FOUNDED 1900
THE ENGLISH SCHOOL
A SECOND CENTURY OF EXCELLENCE

END-OF-YEAR-EXAMINATIONS

YEAR 3 MATHEMATICS
MATHEMATICS A - IGCSE Book 1

Time allowed: 2 hours

Instructions to candidates

In the boxes below write your name, surname and form.
Answer the questions in the spaces provided.
Without sufficient working, correct answers may be awarded no marks.

Information to candidates

This paper has 27 questions.
There are 19 pages in this question paper.
Full marks may be obtained for answers to all questions.
The total marks for this paper is 120.
The marks for each question is 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

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.

$$\frac{\sqrt{1.44\times10^{6}}}{5.7\times10^{-4}-3.1\times10^{-5}}$$

Answer…….. (1)

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2. Simplify:

a) $10x^{7}\times10x^{3}$

Answer…….. (2)

b) $\dfrac{\left(4a^{2}\right)^{3}\times a^{6}}{\left(2a^{3}\div a\right)^{2}}$

Answer…….. (3)

c) $\dfrac{v+3}{15}\div\dfrac{v^{2}+3v}{25}=$

Answer…….. (2)

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3. Three schools have sent some students to participate in a Maths conference.
The first school sent both boys and girls. This school sent 4 boys. The ratio of the number of boys it sent to the number of girls it sent was 2:3.
The second school sent only girls.
The third school sent the same number of boys and girls.
Each of the three schools sent the same number of students.

Work out the ratio of the total number of boys to the total number of girls participating in the conference. Simplify your answer.

Answer: Boys : Girls = …… : …… (4)

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4. a) The Highest Common Factor (HCF) of two numbers is 6.
The Lowest Common Multiple (LCM) of the same numbers is 60.
Both numbers are larger than the HCF.
What are the two numbers?

Answer …… and …….. (2)

b) A red light flashes every 3 seconds.
A yellow light flashes every 8 seconds.
A green light flashes every 11 seconds.
They all flash at the same time.
After how many seconds will they next all flash at the same time?

Answer …… seconds (2)

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5. a) A ten-year savings bond pays 4% interest for the first year, then 5% per annum compound interest after that. Work out the total final value after ten years of an initial investment of £500.

Answer £ …….. (2)

b) The price of a new smart television is £960 including VAT at 20%. Work out the price of the television before VAT was added.

Answer £ …….. (2)

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6. Expand and simplify these:

a) $(x-7)^2 + 2x(x^2-3) =$

Answer…….……..…..…….. (2)

b) $(2x-1)(5x+3) =$

Answer…….……..…..…….. (2)

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7. A car travels a distance of 150 miles, in 2.5 hours. In fact, the distance is correct to the nearest 10 miles and the time is correct to the nearest 0.1 hour.

a) Work out the lower bound for the speed of the car.

b) Work out an upper bound for the speed of the car.

Give your answers correct to 3 significant figures.

Lower Bound = ……..….. mph (2)

Upper Bound = ……..….. mph (2)

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8. *ABCD* is a parallelogram.

DC = 5 cm
Angle ADB = 36°

Calculate the length of AD.
Give your answer correct to 3 significant figures.

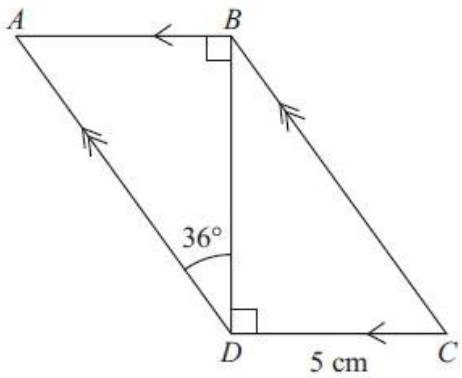

Diagram **NOT** accurately drawn

Answer……. cm (2)

