

Centre No.						Paper Reference						Surname	Initial(s)	
Candidate No.						1	3	8	0	/	3	H	Signature	

Paper Reference(s)

1380/3H

Edexcel GCSE

Mathematics (Linear) – 1380

Paper 3 (Non-Calculator)

Higher Tier

Friday 2 March 2012 – Afternoon

Time: 1 hour 45 minutes



Examiner's use only

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Team Leader's use only

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Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser.
Tracing paper may be used.

Items included with question papers

Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initials and signature.

Check that you have the correct question paper.

Answer ALL the questions. Write your answers in the spaces provided in this question paper.

You must NOT write on the formulae page.

Anything you write on the formulae page will gain NO credit.

If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2).

There are 24 questions in this question paper. The total mark for this paper is 100.

There are 24 pages in this question paper. Any blank pages are indicated.

Calculators must not be used.

Advice to Candidates

Show all stages in any calculations.

Work steadily through the paper. Do not spend too long on one question.

If you cannot answer a question, leave it and attempt the next one.

Return at the end to those you have left out.

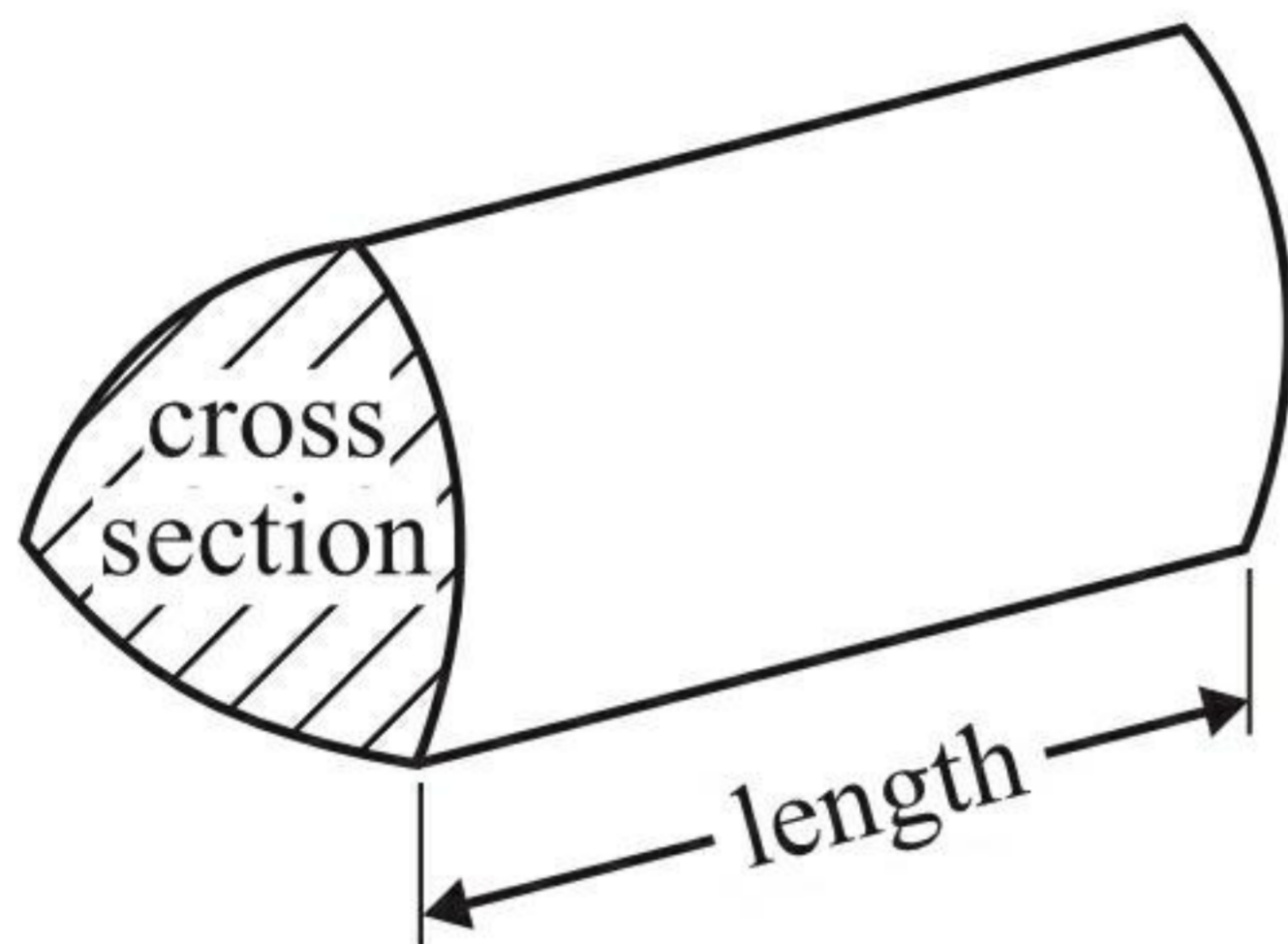


GCSE Mathematics (Linear) 1380

Formulae – Higher Tier

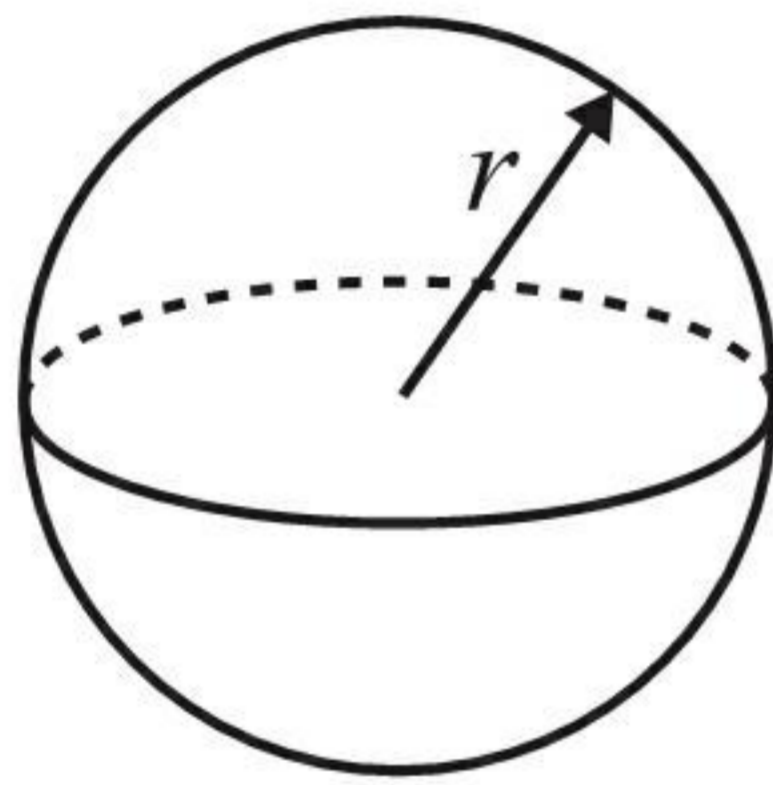
**You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.**

Volume of prism = area of cross section \times length



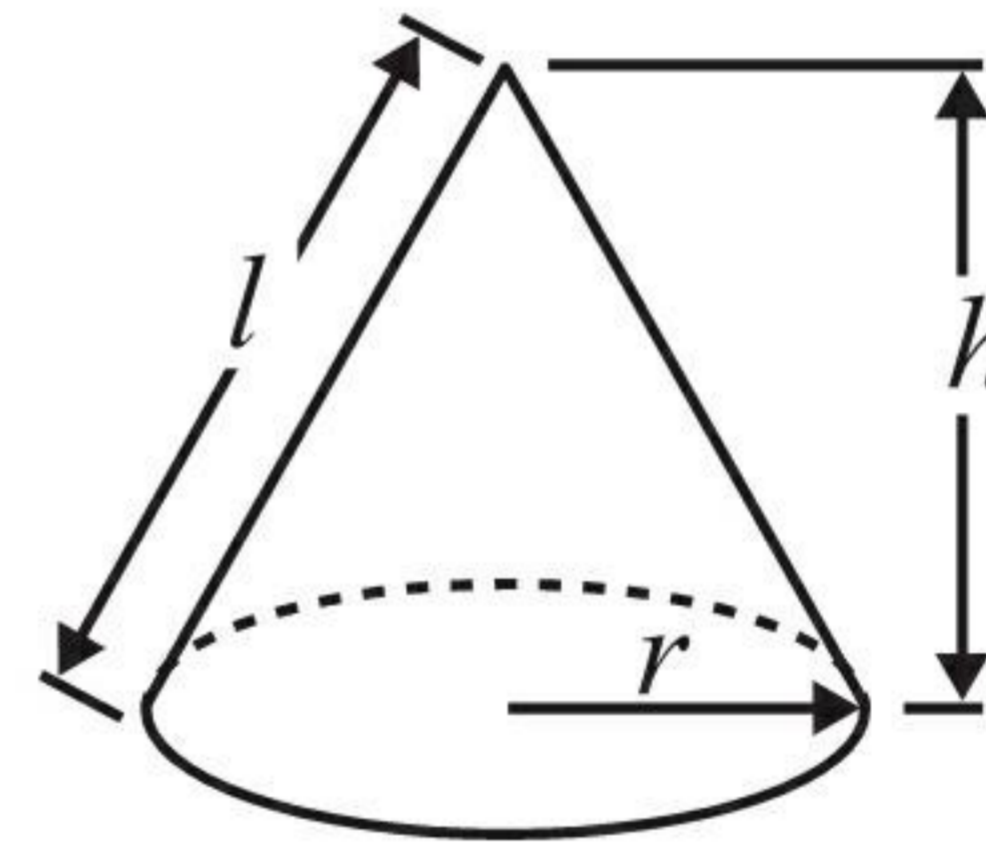
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

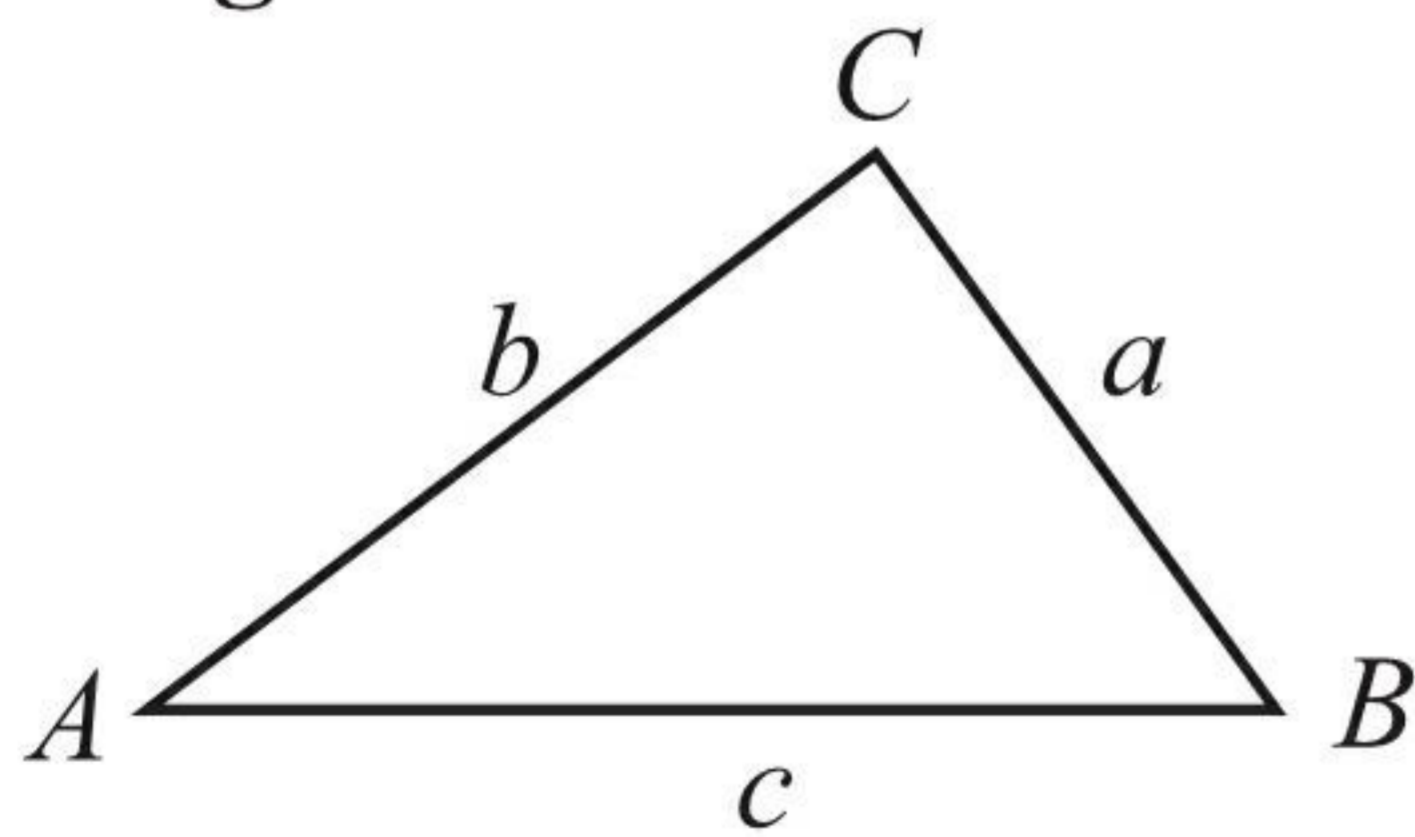


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$



In any triangle ABC



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$



Answer ALL TWENTY FOUR questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1. (a) Simplify $2a + 3b - a - b$

