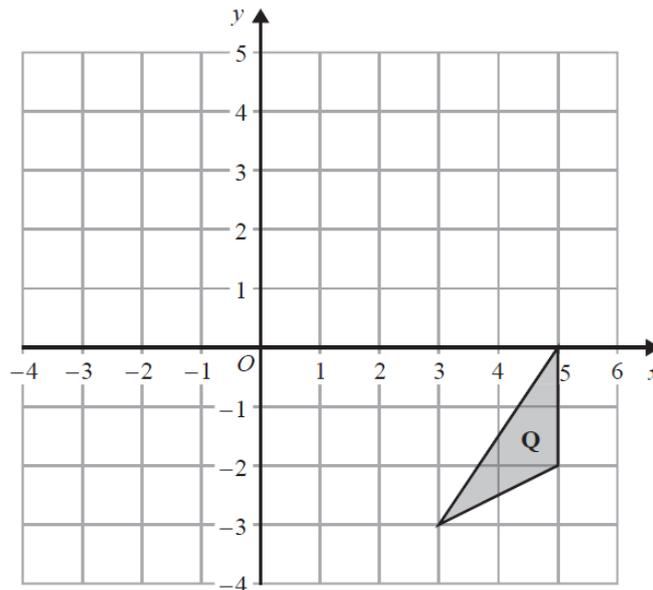
Diagram NOT accurately drawn

The size of each interior angle is 150 degrees greater than the size of each exterior angle.

Work out the number of sides the regular polygon has.

Answer: ..... sides (4)

19.



- a) On the grid, reflect triangle **Q** in the line  $x = 1$   
Label the new triangle **R**.

(1)

Triangle **R** is mapped onto triangle **S** by a reflection in the line  $y = 0$

- b) Describe fully the single transformation that maps triangle **Q** onto triangle **S**.

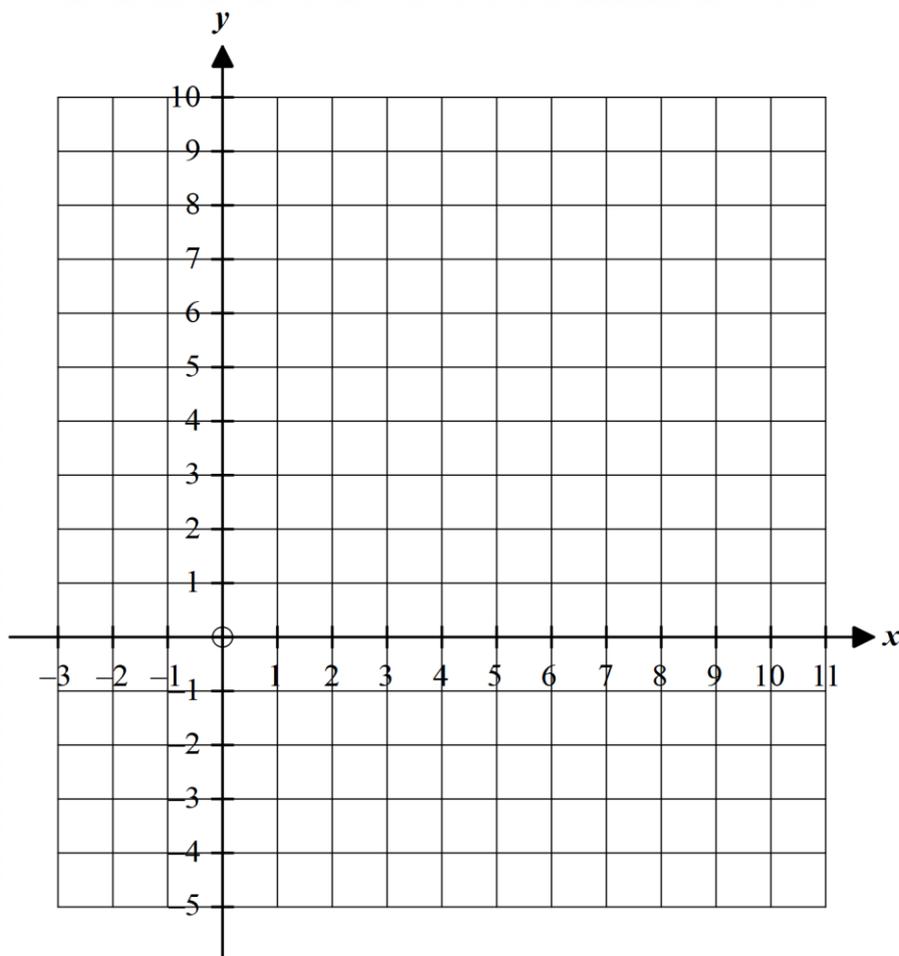
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(2)

20. a) Find the equation of the straight line joining the points A (1, 7) and B (10, - 2).