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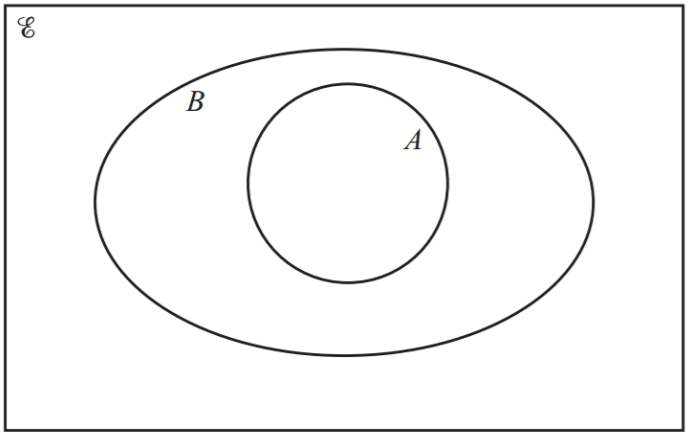
9. $\mathscr{E}$ = {20, 21, 22, 23, 24, 25, 26, 27, 28, 29}
A = {prime numbers}
B = {odd numbers}

a) Place the 10 numbers in the correct places on the Venn diagram.



(2)

b) State the value of $n(A \cup B')$.

Answer …… (1)

c) Use set notation to describe the set: "The odd numbers which are not prime"

Answer …….. (1)

d) A number is chosen at random from the universal set. Find the probability that the number chosen:

(i) Is an even number.

Answer …….. (1)

(ii) Is a member of the set $B \cap A$

Answer …….. (1)

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

a) $12pq^3 - 12pq^2 + 15pq =$

Answer…….. (1)

b) $4y^2 - 36 =$

Answer…….. (2)

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11. Solve the following equations.

a) $\dfrac{x+13}{2} - \dfrac{12-3x}{3} = 1$

***x* = …….. (3)**

b) $\sqrt{\dfrac{x^2+4}{20}} + 7 = 8$

***x* = …….. (3)**

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12. Solve the simultaneous equations:

$3x - 2y = 33$

$2x + 3y = -4$

Answer: *x* = …… *y* = …….. (4)

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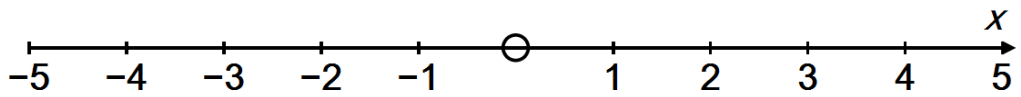
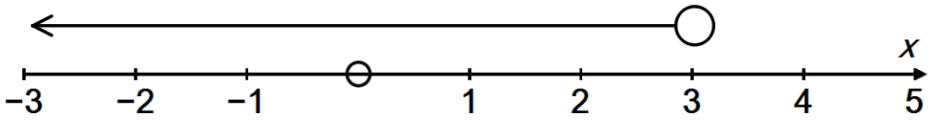
13. a) Solve the inequality $1 \le 2(x+3) \le 12$ and show the result on the number line.



Answer……..…….. (4)

b) Write down the inequality shown by the diagram.



Answer……..…….. (1)

c) Write down all the integers that satisfy both inequalities shown in part (a) and (b).

Answer…….. (1)

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14. Make *x* the subject of the formula:

$$P = 4x + \frac{\pi x}{5}$$

Answer: *x* = …… (3)

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15. In the trapezium shown below, the lengths of three of the sides are $x - 5$, $x + 2$ and $x + 6$. All measurements are given in centimetres.

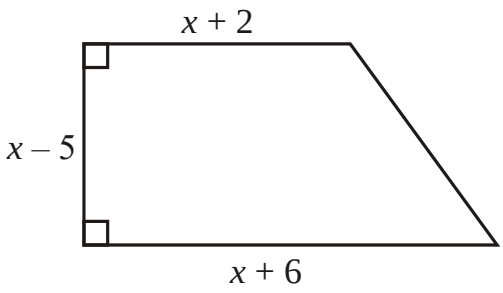

Diagram **NOT** accurately drawn

The area of the trapezium is 36 cm^2.

a) Show that $x^2 - x - 56 = 0$.

(3)

b) Solve the equation $x^2 - x - 56 = 0$, and hence find the length of the shortest side of the trapezium.

Answer……cm **(3)**

16. A Mathematics quiz had five questions. The table below shows the number of correct answers given by the students who took the quiz.

