

MATHEMATICS –
COMPONENT 2
CALCULATOR – ALLOWED
MATHEMATICS
HIGHER TIER

THURSDAY,
6 JUNE 2019 – MORNING

2 hours 15 minutes
(plus your additional
time allowance)

**A CALCULATOR WILL
BE REQUIRED FOR
THIS EXAMINATION**

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	4	
2.(a)	5	
2.(b)	1	
3.	3	
4.(a)	3	
4.(b)	3	
5.(a)(b)(c)	8	
5.(d)(e)	5	
6.	5	
7.	9	
8.	5	
9.	8	
10.	5	
11.	5	
12.	6	
13.	2	
14.	4	
15.(a)	2	
15.(b)	3	
16.	11	
17.	7	
18.	7	
19.	6	
20.	3	
Total	120	

Surname:	
Other Names:	
Centre Number:	
Candidate Number:	0

ADDITIONAL MATERIALS

A ruler, a protractor and a pair of compasses may be required.

ITEMS INCLUDED WITH QUESTION PAPER

A separate Formula List.

A separate Diagram Booklet.

A spare Diagram Booklet.

Model for Question 18.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball – point pen, black felt tip or your usual method.

Write your name, centre number and candidate number in the spaces on the front cover.

Answer ALL questions.

Write your answers in the spaces provided.

If you run out of space, use the continuation pages at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3.14 or use the π button on your calculator.

(Turn over)

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part – question.

You are reminded of the need for good English and orderly, clear presentation in your answers.

1. Harman has written some calculations he needs to work out for his homework.

Write down the calculation needed to work out each of the following using the fewest number of key presses.

Give your answer to each question.

(a) $13 + 13 + 13 + 13 + 13 + 13 - 17 \times 17 \times 17$

Answer: _____

continued on the next page . . .

(Turn over)

Question 1 continued

1. (b) $232 + 34\%$ of 232

Answer: _____

continued on the next page . . .

Question 1 continued

1. (c) 4530 – 18% of 4530

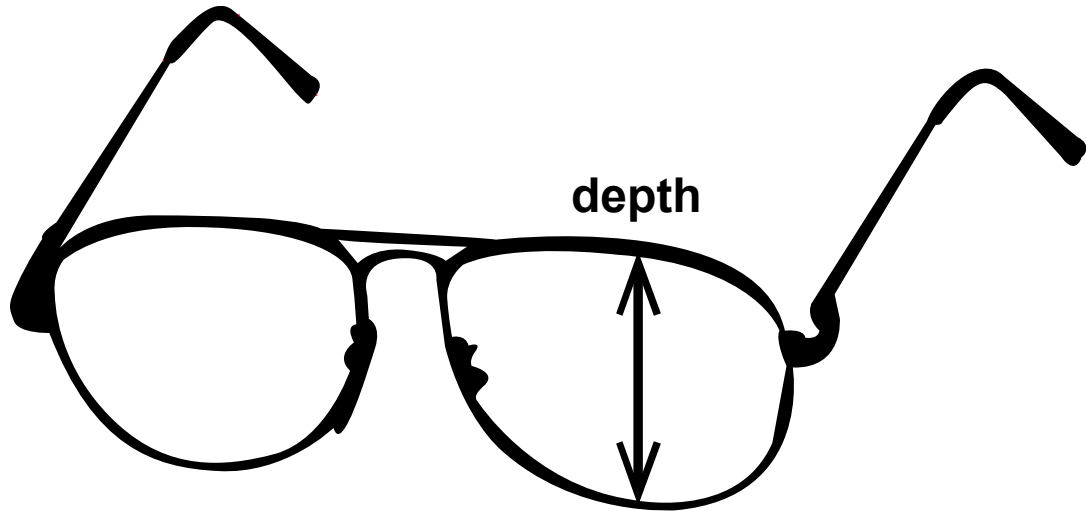
Answer: _____

[4 marks]

(Turn over)

2. Marie works for an optician.

She records the depth of a lens in each of the 100 pairs of glasses on display.



Her results are summarised in the table below.

Depth of lens, Y mm, to the nearest mm	Number of pairs of glasses
$10 \leq Y < 20$	5
$20 \leq Y < 30$	20
$30 \leq Y < 40$	23
$40 \leq Y < 50$	52

continued on the next page . . .

(Turn over)

Question 2 continued

- 2. (a) (i) Calculate an estimate for the mean depth of a lens.**

[illegible]

(Turn over)

[4 marks]

2. (a) (ii) In which group does the median lie?

[1 mark]

continued on the next page . . .

(Turn over)

Question 2 continued

2. (b) In the display of **100** pairs of glasses at **DAVY’S OPTICIANS**, the mean depth of a lens is exactly the same as Marie’s opticians.

Marie says,

“Considering only the mean depth of a lens, our display is CERTAIN to be very similar to the display in Davy’s Opticians.”

Explain why Marie is incorrect.

(Turn over)

[1 mark]

3. Look at the diagram for Question 3 in the separate Diagram Booklet.
The diagram is NOT drawn to scale.

The diagram shows triangle *EFG*.

In the triangle,

$$FG = 12.3 \text{ cm}$$

$$EG = 8.4 \text{ cm}$$

Angle *FEG* is a right angle.