$$\frac{a + 2b}{\dots\dots\dots} \quad (2)$$

- (b) Expand $4(2m - 3n)$

$$\frac{8m - 12n}{\dots\dots\dots} \quad (1)$$

(Total 3 marks)

Q1

2. Work out an estimate for the value of $\frac{60.2 \times 0.799}{223}$
Give your answer as a decimal.

$$\frac{60 \times 0.8}{200}$$

$$\frac{48}{200} = \frac{24}{100}$$

$$\frac{0.24}{\dots\dots\dots}$$

(Total 3 marks)

Q2



3. Fred buys 18 tins of polish costing £2.37 each.

(a) Work out the total cost.

	200	30	7
10	2000	300	70
8	1600	240	56

$$\begin{array}{r}
 2000 \\
 1600 \\
 300 \\
 240 \\
 70 \\
 56 \\
 \hline
 4266
 \end{array}$$

£ 42.66..... (3)

A vacuum cleaner costs £85
 Fred gets 10% off the price of the vacuum cleaner.

(b) Work out how much he has to pay.

$$\begin{array}{r}
 10\% = £8.50 \\
 7 \text{ } 85.00 \\
 - \quad 8.50 \\
 \hline
 76.50
 \end{array}$$

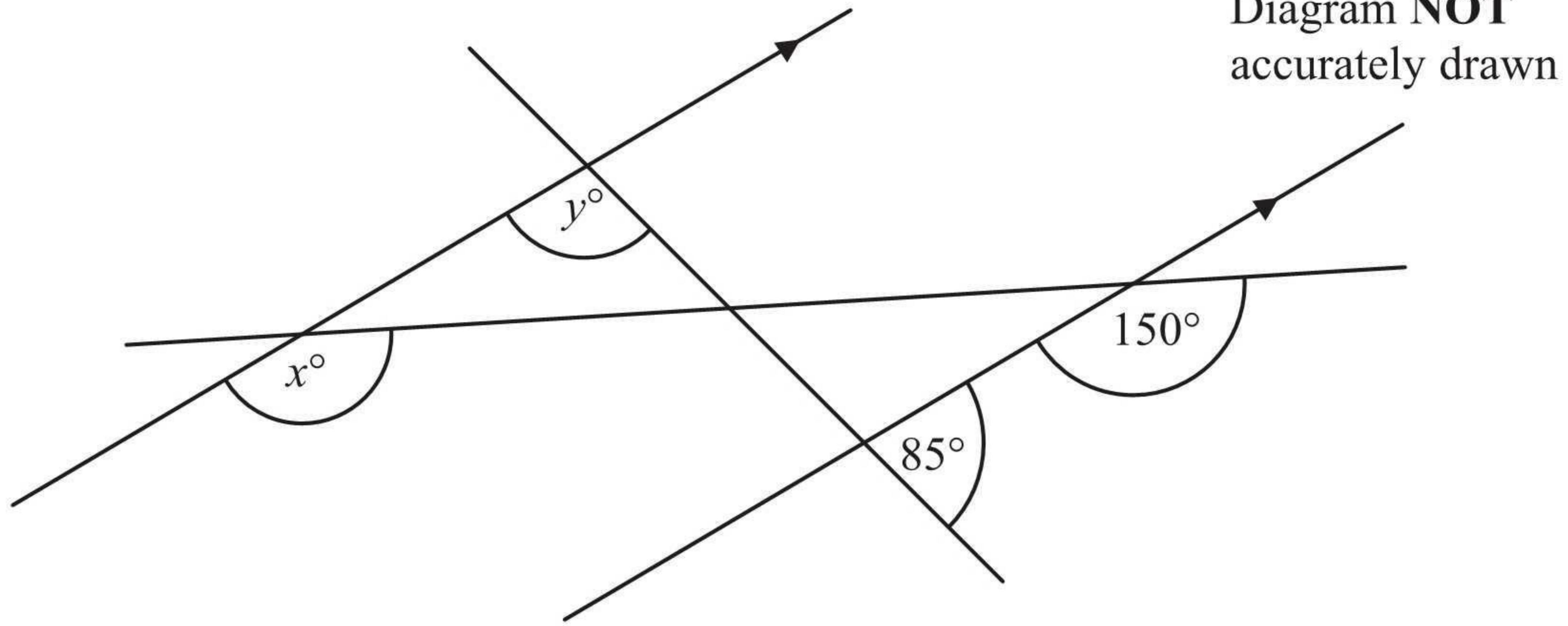
£ 76.50..... (3)

(Total 6 marks)

Q3



4.



(a) Find the value of x .

150
(1)

(b) Find the value of y .
Give reasons for your answer.

Angles on a straight line add upto 180°
Corresponding angles are equal.

95
(2)

(Total 3 marks)

Q4



5. There are only red counters, blue counters and green counters in a bag.
 There are 5 red counters.
 There are 6 blue counters.
 There is 1 green counter.

Jim takes at random a counter from the bag.

- (a) Work out the probability that Jim takes a counter that is **not** red.

$$\frac{7}{12}$$

(2)

Jim puts the counter back in the bag.
 He then puts some more green counters into the bag.

The probability of taking at random a red counter is now $\frac{1}{3}$

- (b) Work out the number of green counters that are now in the bag.

5 counters is $\frac{1}{3}$
 \therefore there are 15 counters
 3 have been added

$$4$$

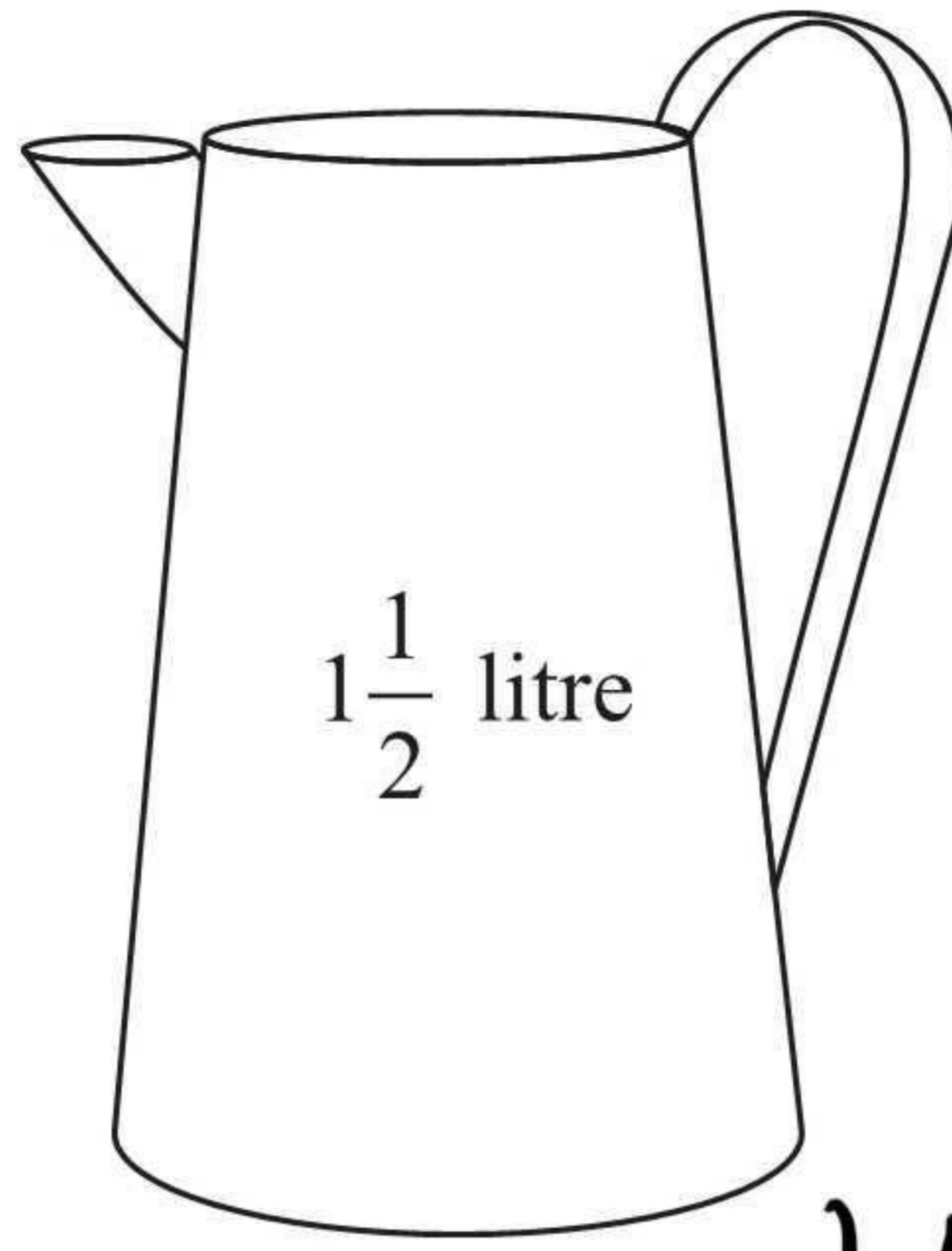
(2)

(Total 4 marks)

Q5



6.



1500ml

There are $1\frac{1}{2}$ litres of juice in a jug.

Lisa is going to pour the juice into some glasses.
She will fill each glass with 175 ml of juice.

Work out the greatest number of glasses she can fill.

175 = 1 glass
 350 = 2 glasses
 700 = 4 glasses
 1400 = 8 glasses

8

.....

(Total 4 marks)

Q6



7. Jo measured the times in seconds it took 18 students to run 400 m. Here are the times.

~~67~~ ~~78~~ ~~79~~ ~~98~~ ~~96~~ ~~103~~
~~75~~ ~~85~~ ~~94~~ ~~92~~ ~~61~~ ~~80~~
~~82~~ ~~86~~ ~~90~~ ~~95~~ ~~90~~ ~~89~~

(a) Draw an ordered stem and leaf diagram to show this information.

6		1 7
7		5 8 9
8		0 2 5 6 9
9		0 0 2 4 5 6 8
10		3

Median ↙

Key:
 $6/1 = 61 \text{ seconds}$

(3)

(b) Work out the median.

middle of 86 and 89

87.5 seconds
 seconds
 (2)

(Total 5 marks)

Q7



8. (a) Solve $13x + 1 = 11x + 8$

$$\begin{aligned} & -11x \quad -11x \\ & 2x + 1 = 8 \\ & \quad -1 \quad -1 \\ & 2x = 7 \\ & x = 3.5 \end{aligned}$$

$$x = \dots 3.5 \dots \quad (2)$$

(b) Show that $y = -2$ is a solution of the equation $\frac{4}{y} + y = 2y$

$$\begin{aligned} \frac{4}{(-2)} + (-2) &= 2(-2) \\ -2 - 2 &= -4 \end{aligned}$$

✓

(2)

Q8

(Total 4 marks)

9. Sweets are sold in bags and in tins.

There are 20 sweets in a bag.