Number of correct answers	Number of students	
0	6	
1	10	
2	13	
3	21	
4	49	
5	1	

a) Calculate the mean number of correct answers. You must show your working.

Mean = …… correct answers **(3)**

b) Find the median number of correct answers.

Median = …… correct answers **(2)**

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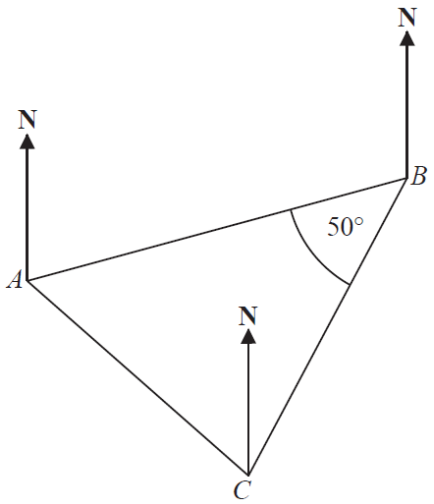
17. The diagram shows the positions of three points, *A*, *B* and *C*, on a map.
The bearing of *B* from *A* is 070°
Angle *ABC* is 50°
AB = *CB*

Work out the bearing of *C* from *A*.



Answer…… ° **(2)**

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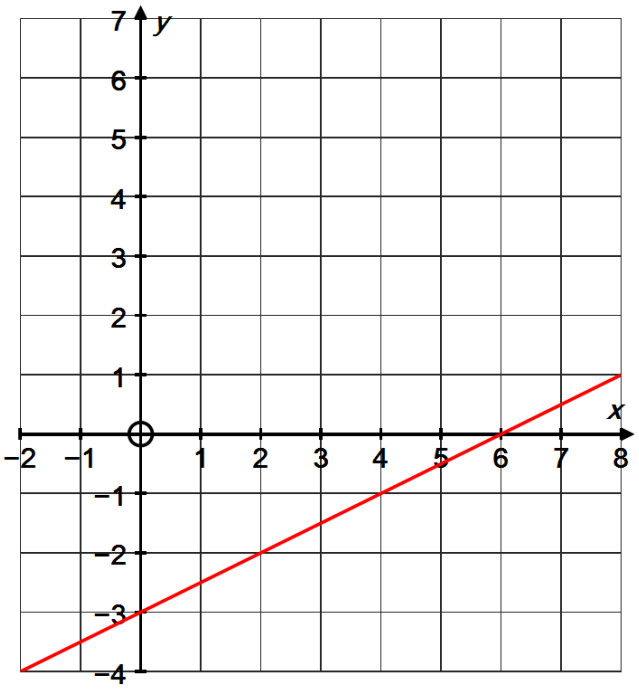
18. a) Find the equation of the straight line shown below.



Answer……... (2)

b) On the grid above draw the graph of $x + y = 6$

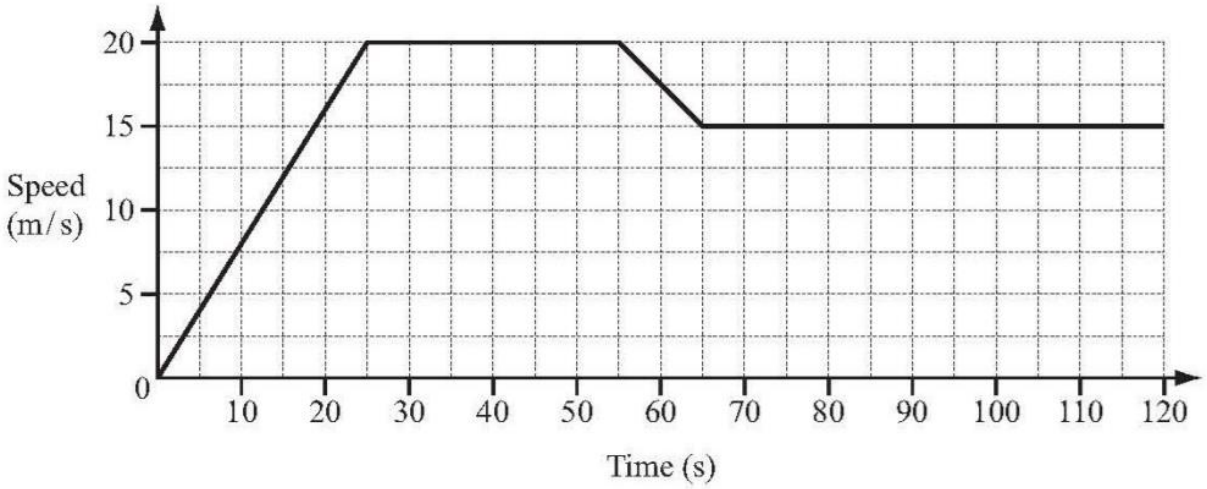
(2)