Calculate the size of angle *f*.

[3 marks]

(Turn over)

4. (a) A motorcycle depreciates by 16% per annum.

MOTORCYCLE NOW WORTH £2500

After how many whole years will this motorcycle be worth less than £1000?

You must show all your working.

Motorcycle will be worth less than £1000 after

_____ whole years.

[3 marks]
(Turn over)

Question 4 continued

4. (b) Rachela takes out a loan for £500

from an online loan company.

The interest rate is 325% per annum.

**Rachela is thinking she would pay off
the loan and interest in full after 3 years.**

A friend correctly says,

**“That is a very high rate of interest.
You will owe over £30 000.”**

**Calculate the total amount Rachela would
have to pay back after 3 years.**

(Turn over)

15

[3 marks]

(Turn over)

5. (a) Expand and simplify $(x + 6y)(3x + 5y)$

[3 marks]

(b) Factorise $x^2 - 13x + 36$

[2 marks]

continued on the next page . . .

(Turn over)

Question 5 continued

5. (c) Solve $w^2 + 7w - 18 = 0$

[3 marks]

(d) Factorise $y^2 - 121$

[1 mark]

(Turn over)

Question 5 continued

5. (e) You are given that:

- $y = x^2 + cx + d$
- $y = 16$ when $x = 0$
- $y = 0$ when $x = -2$

Find the values of c and d .

[4 marks]

(Turn over)

[5 marks]

7. (a) The volume of a sphere with a radius of 2.7 cm is equal to the volume of a cuboid.

The base of the cuboid has an area of 14.2 cm^2

Calculate the height of the cuboid.

[4 marks]

7. (b) A piece of paper is in the shape of a circle.
The circumference of the circle is 86 cm.

The paper is cut into 2 semi – circles.

Calculate the PERIMETER of one of the
semi – circles.

Give your answer correct to the

nearest $\frac{1}{10}$ cm.

(Turn over)

[5 marks]

(Turn over)

8. **7** cartons of apple juice and
2 cartons of grapefruit juice
cost **£6.15** altogether.

5 cartons of apple juice and
8 cartons of grapefruit juice
cost **£9.19** altogether.

Use an algebraic method to calculate the
TOTAL cost of **2** cartons of apple juice and
5 cartons of grapefruit juice.

TOTAL cost of 2 cartons of apple juice and 5 cartons of grapefruit juice is £ _____

[5 marks]

(Turn over)

9. In scientific reports, temperatures are often given using more than one temperature scale.

Celsius, Fahrenheit and kelvin are all measured on linear scales.

Use the information given below to complete the tables.

(a)

Degrees Celsius	Degrees Fahrenheit
30	
40	104
50	122
60	

[1 mark]

(Turn over)

Question 9 continued**9. (b)**

Kelvin	Degrees Celsius
0	
100	
200	
300	26.85
400	126.85

[2 marks]**continued on the next page . . .****(Turn over)**

Question 9 continued**9. (c)**

Kelvin	Degrees Celsius	Degrees Fahrenheit
320		

[5 marks]**(Turn over)**

- 10. You are given that y is inversely proportional to x , and that $y = 124.5$ when $x = 18$**

(a) Find a formula for y in terms of X .

[illegible]

[3 marks]

(Turn over)

Question 10 continued

- 10. (b) Use the formula you found in (a) to complete the following table.**

x	y
$\frac{1}{2}$	
18	124.5
	90

[2 marks]

(Turn over)

11. You are given the following:

1 kg $\approx$ 2.2 pounds
1 pound = 16 ounces

In Keto's restaurant, steak is on the menu.

Order any steak for £11 per 100 g

How much would it cost to order an 8 – ounce steak in Keto's restaurant?

You must show all your working.

(Turn over)

(Turn over)

12. Ben draws an irregular pentagon.
The interior angles of the pentagon are
all less than 180°

Ben attempts to express the interior angles of
his pentagon using algebra.

His expressions are

$$x^\circ$$

$$(x + 40)^\circ$$

$$(2x - 30)^\circ$$

$$3(x - 40)^\circ \text{ and}$$

$$3x^\circ$$

Show that Ben is incorrect.

(Turn over)

Ben is incorrect because _____

--	--	--

[6 marks]

(Turn over)

13. Find the n th term of the following sequence.

$-7, -4, 1, 8, 17, \dots$

[2 marks]

(Turn over)

- 14. Look at the diagram for Question 14 in the separate Diagram Booklet.**

The diagram is a graph.

The graph shows the water level in a container from 13:00 to 14:00

- (a) Calculate the rate of the increase in the depth of water in the container.**

Give your answer in cm/min.

Rate of increase _____ cm/min

[2 marks]

continued on the next page . . .

(Turn over)

Question 14 continued

- 14. (b) (i) If the depth of water in the container continues to rise at the same rate, what would be the height of the water in the container at 15:20?**

[1 mark]

- (ii) Why may it not be sensible to state the height of the water in the container at 17:00?**

[1 mark]

(Turn over)

15. (a) The density of glass in a bottle is
 2.4 g/cm^3

The volume of glass used to make the
bottle is 13.4 cm^3

Calculate the mass of the glass bottle.
Give your answer in grams.