There are 30 sweets in a tin.

Lee buys B bags of sweets and T tins of sweets.

He buys a total of S sweets.

Write down a formula for S in terms of B and T .

$$S = 20B + 30T$$

Q9

(Total 3 marks)



10. Jim has only 5p coins and 10p coins.

The ratio of the number of 5p coins to the number of 10p coins is 2 : 3

Work out the ratio of

the total value of the 5p coins : the total value of the 10p coins.

Give your answer in its simplest form.

$$\begin{array}{cc} 2 & : & 3 \\ \uparrow & & \uparrow \\ 5p & & 10p \\ & & \\ & & 10p : 30p \end{array}$$

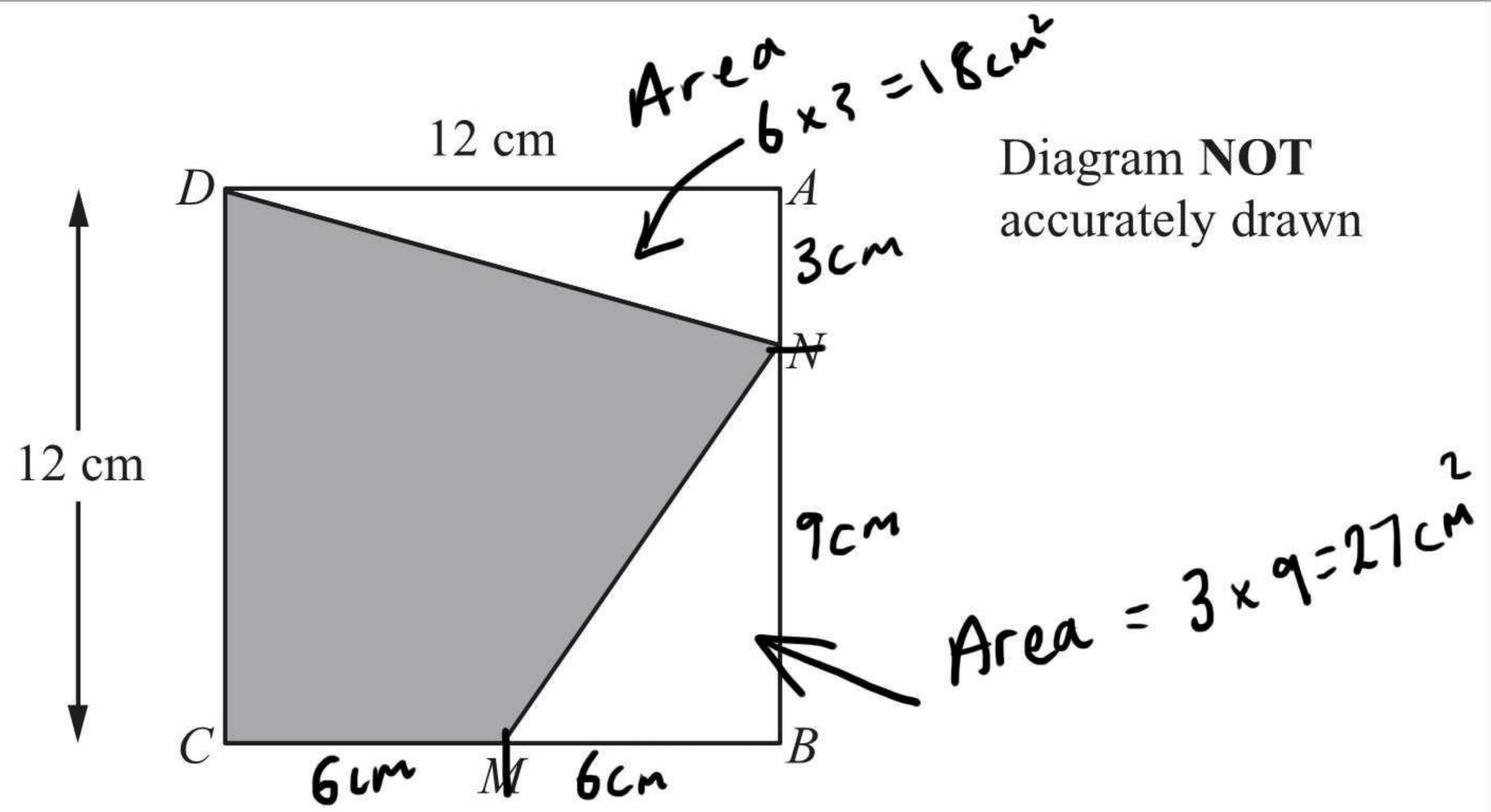
$$\dots\dots\dots 1 : 3 \dots\dots\dots$$

(Total 2 marks)

Q10



11.



$ABCD$ is a square of side 12 cm.

M is the midpoint of CB .

N is a point on AB .

$$AN = \frac{1}{4} AB.$$

Calculate the area of the shaded region $CDNM$.

$$\text{Area of square} = 12 \times 12 = 144 \text{ cm}^2$$

$$\text{Area of triangles} = 18 + 27 = 45 \text{ cm}^2$$

$$144 - 45 = 99$$

..... 99 cm^2

(Total 6 marks)

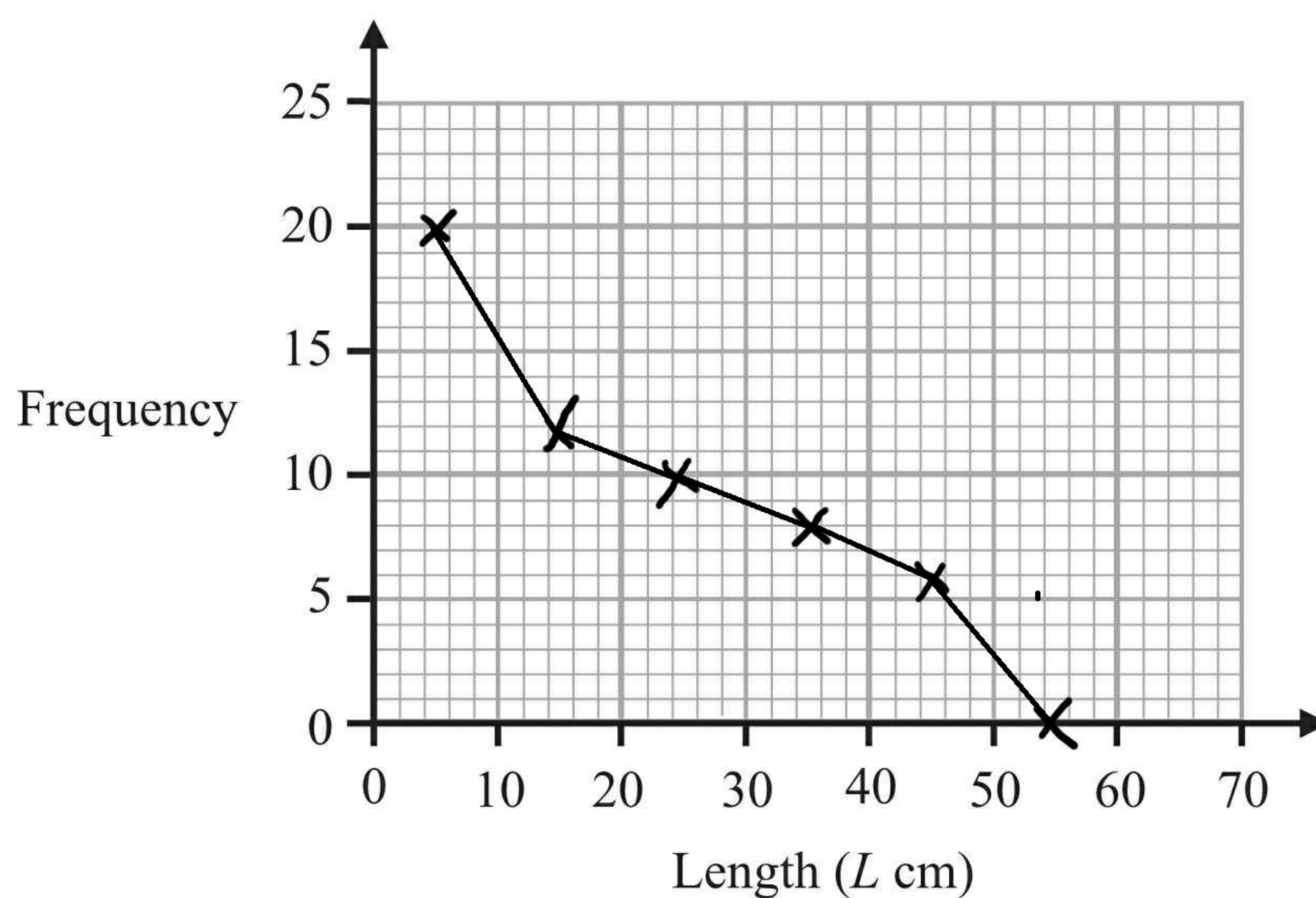
Q11



12. The table gives information about the lengths of the branches on a bush.

Length (L cm)	Frequency
$0 \leq L < 10$	20
$10 \leq L < 20$	12
$20 \leq L < 30$	10
$30 \leq L < 40$	8
$40 \leq L < 50$	6
$50 \leq L < 60$	0

(a) Draw a frequency polygon to show this information.



(2)

(b) Write down the modal class interval.

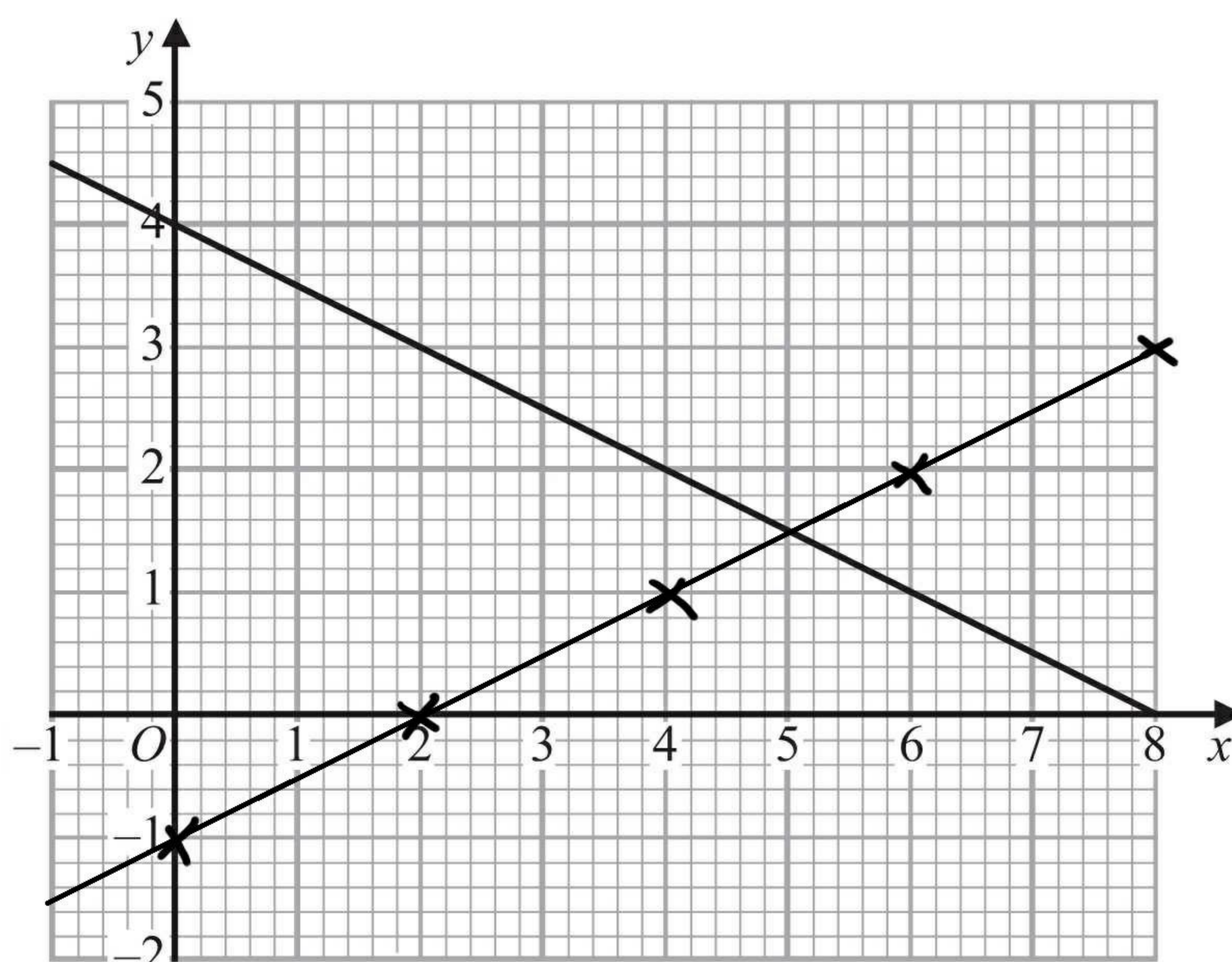
$0 \leq L < 10$
(1)

(Total 3 marks)

Q12



13.