c) Use the graph to write down the solution to the simultaneous equations:

$$x + y = 6$$
$$y = \frac{1}{2}x - 3$$

Answer: *x* = ……., *y* = ……. (1)

19. The diagram below shows the speed-time graph for the first 120 seconds of a car journey.



a) Find the acceleration of the car during the first 25 seconds of the journey.

Answer…… m/s^2 **(2)**

b) For how long was the car travelling with constant speed during these 120 seconds?

Answer…… seconds **(1)**

c) When did the car start decelerating?

Answer: After …… seconds **(1)**

d) Calculate the distance travelled by the car during the first 55 seconds of its journey.

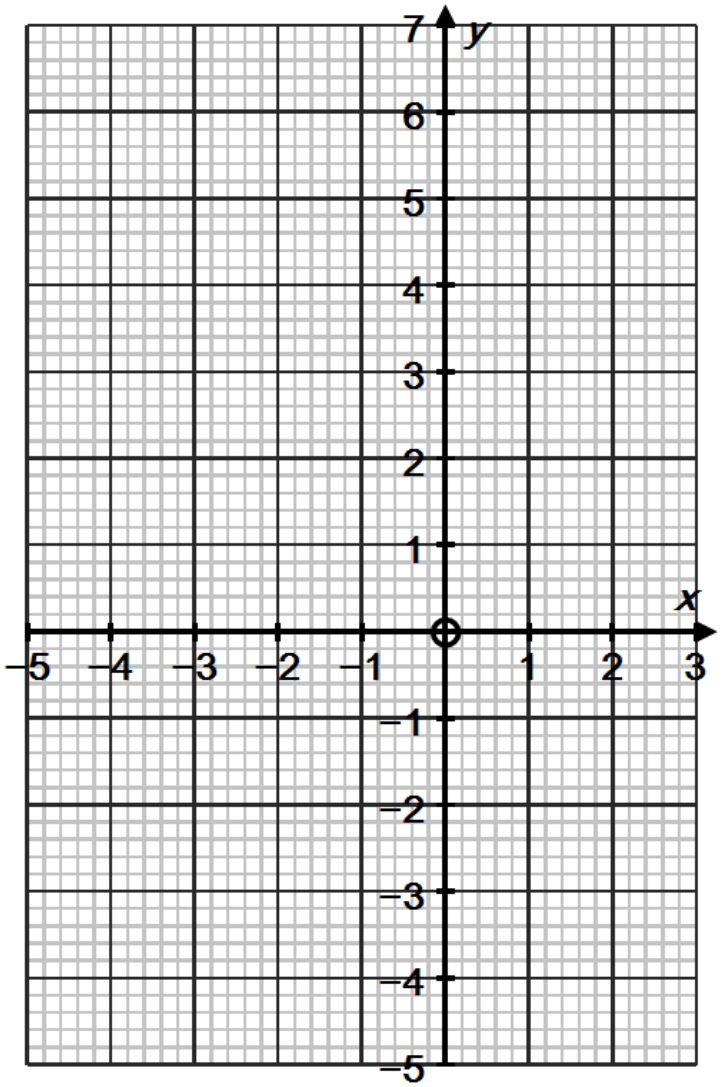
Answer……. m **(2)**

20. a) Complete the table below for $y = x^2 + 2x - 3$.

x	-4	-3	-2	-1	0	1	2
y			-3				

(2)

b) Draw the graph of $y = x^2 + 2x - 3$ on the grid below.