(Turn over)

Mass _____ grams

[2 marks]

15. (b) A force of 135 N is applied to an area of 3600 cm²

Calculate the pressure.

Give your answer in N/m²

(Turn over)

Pressure _____ N/m^2

[3 marks]

(Turn over)

16. Look at the diagram for Question 16 in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

The diagram shows a plan view of a stage, *ABCD*.

ABC is a sector of a circle, with centre *C*.

$$AC = 3.6 \text{ m}$$

$$DC = 4.1 \text{ m}$$

$$AC = BC$$

$$\text{Angle } DCA = 67^\circ$$

$$\text{Angle } ACB = 42^\circ$$

- (a) The band FREDALIVE need a stage area of at least 11.5 m^2 to set up equipment and perform.

Is this stage suitable for FREDALIVE to set up equipment and perform?

You must show all your working.

Conclusion

The stage is suitable:

Yes	☐	No	☐
-----	--------------------------	----	--------------------------

[5 marks]

(Turn over)

Question 16 continued

- 16. (b) FREDALIVE want to place a banner around the perimeter of the stage.**

**Will a banner of length 14 m fit around this stage without leaving a gap?
You must show all your working.**

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1																					
2																					
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31																					
32																					
33																					

(Turn over)

Conclusion

The banner will fit without leaving a gap:

Yes	☐	No	☐
-----	--------------------------	----	--------------------------

[6 marks]

17. (a) Look at the diagram for Question 17 (a) in the separate Diagram Booklet.

The diagram shows a sketch of $y = f(x)$

On the same diagram, sketch the curve $y = -f(x)$

Mark clearly the coordinates of any point where this curve crosses an axis.

[2 marks]

- (b) Look at the diagram for Question 17 (b) in the separate Diagram Booklet.

The diagram shows a sketch of $y = g(x + 2)$

On the same diagram, sketch the curve $y = g(x - 1)$

Mark clearly the coordinates of the points where this curve crosses the X – axis.

[3 marks]

continued on the next page . . .

(Turn over)

Question 17 continued

- 17. (c) Look at the diagram for Question 17 (c) in the separate Diagram Booklet.**

The diagram shows a triangle on a grid.

Enlarge the triangle, shown on the grid,

by a scale factor of $-\frac{1}{2}$ with $(2, -2)$

as the centre of the enlargement.

[2 marks]

18. Ask for the model for Question 18.

The model is NOT made to scale.

The model is a cone.

**Look at the diagram for Question 18
in the separate Diagram Booklet.**

**The diagram represents a simplified
2D diagram of the cone.**

**The cone has a radius X cm, a
perpendicular height $(X + 2)$ cm and a
slant height 16.4 cm.**

Show that X satisfies the equation

**$x^2 + 2x - 132.48 = 0$ and calculate the
volume of the cone.**

You must show all your working.

(Turn over)

[7 marks]

(Turn over)

19. The driving theory test consists of 50 questions.

At least 43 of these questions must be answered correctly to pass the test.

For each question in the test, four possible answers are given. Only one of these answers is correct.

Waldo takes the test.

Waldo knows 78% of the facts assessed in the test.

For each question based on these facts he selects the correct answer.

On all other questions he randomly selects one of the four possible answers.

(a) A question is selected at random from the paper.

Calculate the probability that Waldo correctly answers the question.

(Turn over)

Question 19 continued

19. (b) Is Waldo likely to pass his driving theory test?

Yes ☐ **No** ☐

You must show all your working to support your answer.

[2 marks]

(Turn over)

20. (a) Look at the diagram for Question 20 (a) in the separate Diagram Booklet.

The diagram shows a set of axes.

Using the axes,

sketch a graph of $y = \sin x$

for values of x from 0° to 360°

[1 mark]

- (b) Find all the solutions of the following equation in the range 0° to 360°

$$5 \sin x = 2$$

(Turn over)

[2 marks]

END OF PAPER
TOTAL 120 MARKS

(Turn over)

Question number	Additional Pages, if required. Write the question number(s) in the left - hand margin.

(Turn over)