Answer..... (3)

- b) On the grid given below draw the straight line joining A and B.

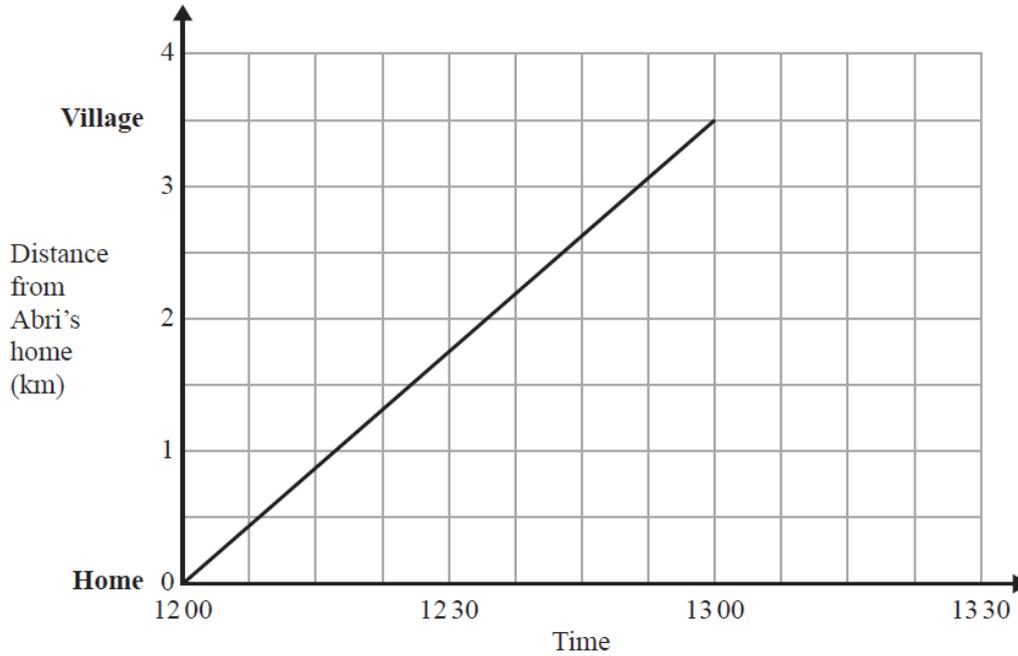


(2)

- c) Solve  $y = 3x - 4$  and  $x + y = 8$  graphically, using the grid above.

Answer:  $x = \dots\dots\dots$ ,  $y = \dots\dots\dots$  (2)

21. Abri walks along a path from her home to a local village.  
Here is the distance-time graph for her journey from her home to the village.

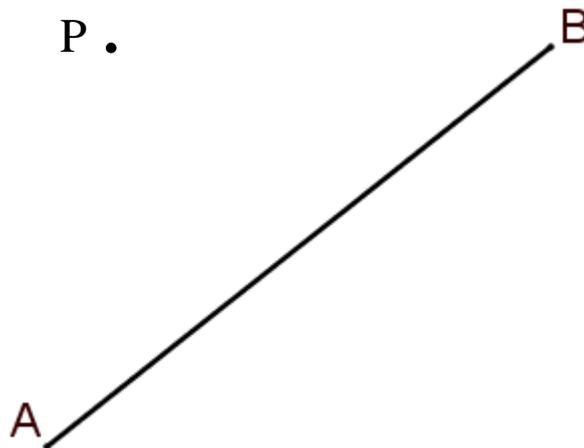


Benito leaves the village at 12:30 and walks at a constant speed along the same path to Abri's home. He arrives at Abri's home at 13:15.

- a) Show the information about Benito's journey on the grid. (2)
- b) How far from the village were Abri and Benito when they passed each other?