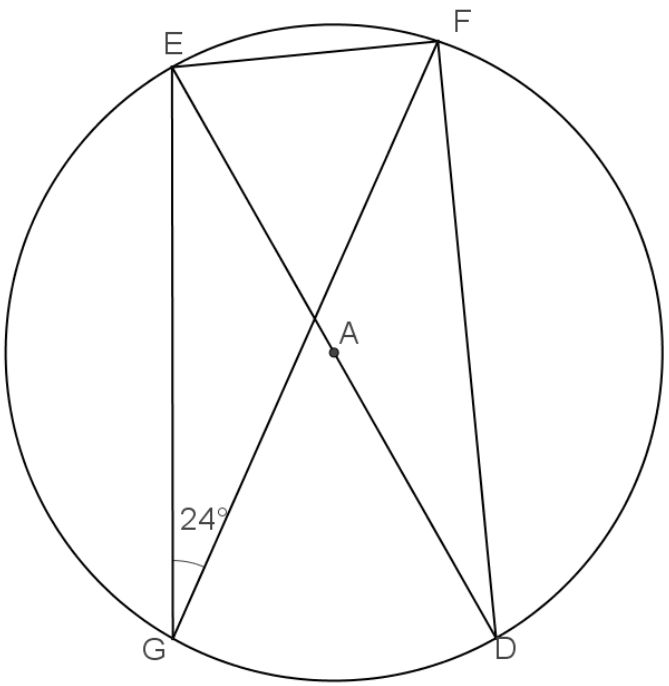


(1)

c) Use your graph to find the solutions to the equation $x^2 + 2x - 3 = 0$

***x* =…… *x* =…....** **(2)**

21. The diagram shows a circle centre A.



E, F, D and G are points on the circumference. Angle EGF = 24º.

a) Work out the size of the angle EDF.

angle EDF = ……º **(1)**

b) Give a reason for your answer.

……. **(1)**

c) Work out the size of angle FED.

Answer: ……º **(2)**

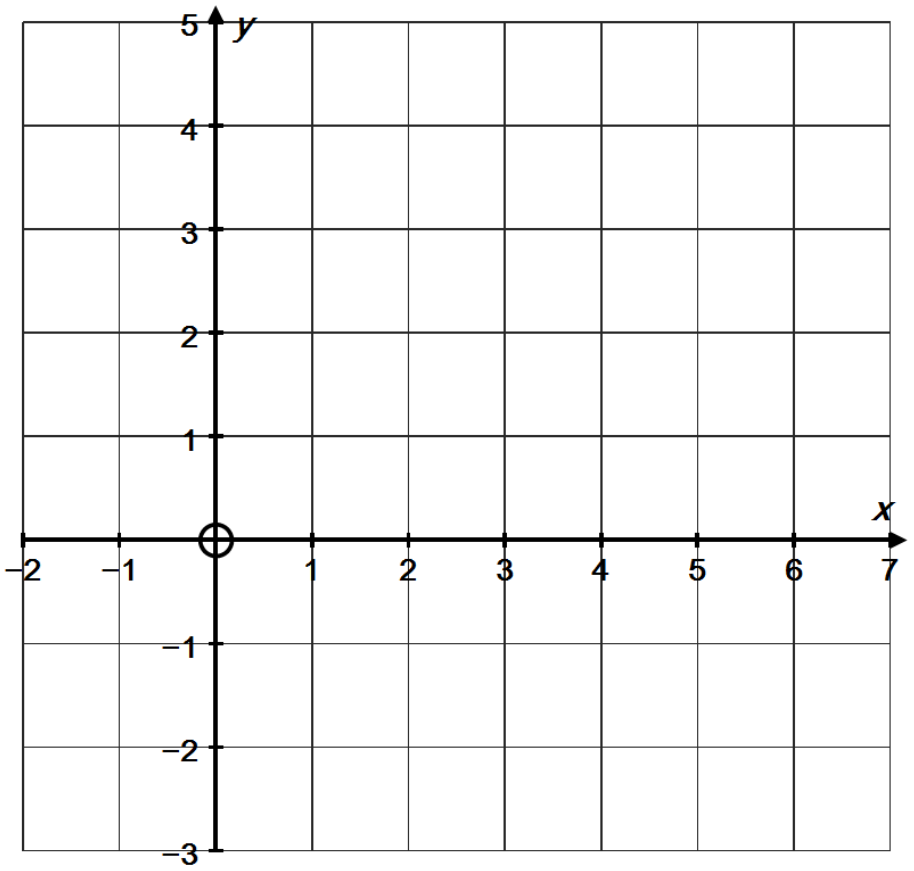
22. a) On the grid below leave unshaded the region satisfied by the inequalities:

$$y < 2$$

$$2y \geq -3x + 6$$

$$y > \frac{1}{2}x - 1$$

Label the region clearly with the letter R.



(4)

b) P is a point in region R. The coordinates of P are both integers. Write down the possible coordinates of P.

Answer ……..…….. (2)

23. The diagram below shows part of a pattern made from tiles. The pattern is made from two types of tiles, tile A and tile B. Both tile A and tile B are regular polygons. Work out the number of sides tile A has.

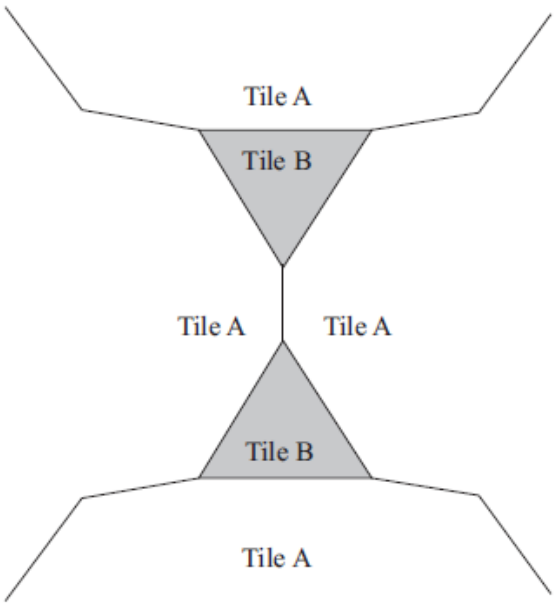


Diagram **NOT** accurately drawn

Answer: …… sides **(4)**

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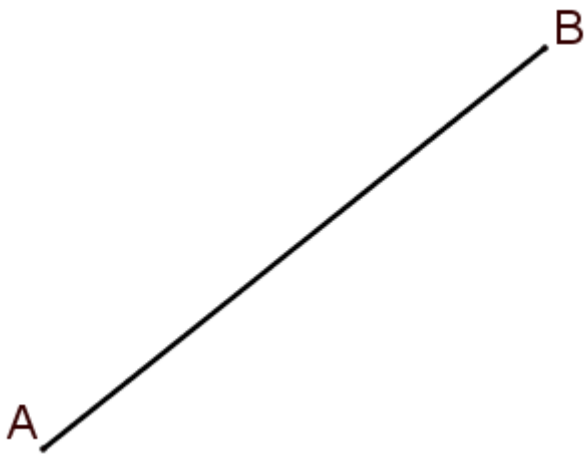
24. Use ruler and compasses to construct the perpendicular bisector of the line segment AB.



(2)

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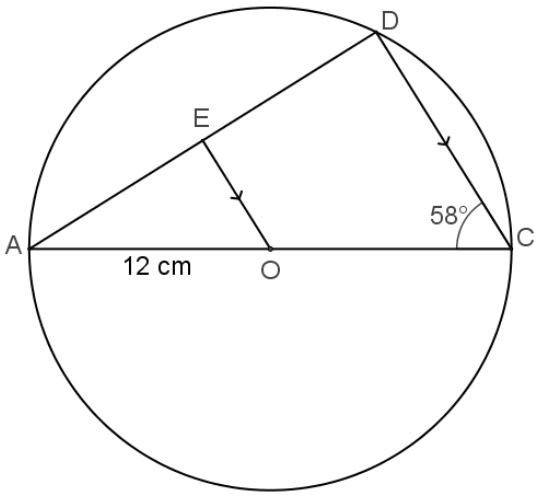
25. In the diagram shown below AC is the diameter of the circle with centre O, and radius 12 centimetres. AD and DC are chords of the circle, OE is parallel to CD and angle ACD is 58º.

a) Explain fully why triangles AEO and ADC are similar.