The graph of the straight line $x + 2y = 8$ is shown on the grid.

(a) On the grid, draw the graph of $y = \frac{x}{2} - 1$

x	0	2	4	6
y	-1	0	1	2

(3)

(b) Use the graphs to find estimates for the solution of

$$x + 2y = 8$$

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

$$x = 5 \quad y = 1.5$$

(1)

Q13

(Total 4 marks)



14. (a) Write 6.43×10^5 as an ordinary number.

$$\underline{643000} \quad (1)$$

(b) Work out the value of $2 \times 10^7 \times 8 \times 10^{-12}$
Give your answer in standard form.

$$16 \times 10^{-5}$$

$$1.6 \times 10^{-4}$$

$$\underline{1.6 \times 10^{-4}} \quad (2)$$

(Total 3 marks)

Q14

15. (a) Factorise fully $2x^2 - 4xy$

$$\underline{2x(x - 2y)} \quad (2)$$

(b) Factorise $p^2 - 6p + 8$

$$\underline{(p - 2)(p - 4)} \quad (2)$$

(c) Simplify $\frac{(x+2)^2}{x+2}$

$$\frac{(x+2)(x+2)}{(x+2)}$$

$$\underline{x+2} \quad (1)$$

(d) Simplify $2a^2b \times 3a^3b$

$$\underline{6a^5b^2} \quad (2)$$

(Total 7 marks)

Q15



16. All the students in Mathstown school had a test.

The lowest mark was 18

The highest mark was 86

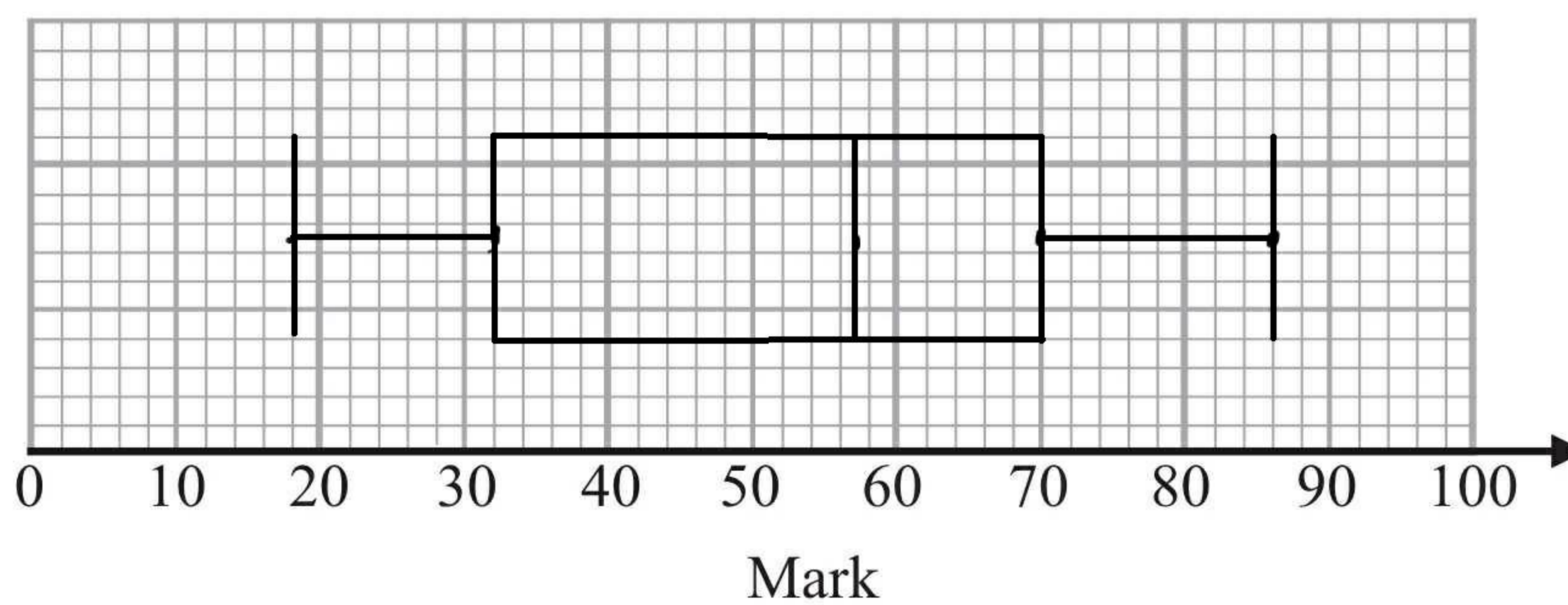
The median was 57

The lower quartile was 32

The interquartile range was 38

$$\text{upper quartile} = 32 + 38 = 70$$

On the grid, draw a box plot to show this information.



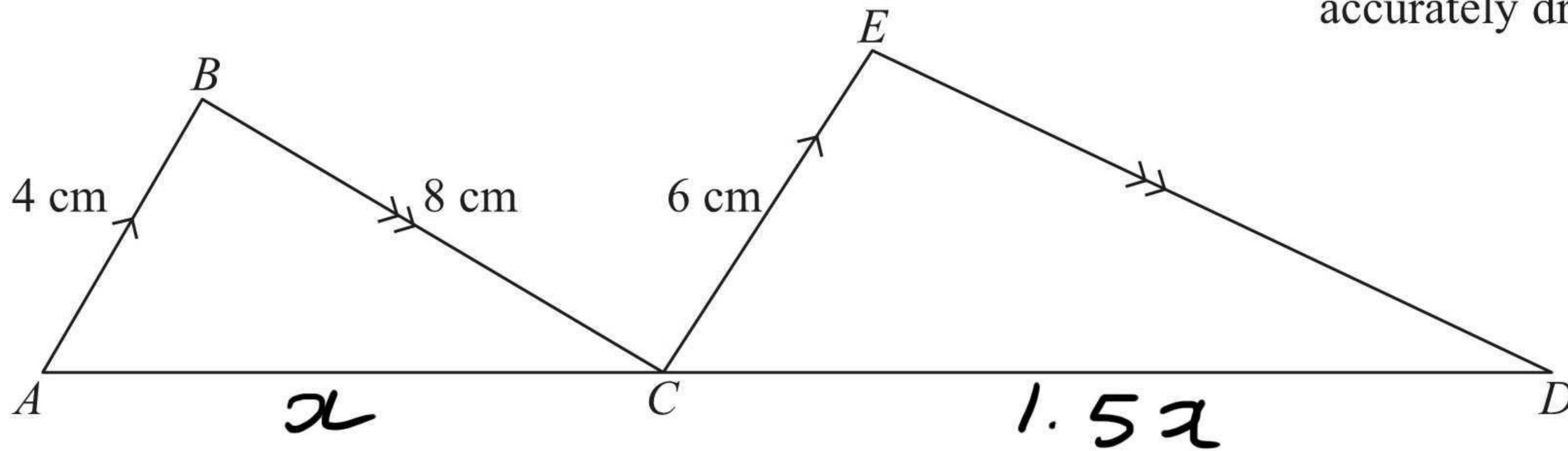
Q16

(Total 3 marks)



17.

Diagram **NOT** accurately drawn



ACD is a straight line.
 AB is parallel to CE .
 BC is parallel to ED .

$AB = 4$ cm.
 $CE = 6$ cm.
 $BC = 8$ cm.

Similar shapes

(a) Calculate the length of ED .

S.F $\times 1.5$

$$8 \times 1.5$$

..... 12 cm
 (2)

$AD = 25$ cm.

(b) Calculate the length of AC .

$$25 = 2.5x$$

$$x = 10$$

..... 10 cm
 (2)

(Total 4 marks)

Q17

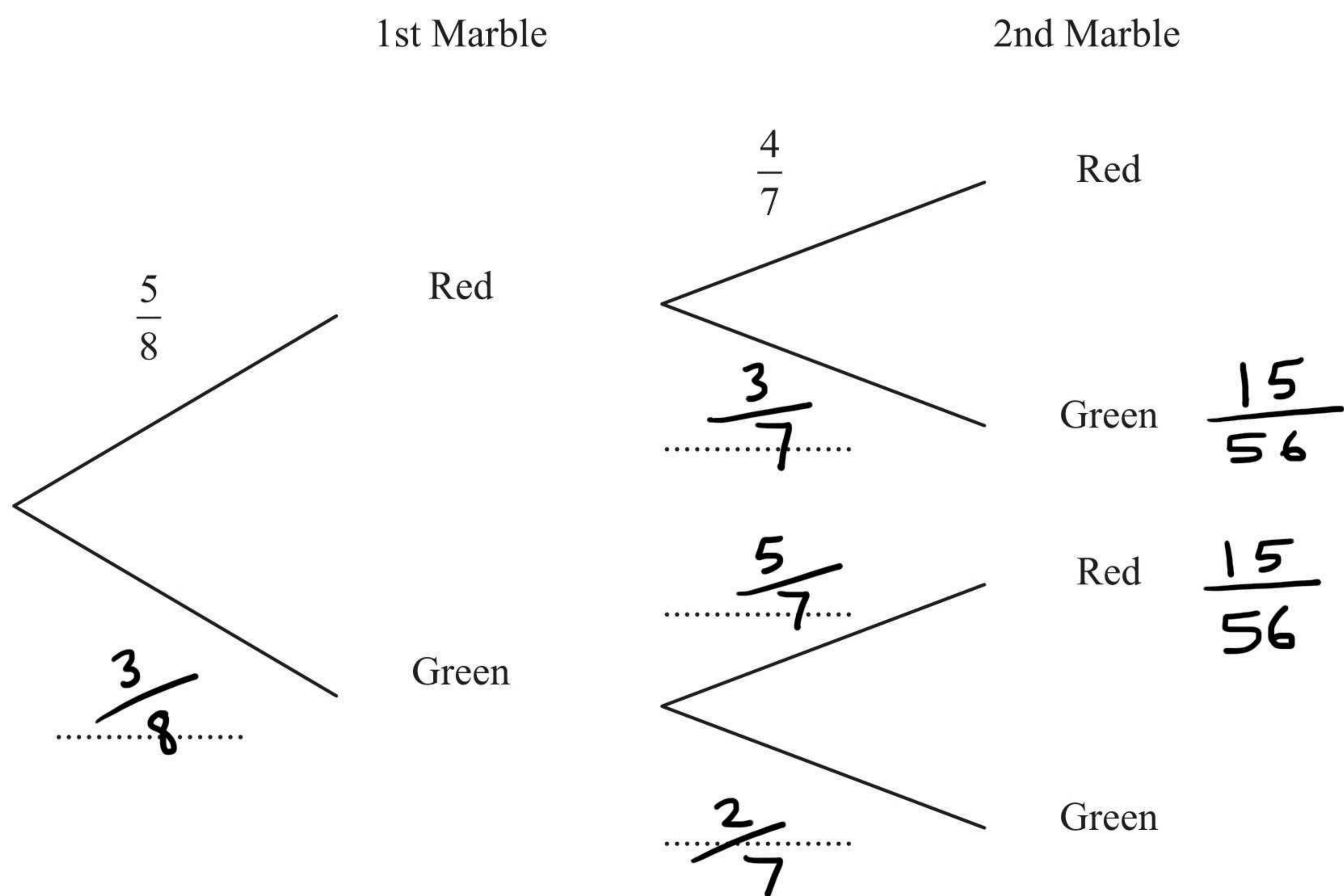


18. There are only red marbles and green marbles in a bag.
There are 5 red marbles and 3 green marbles.

Dwayne takes at random a marble from the bag.
He does not put the marble back in the bag.