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CALCULATOR – ALLOWED MATHEMATICS
HIGHER TIER

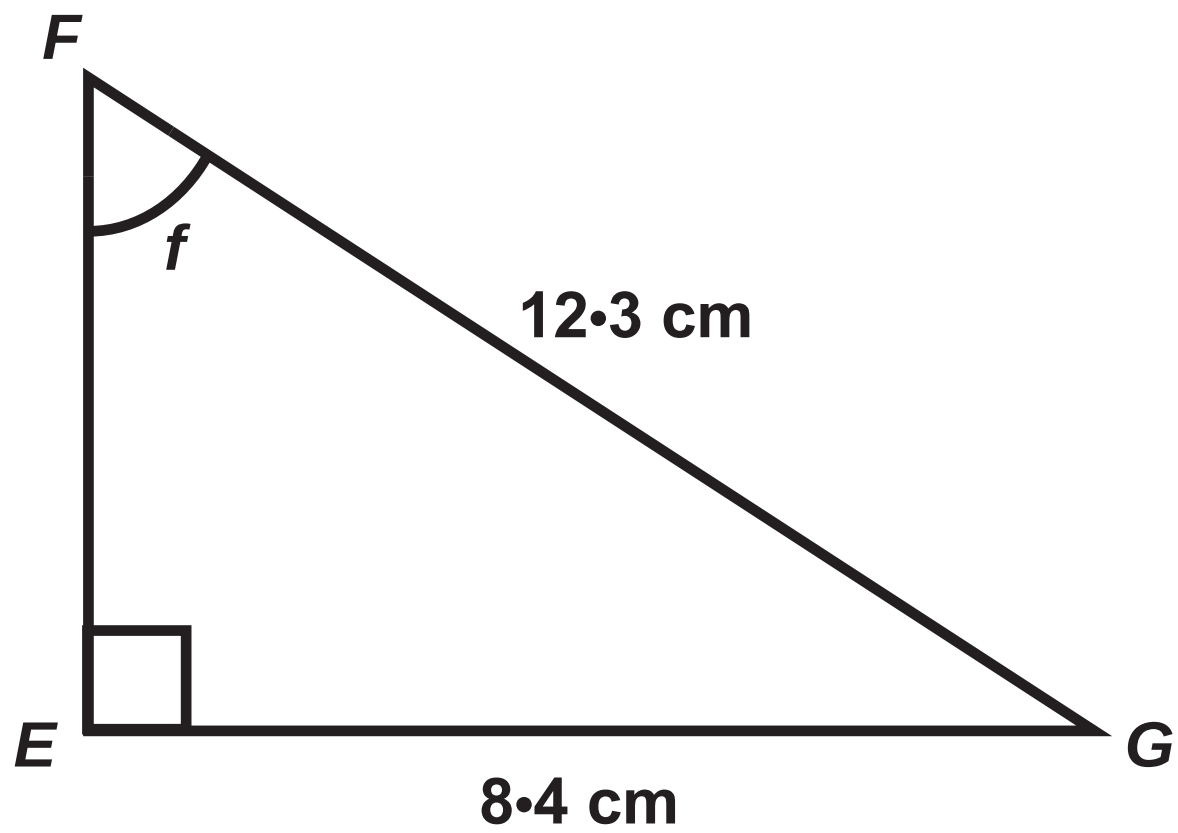
THURSDAY, 6 JUNE 2019 – MORNING

Diagram Booklet

Surname:	