(3)

b) Calculate the length of ED. Give your answer correct to 3 significant figures.

Answer: *ED* = …… cm **(4)**

26. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

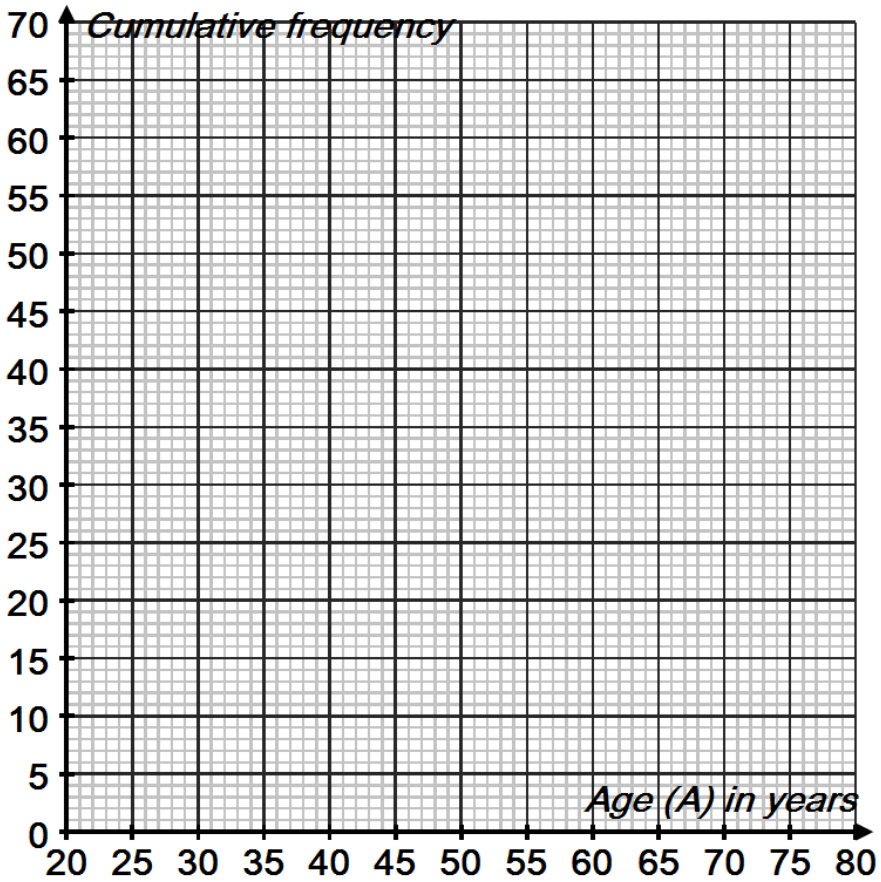
a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	
$20 < A \leq 40$	
$20 < A \leq 50$	
$20 < A \leq 60$	
$20 < A \leq 70$	

(1)

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

(2)



c) Use your cumulative frequency graph to find an estimate for the median age.

…… years (1)

d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

…… teachers (2)

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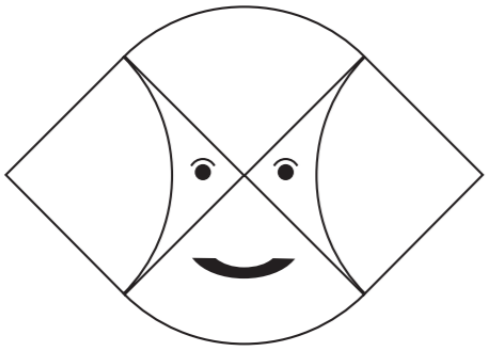
27. George cut a circle of radius r cm, into quarters. He arranged the quarter circles and glued them onto paper to make this face of an alien.



a) Find in terms of r the total area of the alien's face.

Answer: A = …… (2)

b) Find the area of the alien's face if r = 5 cm. Give your answer correct to 3 significant figures.

Answer: A = …… cm^2 (2)

END

TOTAL FOR PAPER=120 MARKS

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