Dwayne takes at random a second marble from the bag.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Dwayne takes marbles of different colours.

$$\frac{15}{56} + \frac{15}{56} = \frac{30}{56}$$

.....
(3)

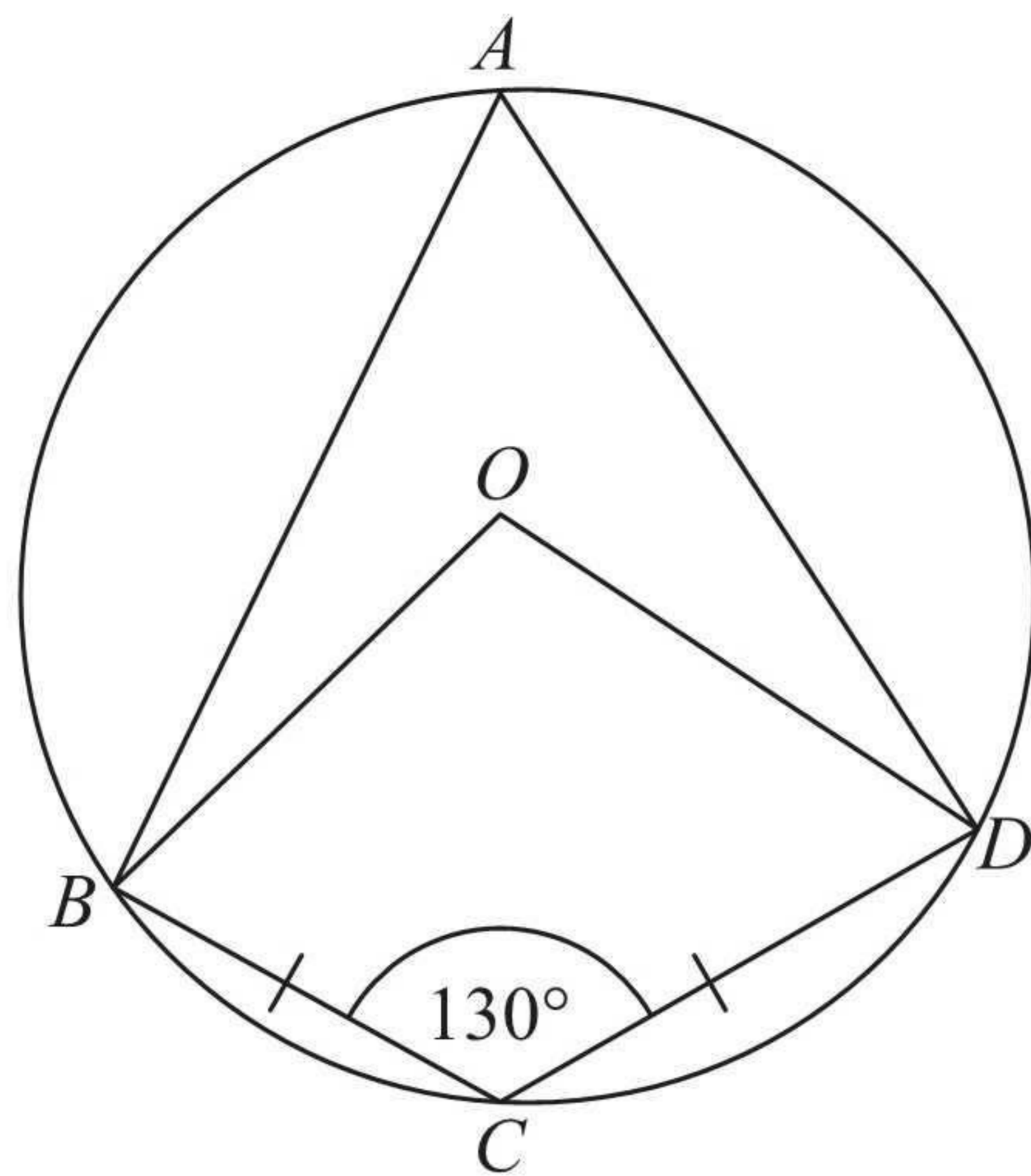
(Total 5 marks)

Q18



19.

Diagram NOT accurately drawn



A, B, C and D are points on a circle, centre O .
 $BC = CD$.
 Angle $BCD = 130^\circ$.

- (a) Write down the size of angle BAD .
 Give a reason for your answer.

opposite angles in cyclic quadrilateral
 add up to 180°

50°
 (2)

- (b) Work out the size of angle ODC .
 Give reasons for your answer.