Other Names:	
Centre Number:	
Candidate Number:	0

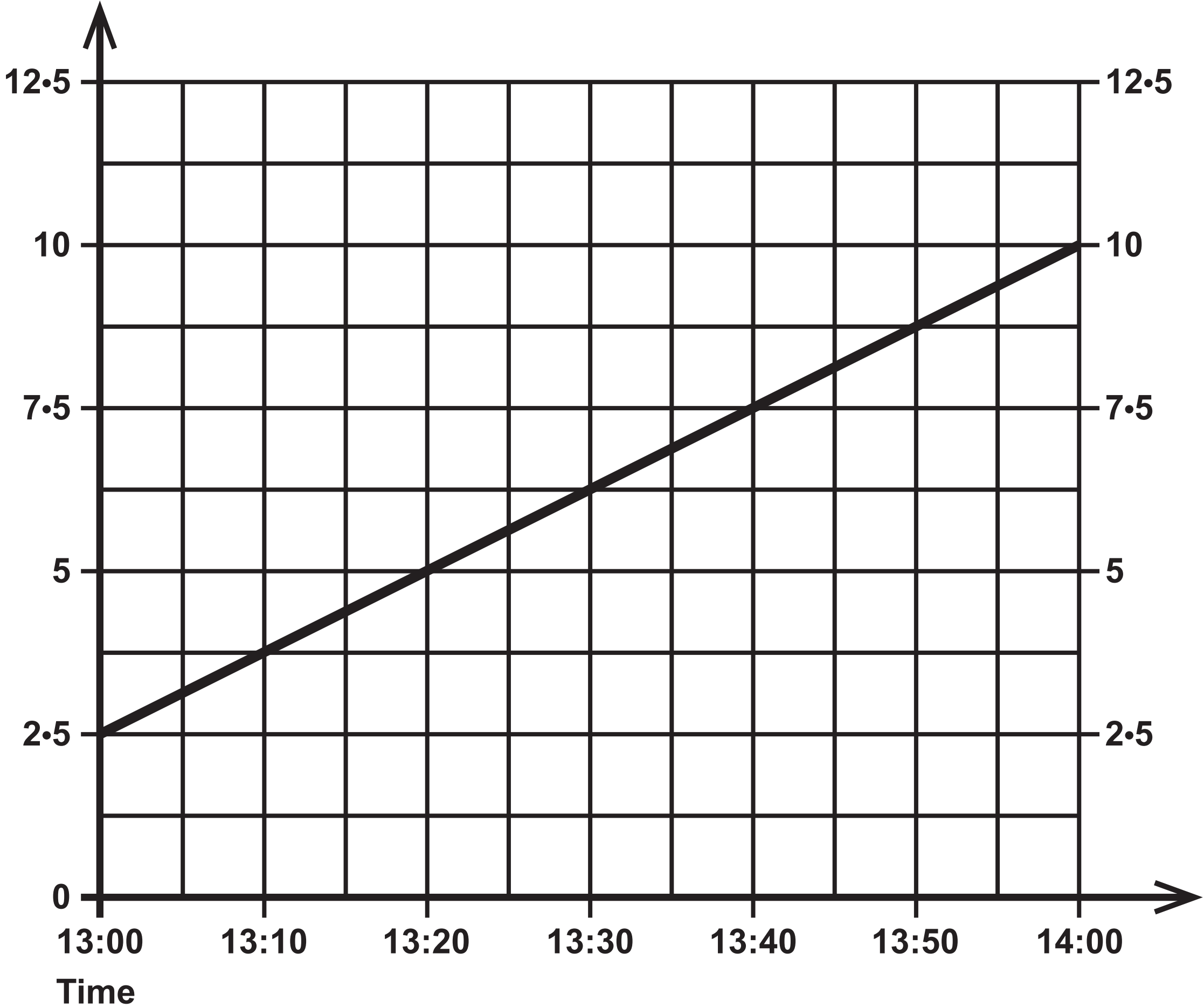
Question 3

Diagram NOT drawn to scale



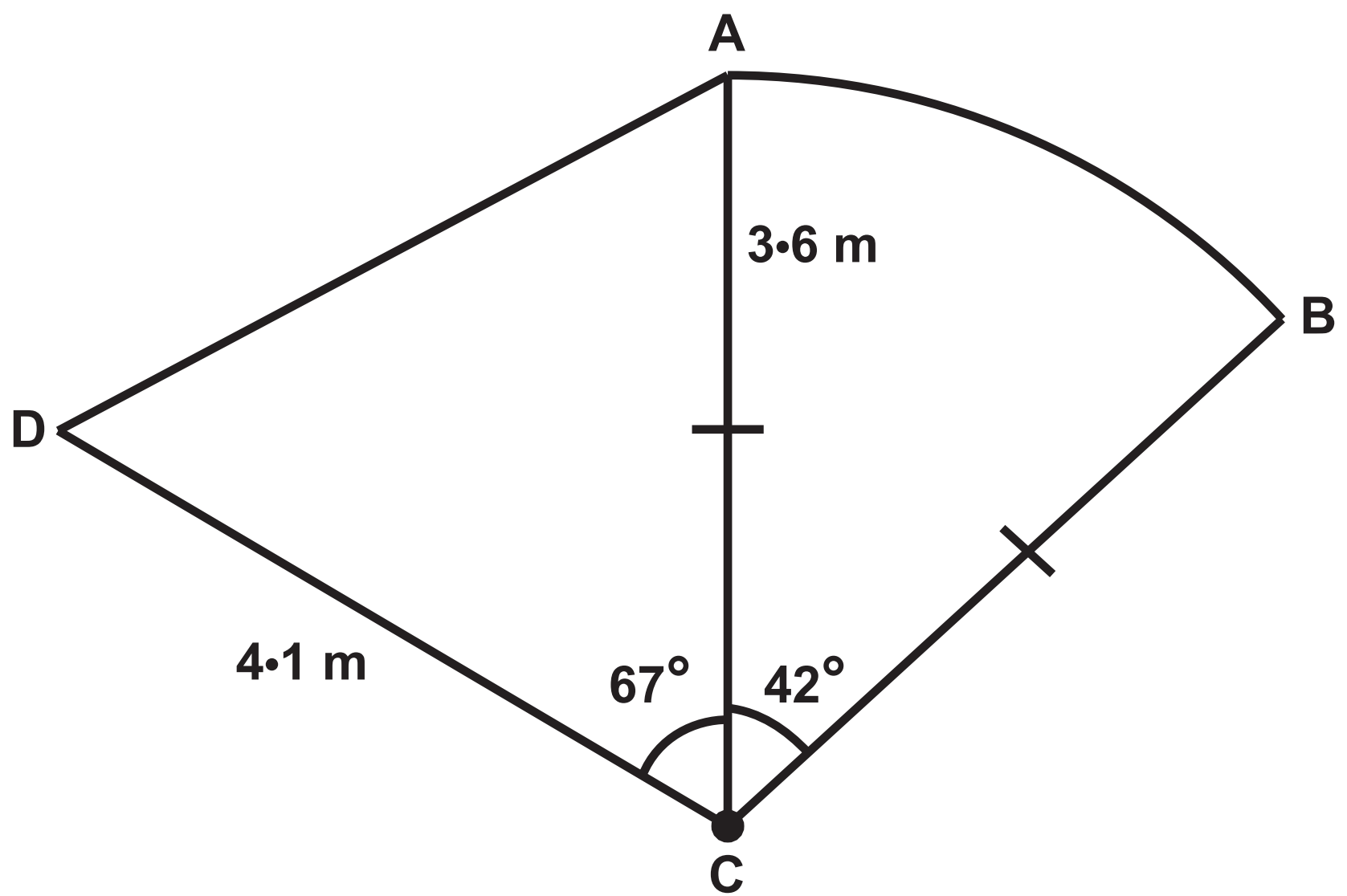
Question 14

Depth of water (cm)