Answer..... km (1)

22. Use ruler and compasses to construct the perpendicular from point P to the line segment AB.



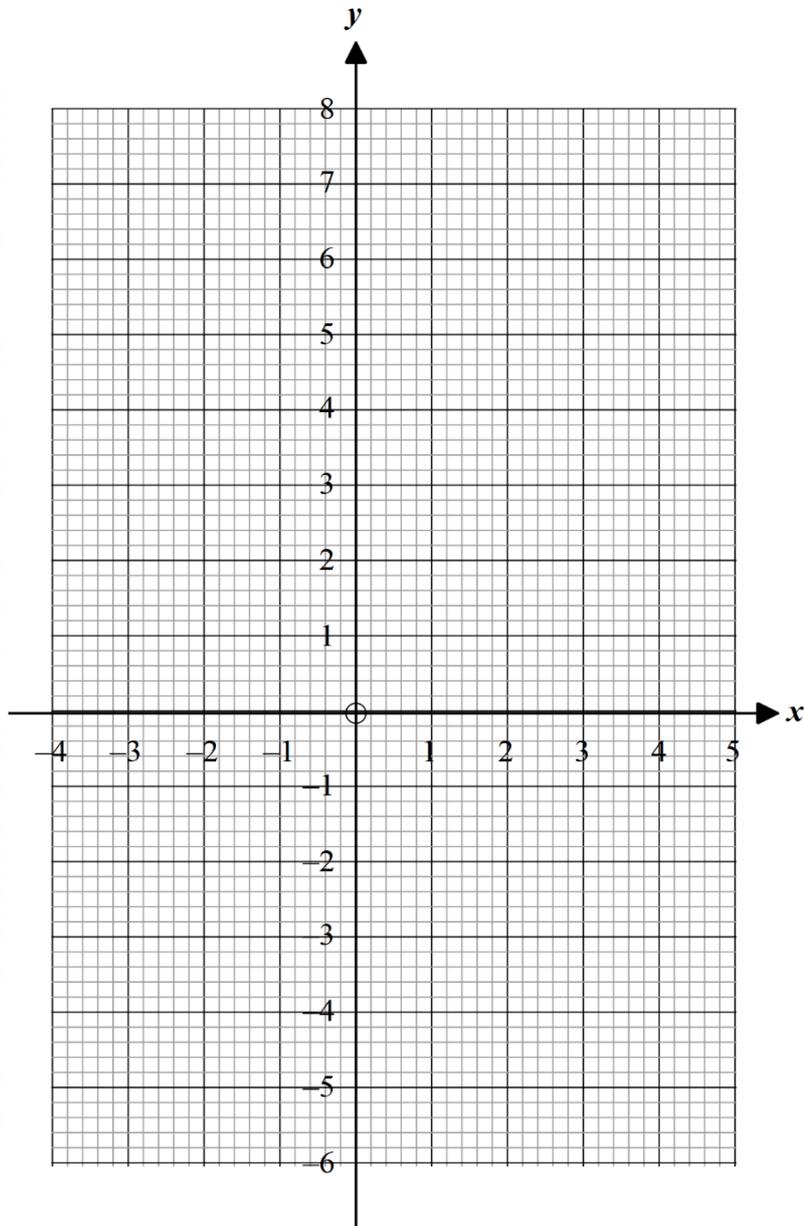
(2)

23. a) Complete the table below for  $y = x^2 - x - 5$ .

<b>x</b>	-3	-2	-1	0	1	2	3	4
<b>y</b>		1				-3		

(2)

- b) Draw the graph of  $y = x^2 - x - 5$  on the grid below.