$\angle BOD = 100^\circ$
 angle at centre twice angle at circumference

$$360 - (100 + 130) = 130^\circ$$

Angles in quadrilateral = 360°

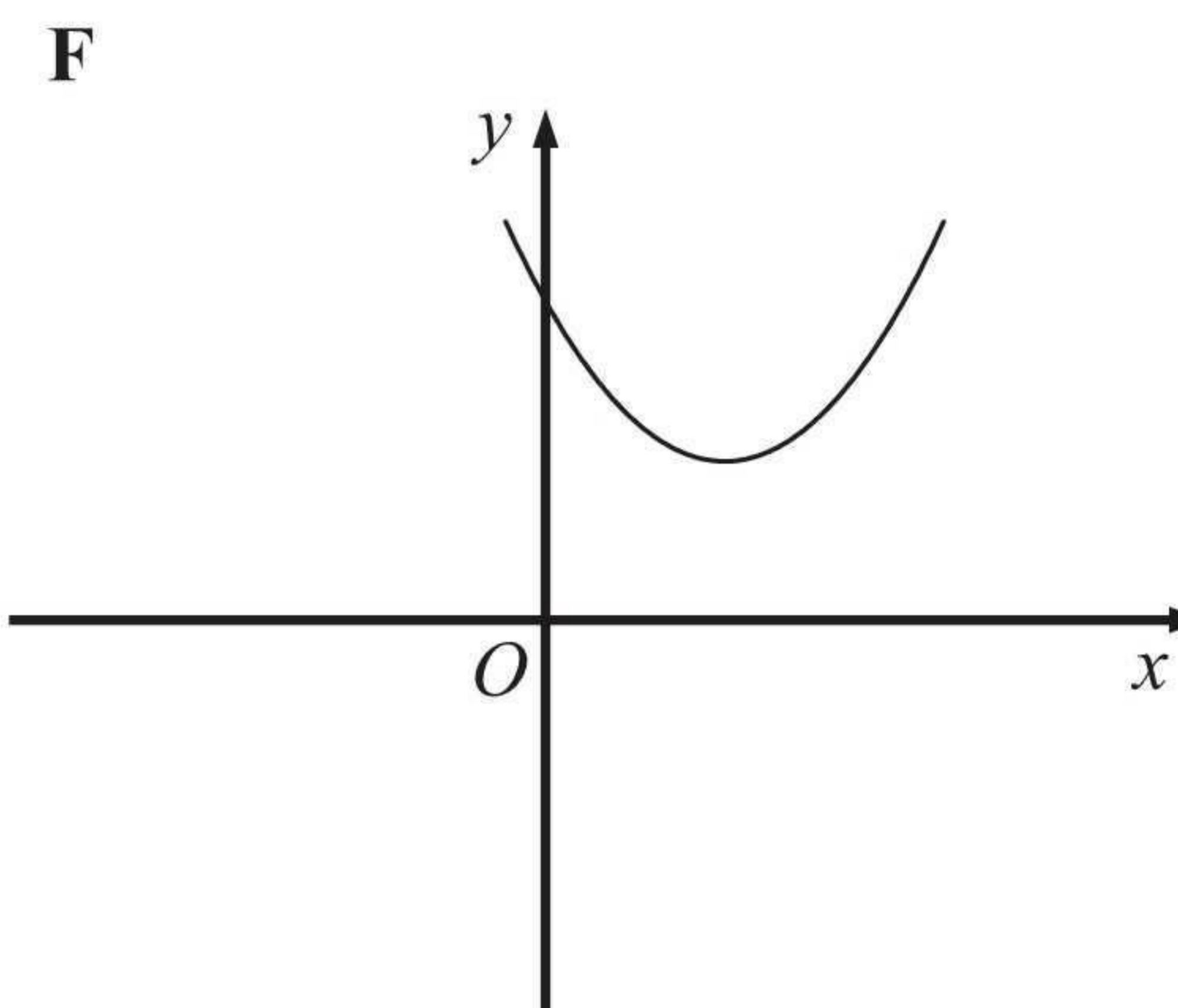
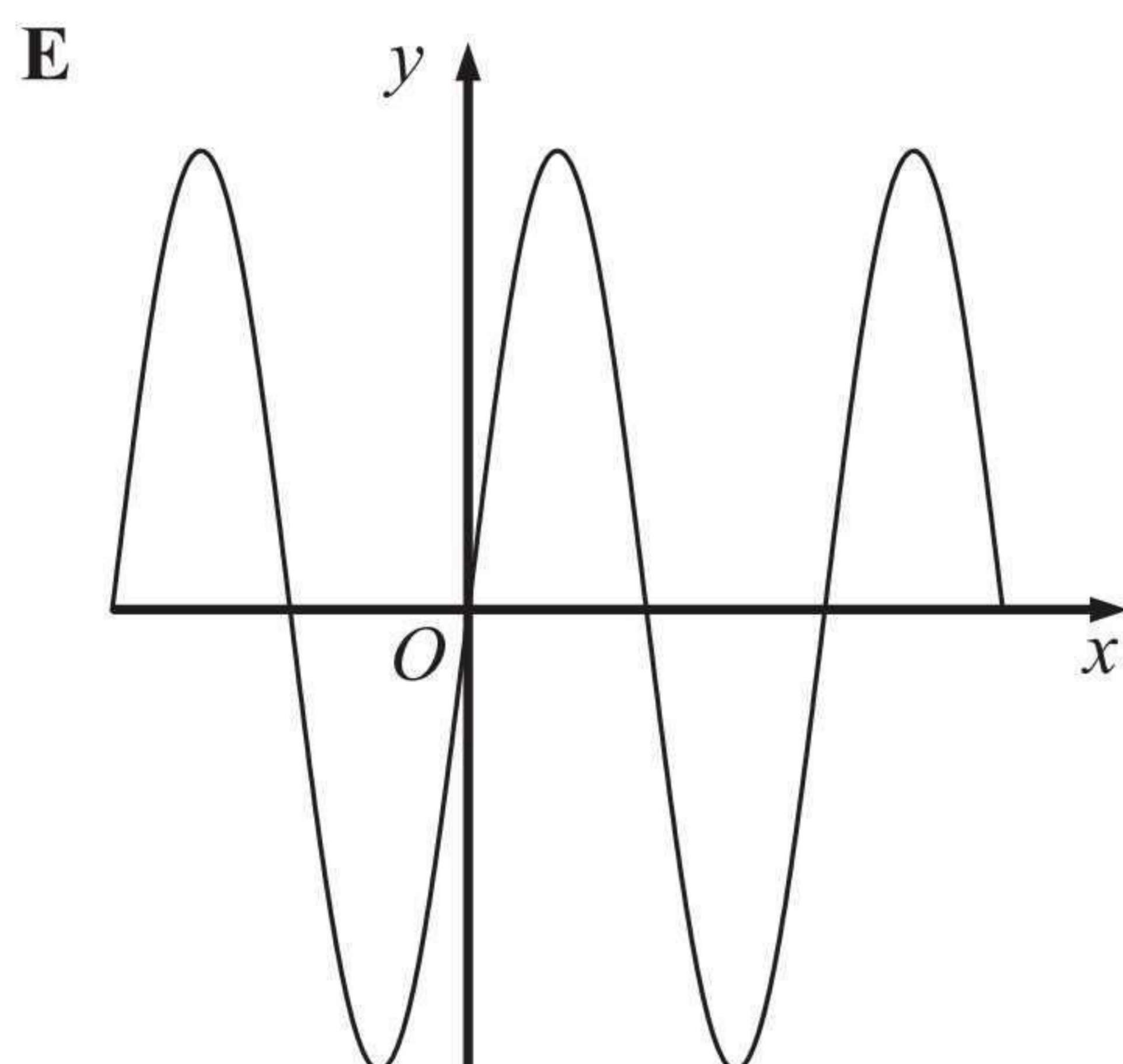
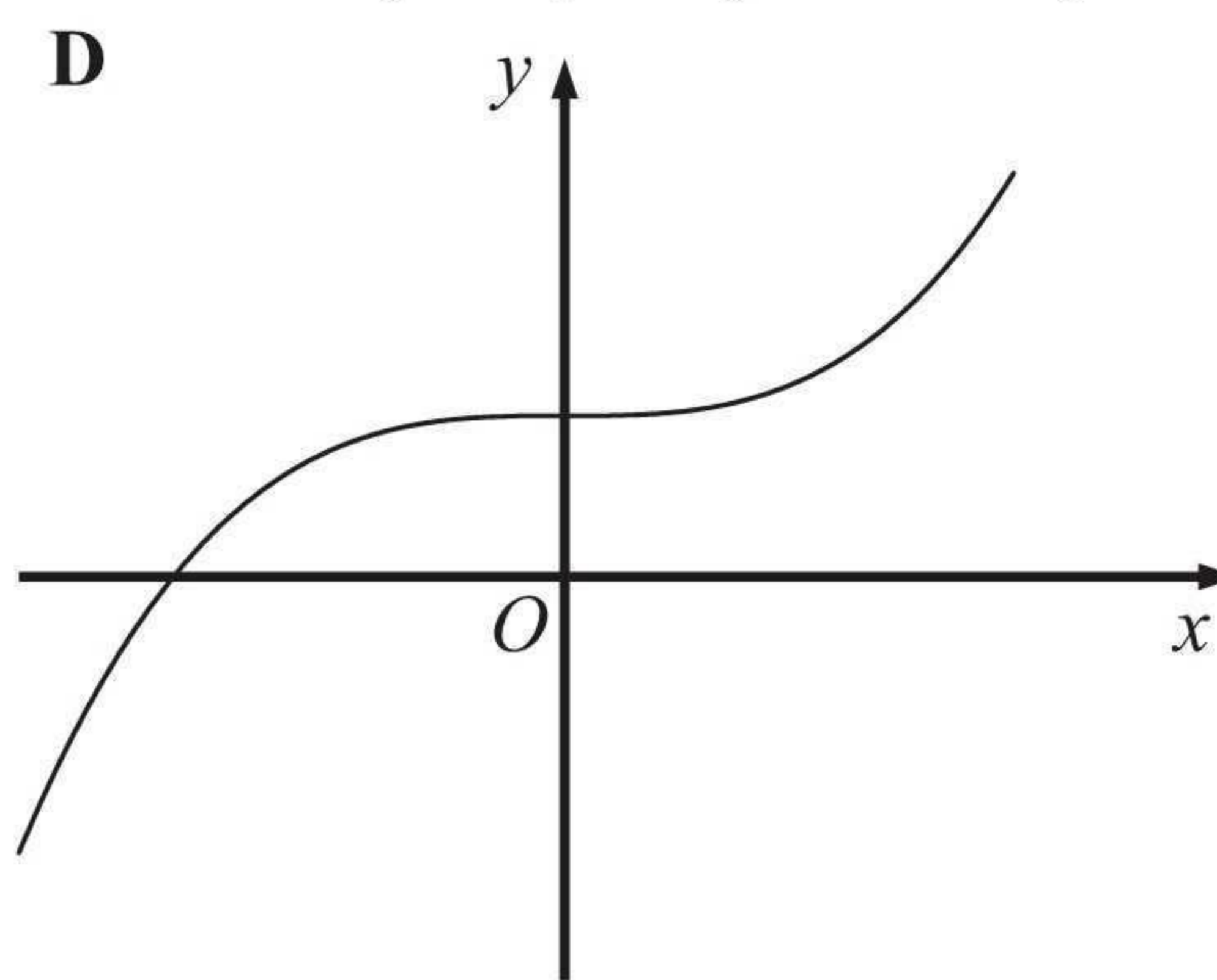
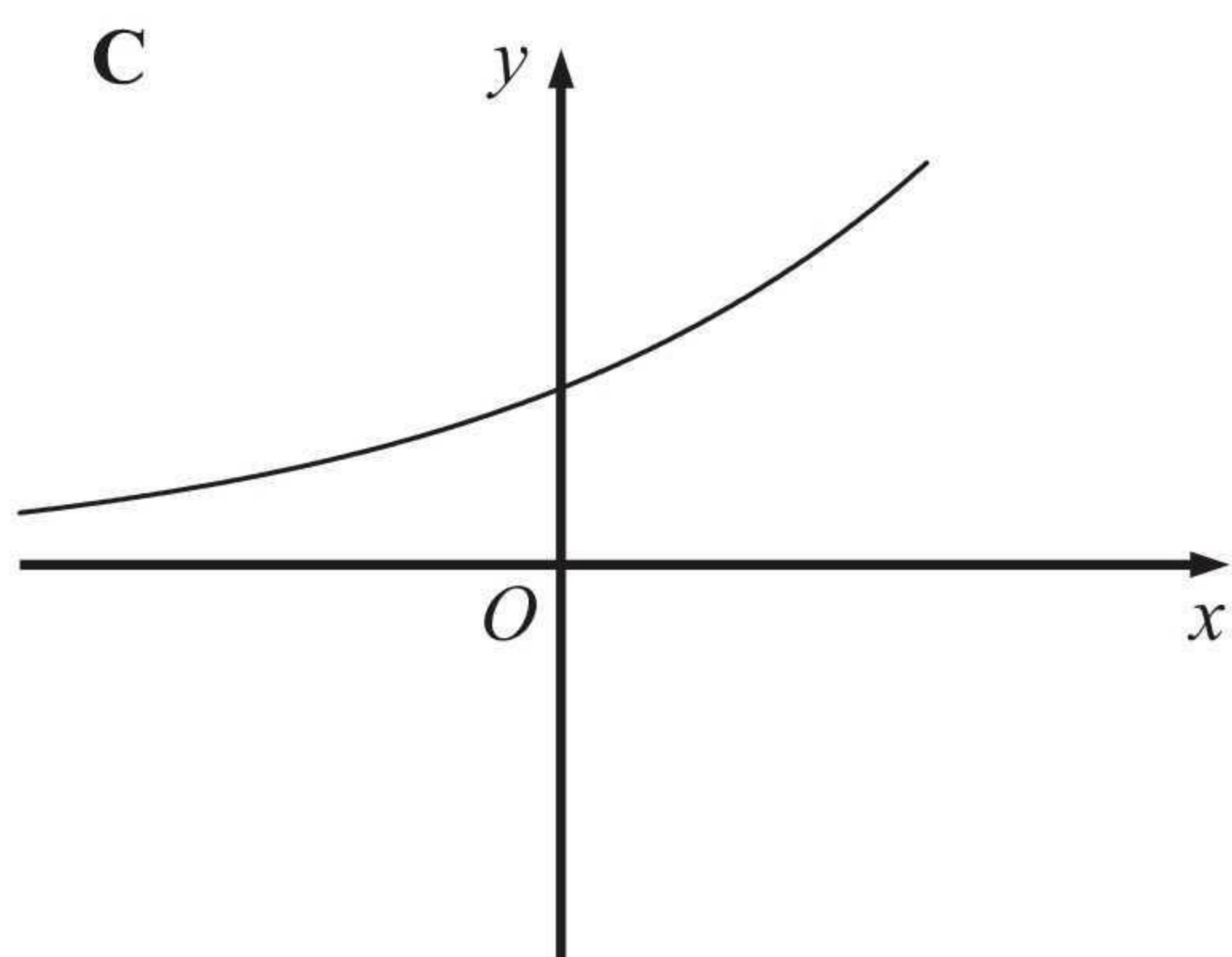
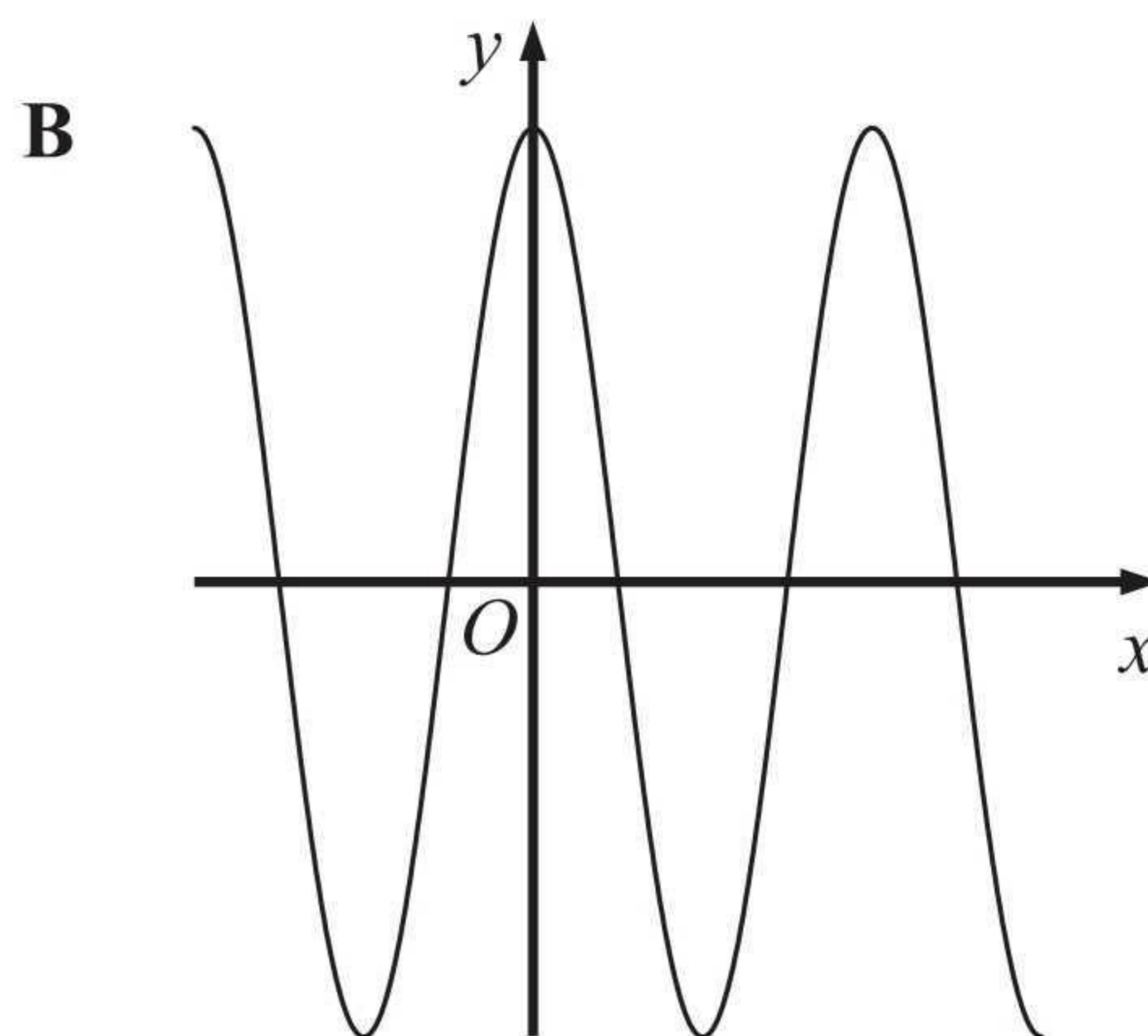
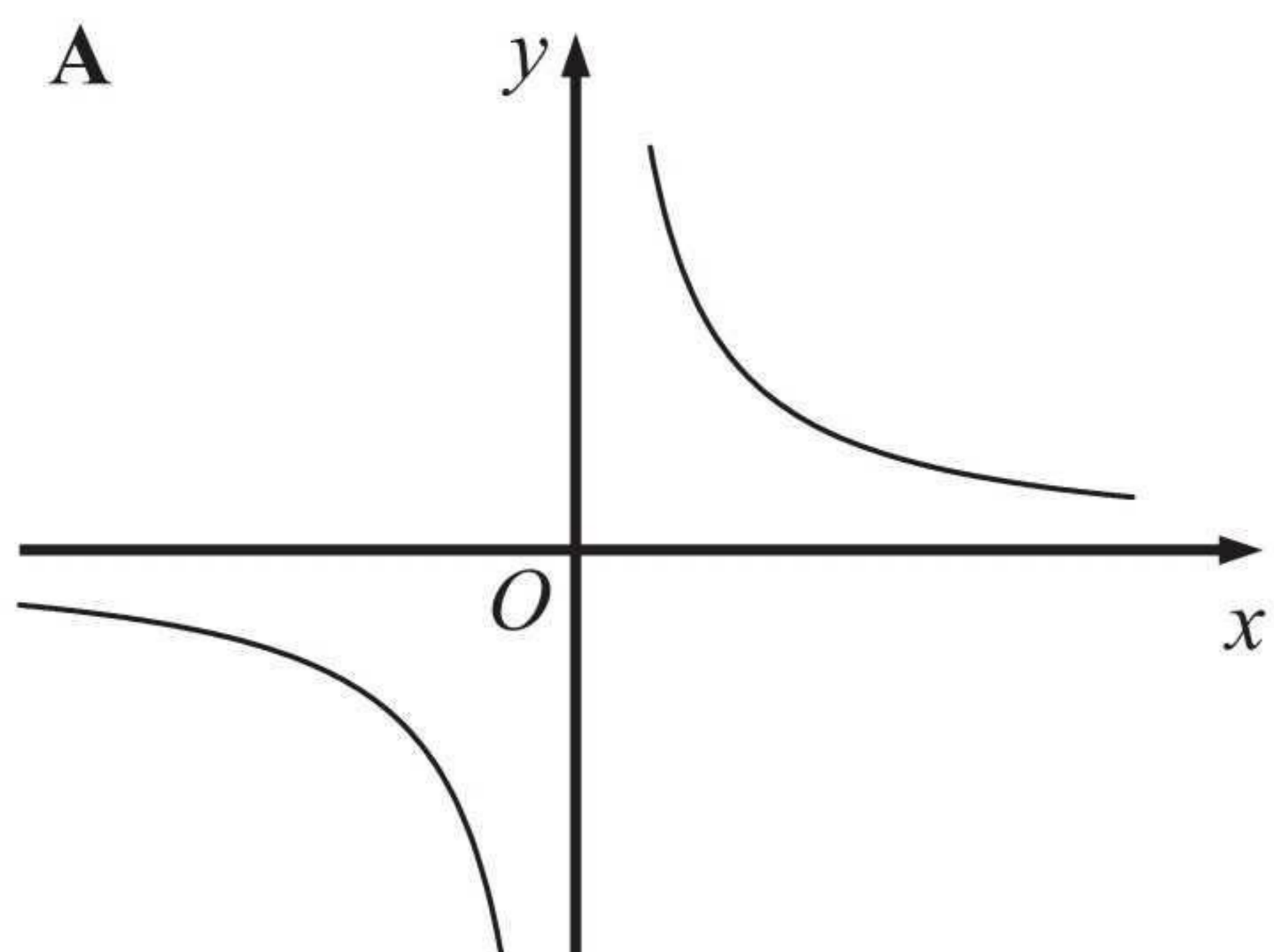
$\angle OBC = \angle ODC$ two radii are equal
 triangles are congruent (SSS)
 $130 \div 2$ 65°
 (4)