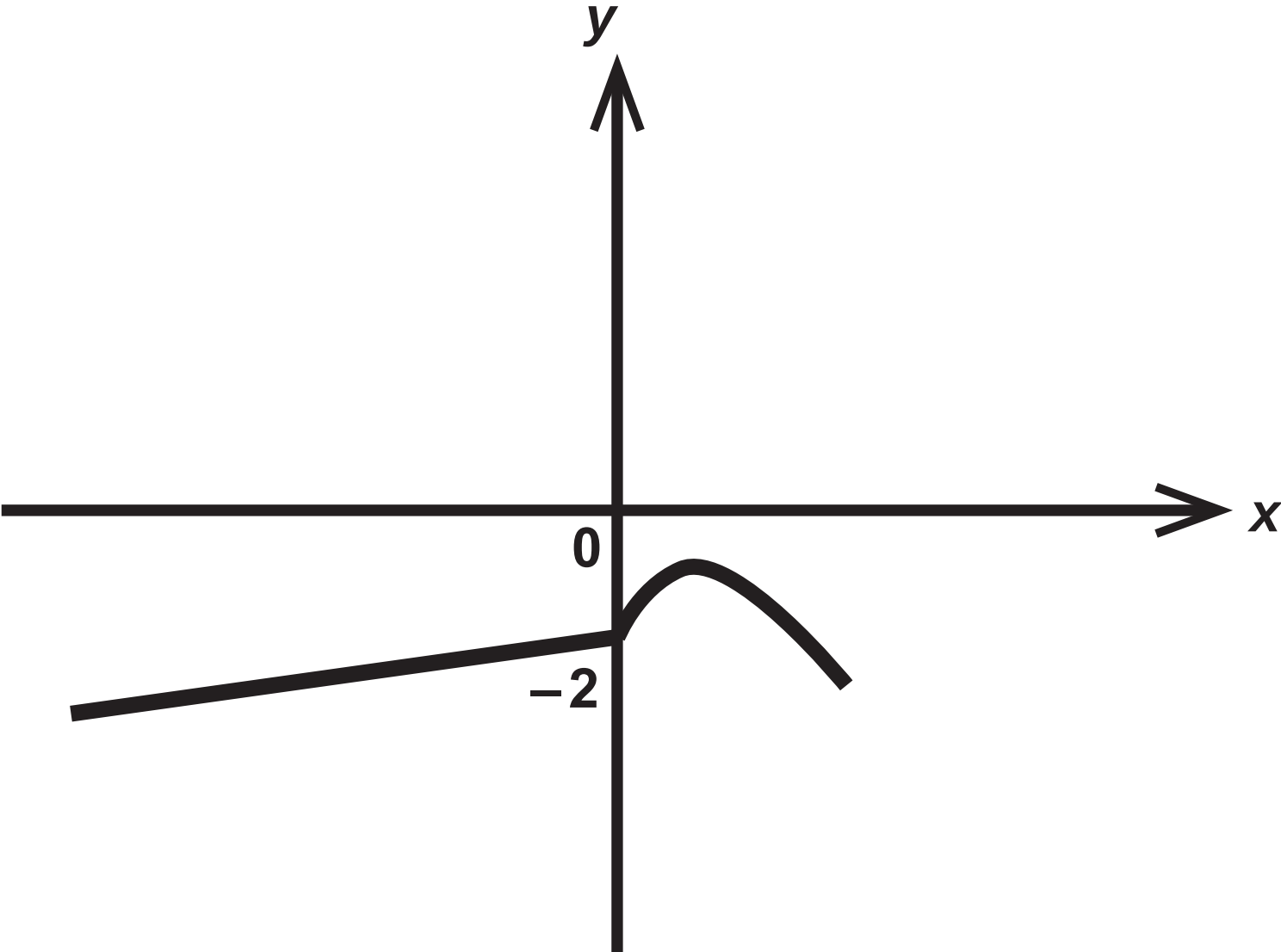


Question 16

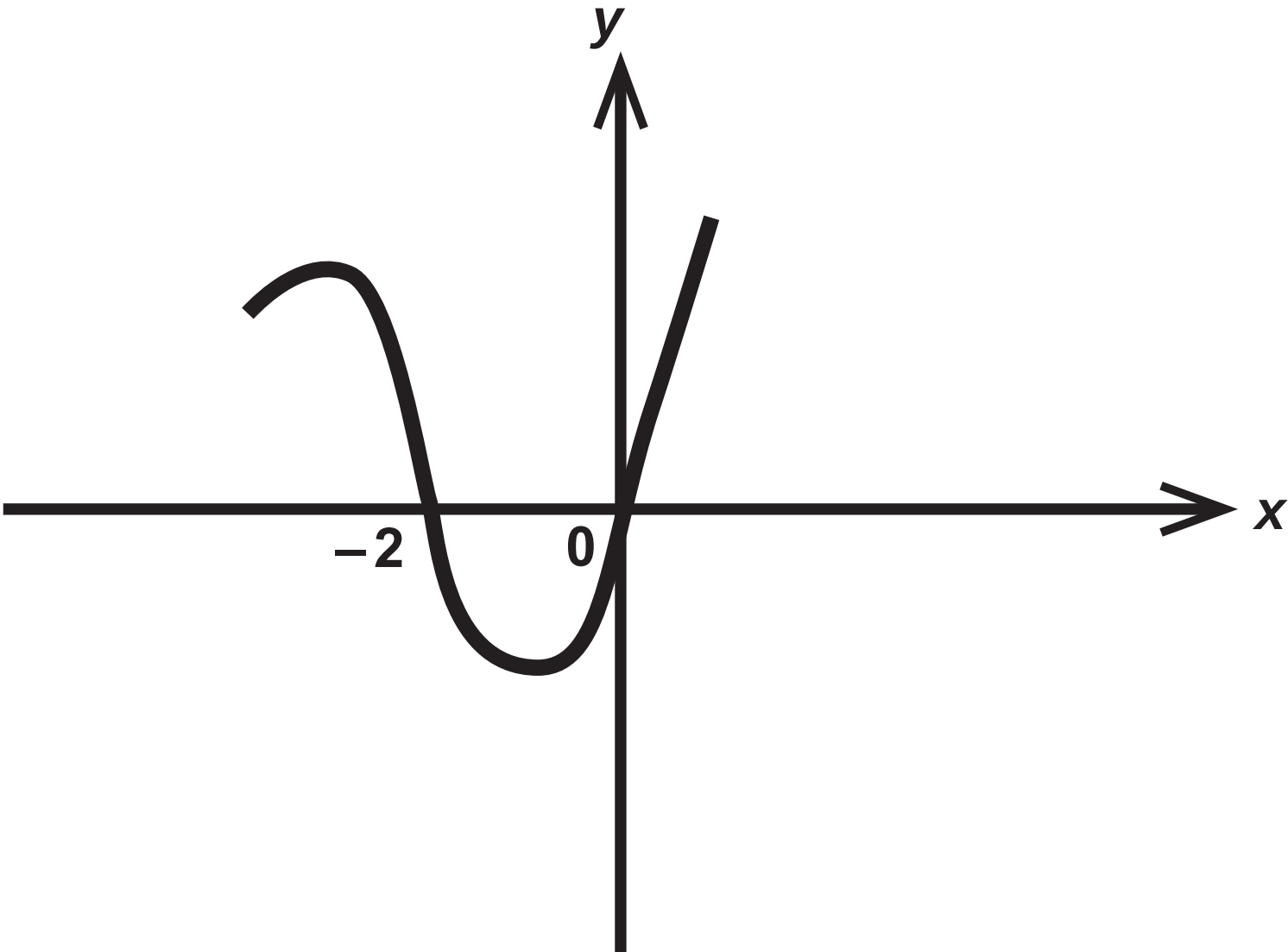