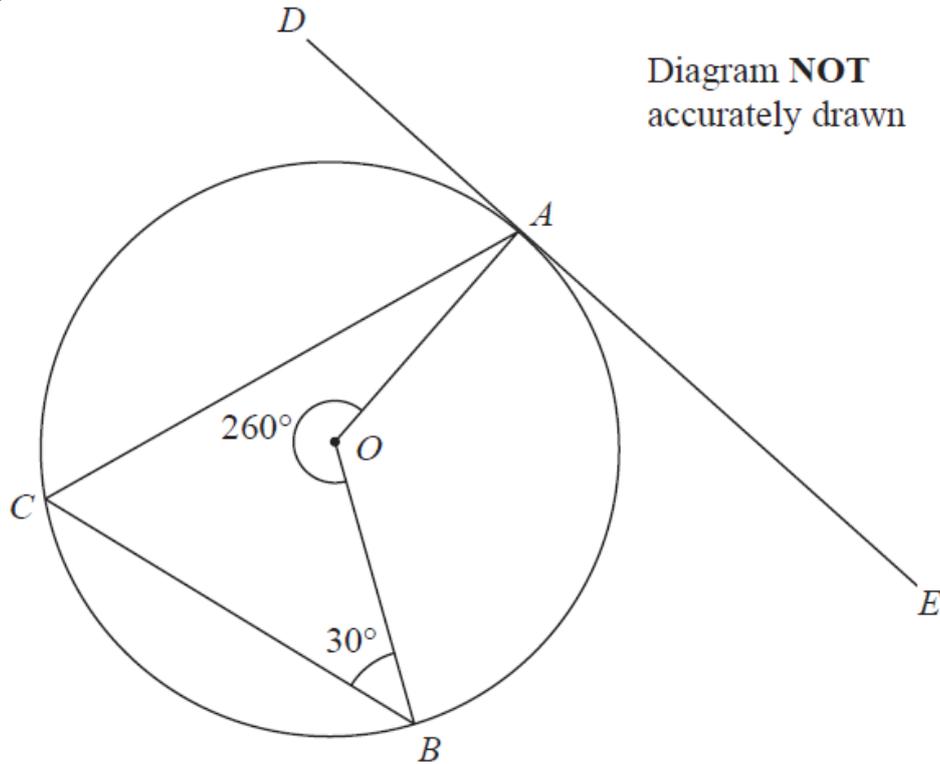


(1)

- c) Use your graph to find the solutions to the equation  $x^2 - x - 5 = 0$

$$x_1 = \dots \text{ and } x_2 = \dots \quad (2)$$

24. The diagram shows a circle centre  $O$ .



$A$ ,  $B$ , and  $C$  are points on the circumference of the circle.  
 $DAE$  is a tangent to the circle.

a) Work out the size of angle  $ACB$ .

angle  $ACB = \dots\dots\dots^\circ$  (1)

b) Give reasons for your answer.

.....  
 .....

(2)

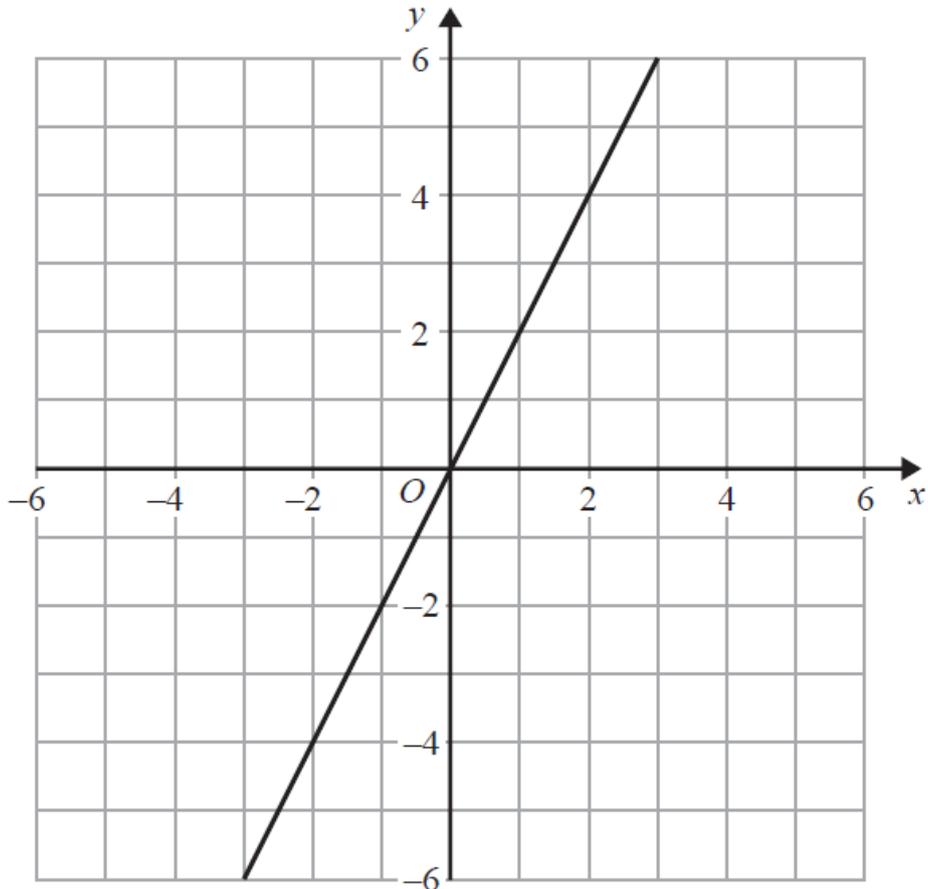
c) Work out the size of angle  $CAD$ .