(Total 6 marks)

Q19



20.



Each equation in the table represents one of the graphs **A** to **F**.

Write the letter of each graph in the correct place in the table.

Equation	Graph
$y = 4 \sin x^\circ$	<i>E</i>
$y = 4 \cos x^\circ$	<i>B</i>
$y = x^2 - 4x + 5$	<i>F</i>
$y = 4 \times 2^x$	<i>C</i>
$y = x^3 + 4$	<i>D</i>
$y = \frac{4}{x}$	<i>A</i>

(Total 3 marks)

Q20



21. Here is a shape $ABCDE$.

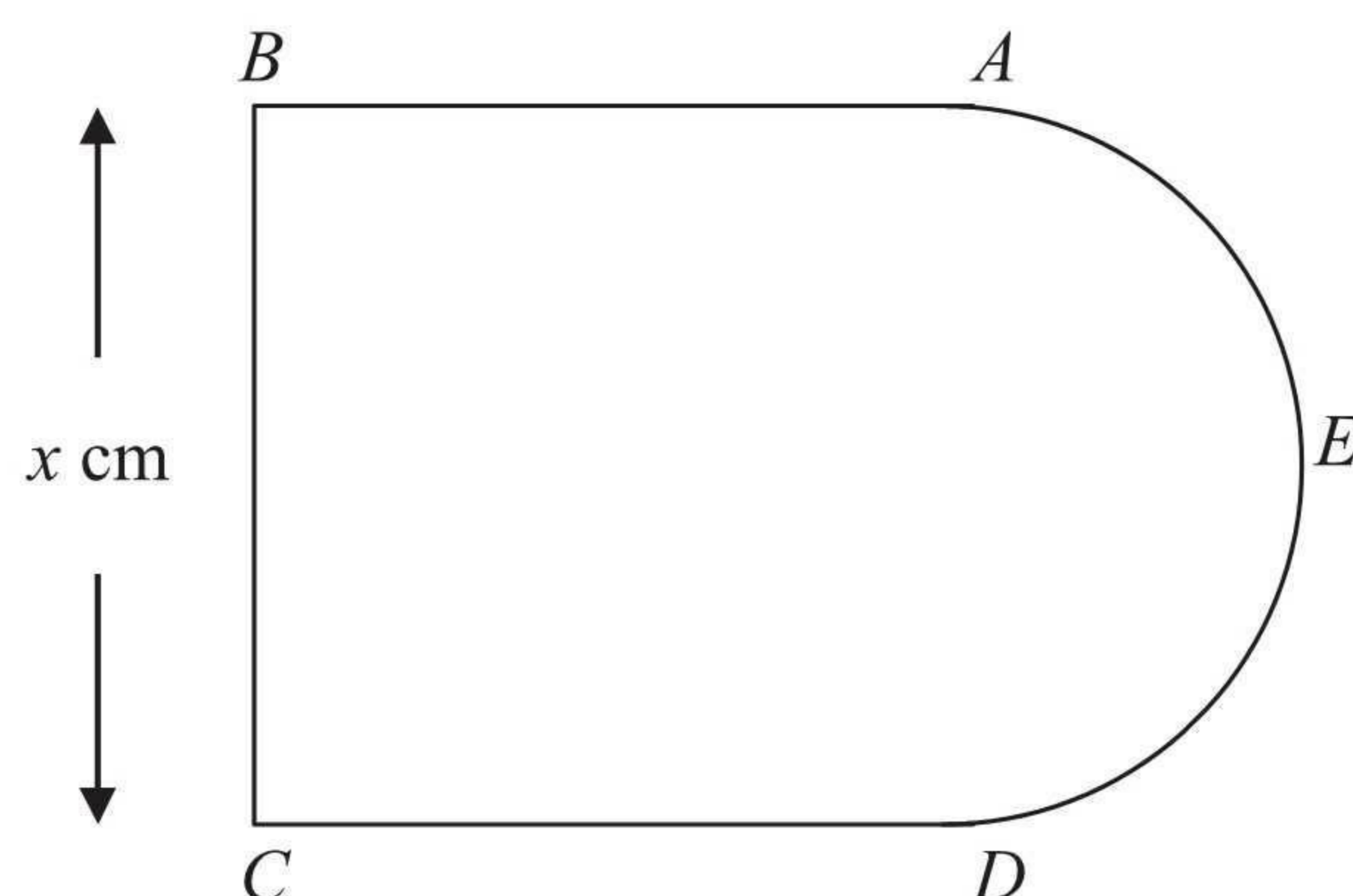


Diagram **NOT** accurately drawn

AB , BC and CD are three sides of a square.

$BC = x$ cm.

AED is a semicircle with diameter AD .

The perimeter, P cm, of the shape $ABCDE$ is given by the formula

$$P = 3x + \frac{\pi x}{2}$$

(a) Rearrange this formula to make x the subject.

$$2P = 6x + \pi x$$

$$2P = x(6 + \pi)$$

$$\frac{2P}{6 + \pi} = x$$

$$x = \frac{2P}{6 + \pi}$$

.....
(2)



The area, $A \text{ cm}^2$, of this shape is given by $A = kx^2$ where k is a constant.

- (b) Find the exact value of k .
Give your answer in its simplest form.

$$\begin{aligned} \text{Area of square} &= x^2 \\ \text{Area of semi circle} &= \frac{1}{2} \pi r^2 \\ &= \frac{1}{2} \pi \left(\frac{x}{2}\right)^2 \\ &= \frac{1}{2} \frac{x^2}{4} \pi \\ &= \frac{x^2}{8} \pi \end{aligned}$$

$$\begin{aligned} \text{Total area} &= x^2 + \frac{x^2}{8} \pi \\ &= \left(1 + \frac{1}{8} \pi\right) x^2 \end{aligned}$$

$$\frac{1 + \frac{1}{8} \pi}{\dots\dots\dots} \quad (3)$$

(Total 5 marks)

Q21

22. Expand and simplify $(2 + \sqrt{2})(3 + \sqrt{8})$

Give your answer in the form $a + b\sqrt{2}$ where a and b are integers.