Diagram NOT drawn to scale



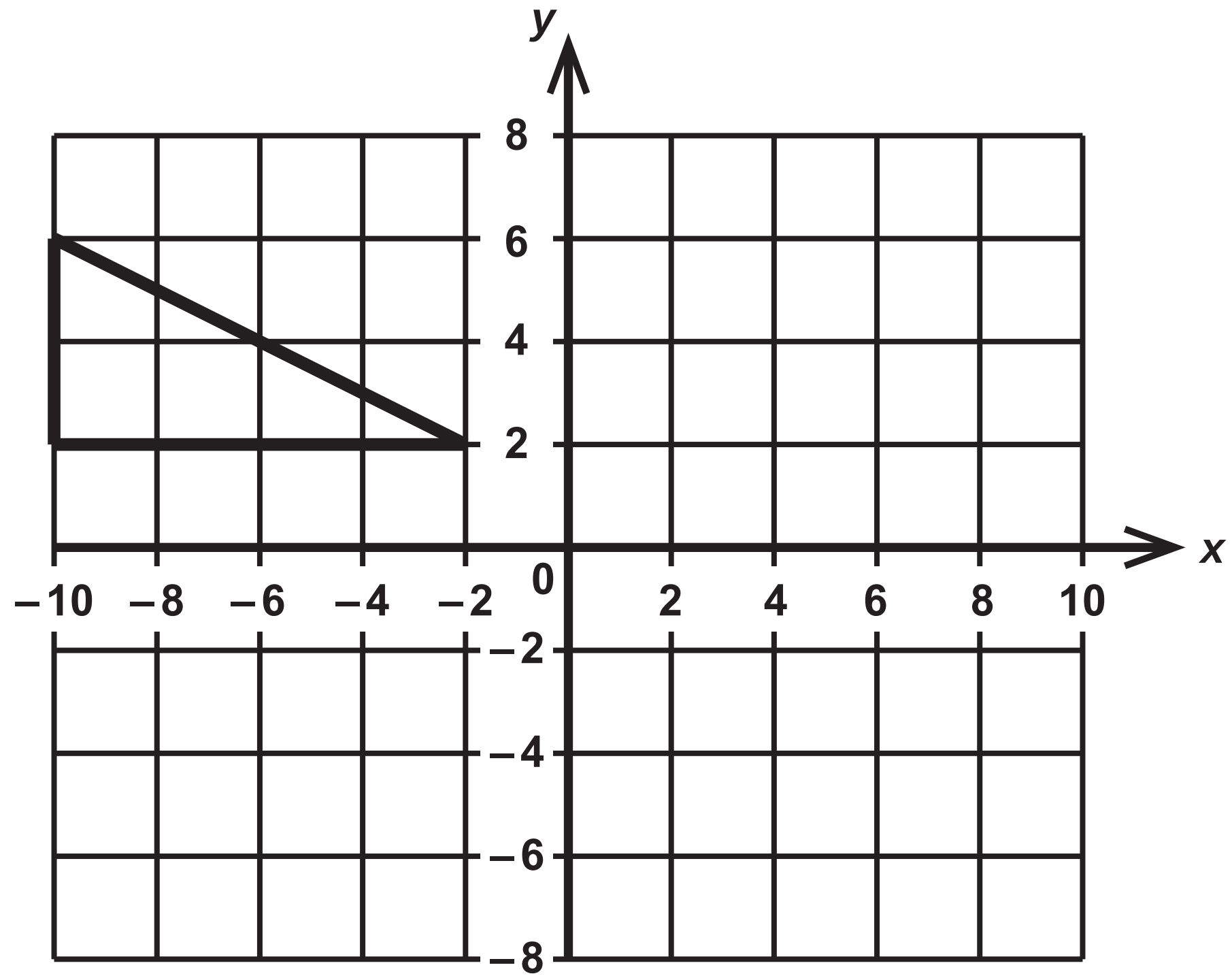
Question 17 (a)