angle  $CAD = \dots\dots\dots^\circ$  (2)

25. The line with equation  $y = 2x$  is drawn on the grid.

(a) On the same grid, draw the line with equation  $4x + 3y = 12$

(2)



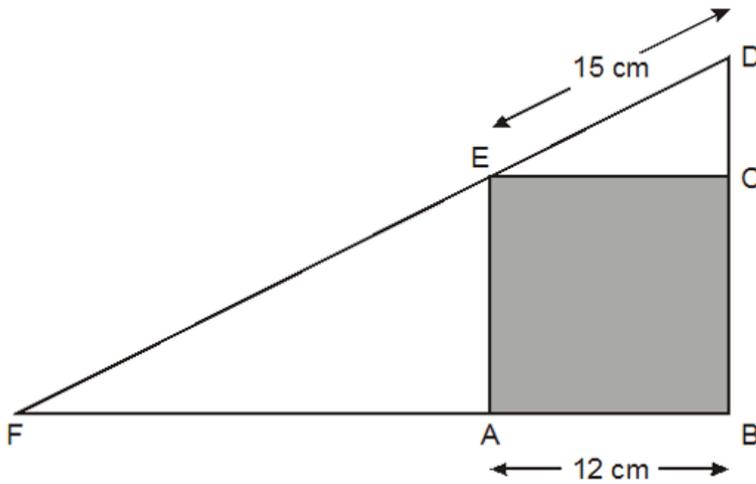
(b) Show, by shading on the grid, the region defined by all four inequalities

$$\begin{aligned}y &\leq 2x \\4x + 3y &\leq 12 \\y &\geq -3 \\x &\leq 4\end{aligned}$$

Label the region clearly with the letter R.

(3)

26. In the diagram shown below ABCE is a square inside the triangle FBD.  
 AB = 12 cm and AD = 15 cm.



- a) Explain fully why triangles AEF and CDE are similar.

- b) Find the length of EF.

(3)

Answer:  $EF = \dots\dots\dots$  cm (2)

27. The table gives information about the number of males in each age group in a survey of 100 males working in Singapore in 2014.

Age ( $A$ years)	Frequency
$15 \leq A < 20$	2
$20 \leq A < 25$	7
$25 \leq A < 30$	9
$30 \leq A < 35$	10
$35 \leq A < 40$	11
$40 \leq A < 45$	12
$45 \leq A < 50$	12
$50 \leq A < 55$	12
$55 \leq A < 60$	11
$60 \leq A < 65$	14