$$\begin{aligned} &6 + 2\sqrt{8} + 3\sqrt{2} + \sqrt{16} \\ &6 + 2(2\sqrt{2}) + 3\sqrt{2} + 4 \\ &10 + 4\sqrt{2} + 3\sqrt{2} \end{aligned}$$

$$\begin{aligned} \sqrt{8} &= \sqrt{4\sqrt{2}} \\ &= 2\sqrt{2} \end{aligned}$$

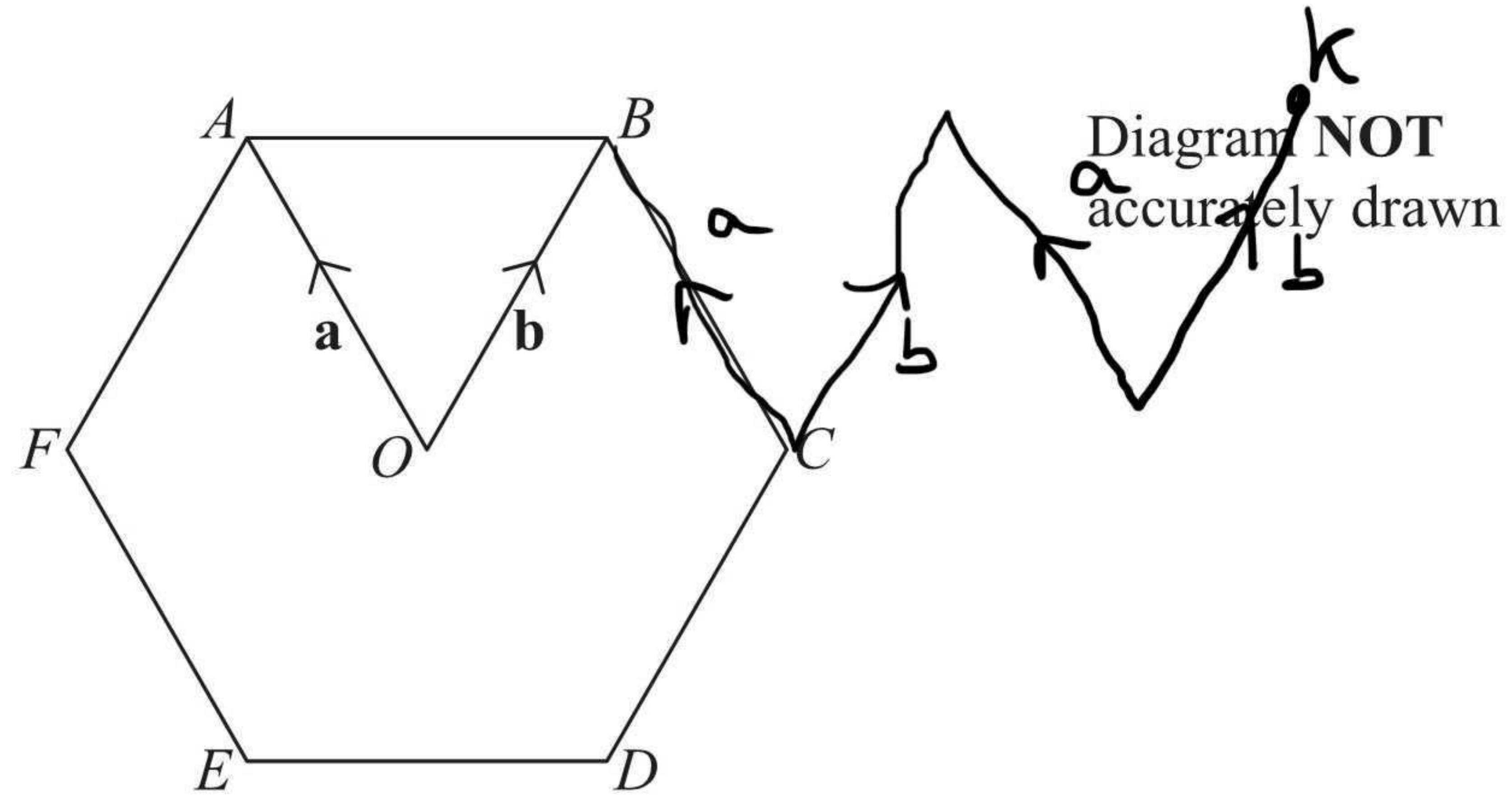
$$\frac{10 + 7\sqrt{2}}{\dots\dots\dots}$$

(Total 4 marks)

Q22



23.



$ABCDEF$ is a regular hexagon, with centre O .

$\vec{OA} = \mathbf{a}$, $\vec{OB} = \mathbf{b}$.

(a) Write the vector \vec{AB} in terms of \mathbf{a} and \mathbf{b} .

$$\underline{\underline{-a + b}} \quad (1)$$

The line AB is extended to the point K so that $AB : BK = 1 : 2$

(b) Write the vector \vec{CK} in terms of \mathbf{a} and \mathbf{b} .
Give your answer in its simplest form.

$$\begin{aligned} \vec{CK} &= b - a + b \\ &= 2b - a \end{aligned}$$

$$\underline{\underline{2b - a}} \quad (3)$$

(Total 4 marks)

Q23

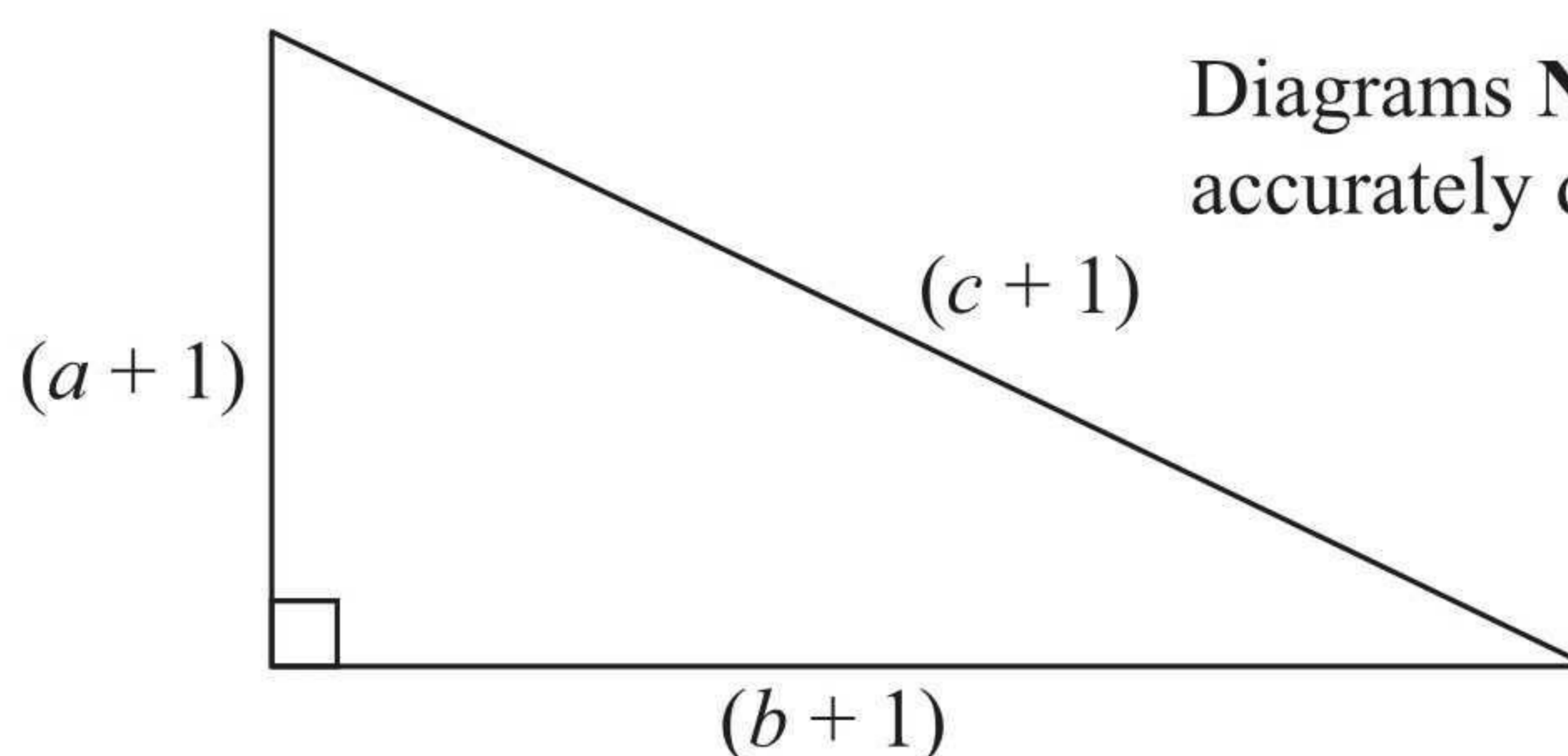
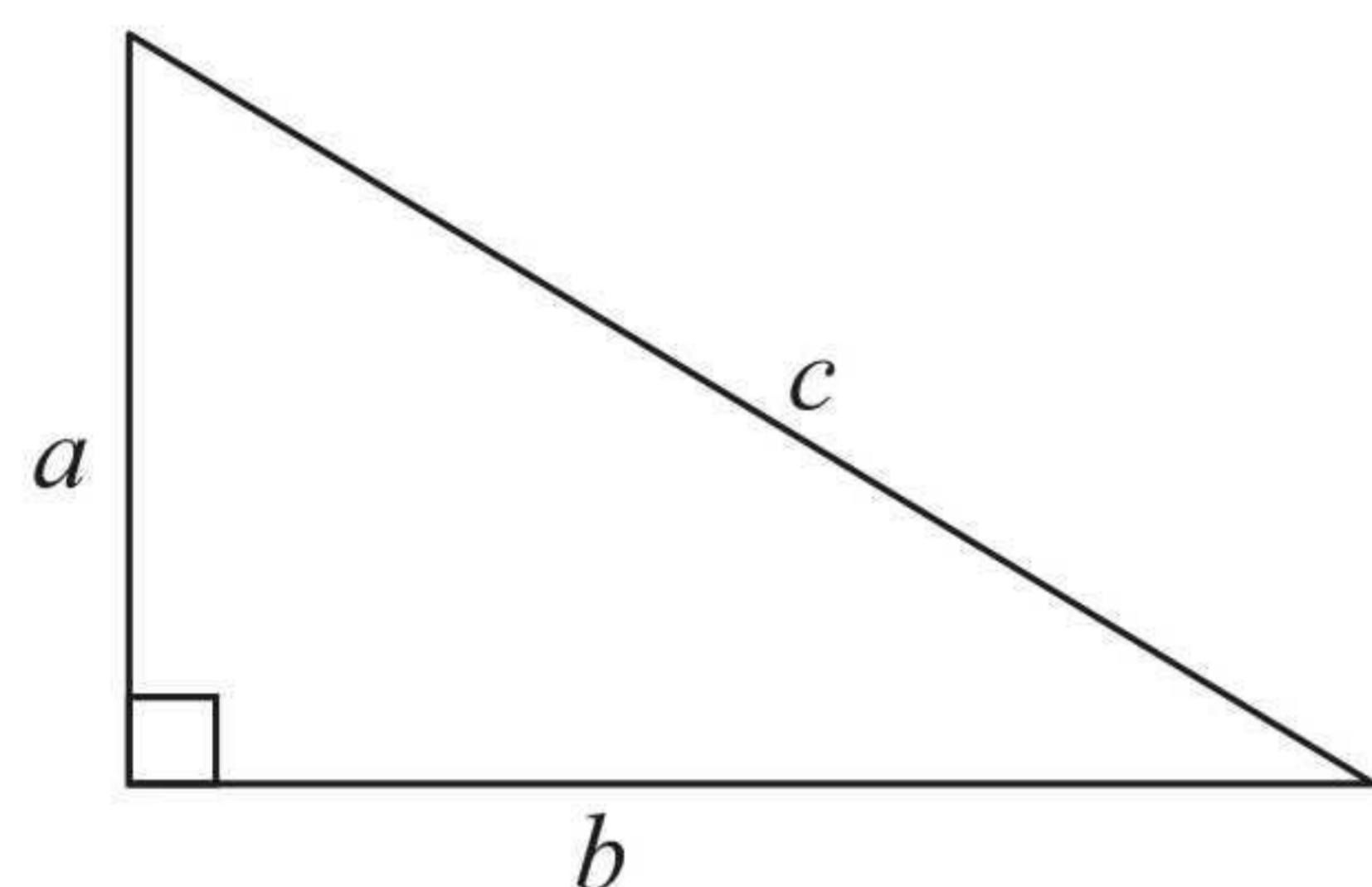


24. Umar thinks $(a+1)^2 = a^2 + 1$ for all values of a .

(a) Show that Umar is wrong.

$$\overbrace{(a+1)(a+1)} \\ a^2 + a + a + 1 = a^2 + 2a + 1 \quad (2)$$

Here are two right-angled triangles.
All the measurements are in centimetres.



Diagrams NOT accurately drawn

(b) Show that $2a + 2b + 1 = 2c$

$$\begin{aligned} a^2 + b^2 &= c^2 \\ a^2 + b^2 &= c^2 \\ &\rightarrow (a^2 + b^2) + 2a + 2b + 2 = c^2 + 2c + 1 \\ &\quad \cancel{c^2} + 2a + 2b + 2 = \cancel{c^2} + 2c + 1 \\ &\quad \underline{2a + 2b + 1 = 2c} \end{aligned} \quad (3)$$

a , b and c cannot all be integers.

(c) Explain why.

even + even = even
even + 1 = odd
if a and b are integers c cannot be because $2c$ would be odd. (1)

(Total 6 marks)

Q24

TOTAL FOR PAPER: 100 MARKS

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