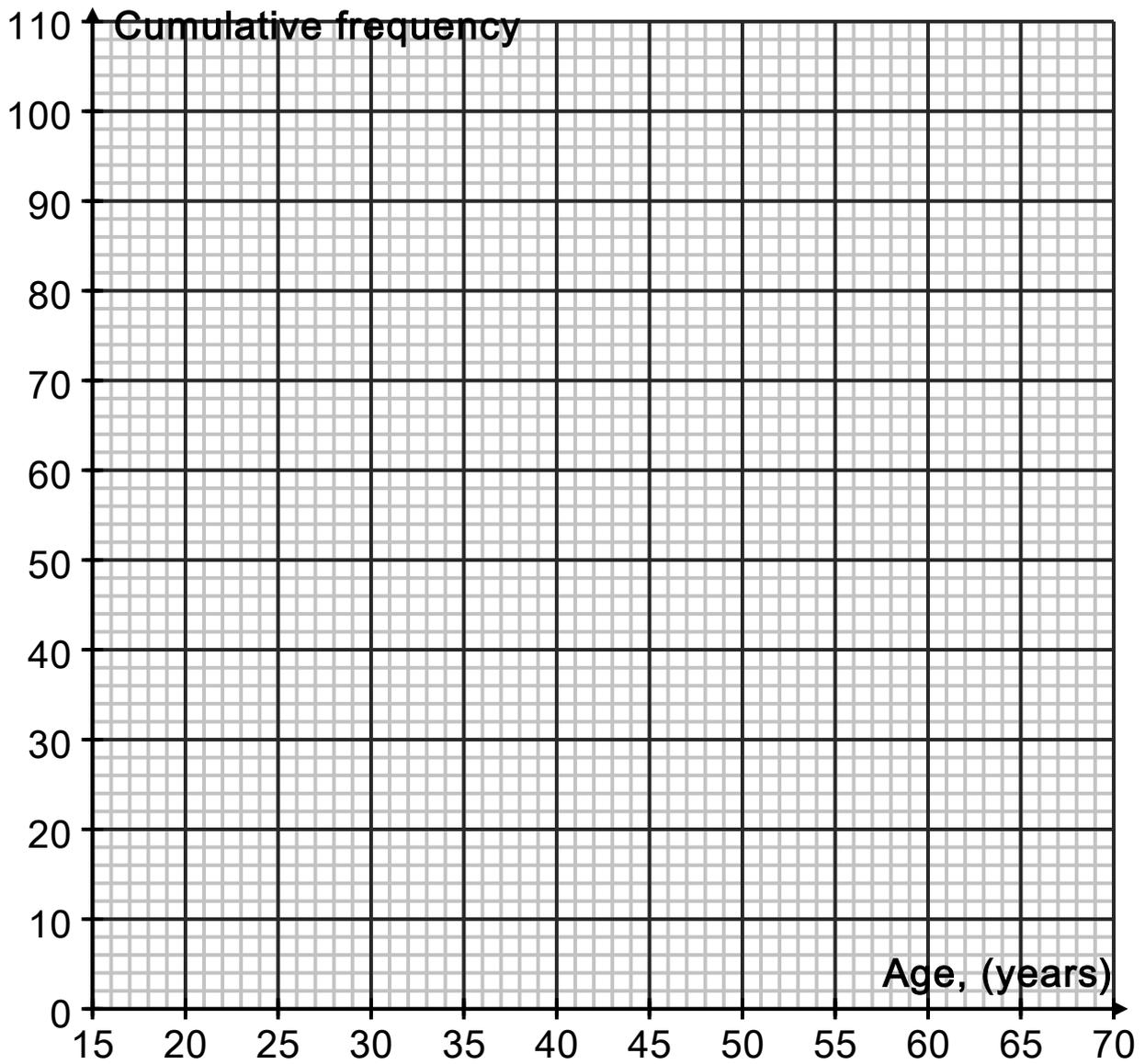
- a) Complete the cumulative frequency table.

Age ( $A$ years)	Cumulative frequency
$15 \leq A < 20$	
$15 \leq A < 25$	
$15 \leq A < 30$	
$15 \leq A < 35$	
$15 \leq A < 40$	
$15 \leq A < 45$	
$15 \leq A < 50$	
$15 \leq A < 55$	
$15 \leq A < 60$	
$15 \leq A < 65$	

- b) On the grid, draw a cumulative frequency graph for this information.

(1)

(2)

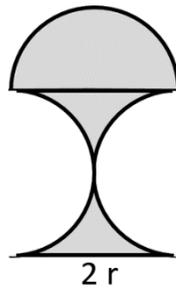


The total number of males aged under 65 working in Singapore in 2014 was 1 200 000.  
Using this information and your graph,

- c) work out an estimate for the number of males working in Singapore in 2014 who were less than 52 years old.

..... (3)

28. Andreas designed a logo for his Design and Technology project, which included the shape shown below. He made this using a square of side  $2r$  cm, out of which he cut out two semicircles. He then attached one of the semicircles on top of his remaining square.



- a) Find the formula for the area  $A$  cm<sup>2</sup> of the shape.  
Give your answer in terms of  $r$  and  $\pi$ .

**Answer:  $A = \dots\dots\dots$  cm<sup>2</sup> (2)**

- b) Find the formula for the perimeter  $P$  cm of the shape.

**Answer:  $P = \dots\dots\dots$  cm (2)**

- c) Find the area when  $r = 4$  cm. Give your answer in terms of  $\pi$ .

**Answer:  $A = \dots\dots\dots$  cm<sup>2</sup> (2)**

- d) Find the value of  $r$  that makes  $A = P$  numerically. Give your answer in terms of  $\pi$ .

**Answer:  $r = \dots\dots\dots$  cm (3)**

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**END**  
19

**TOTAL FOR PAPER=120 MARKS**

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