Question 17 (b)



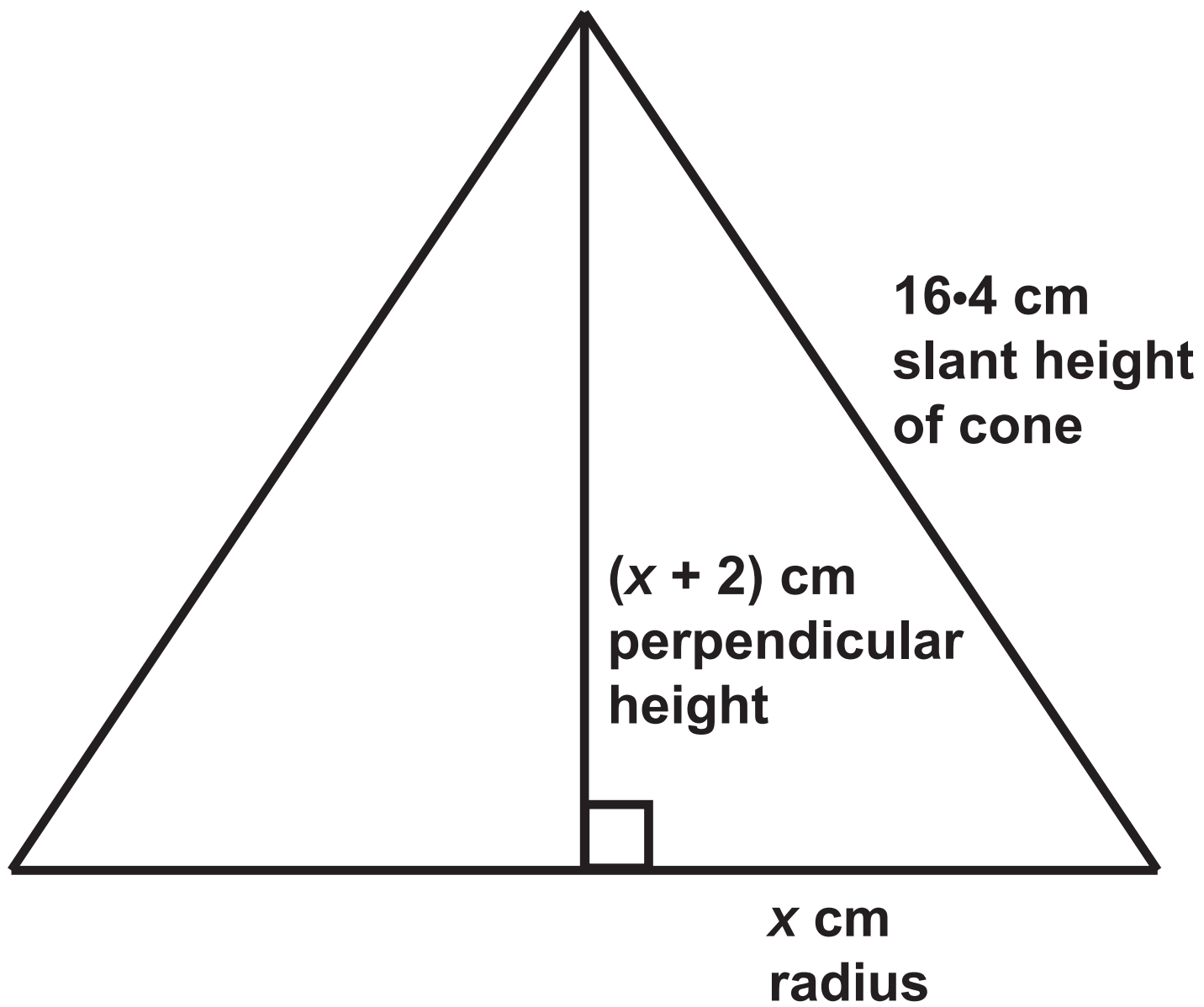
Question 17 (c)



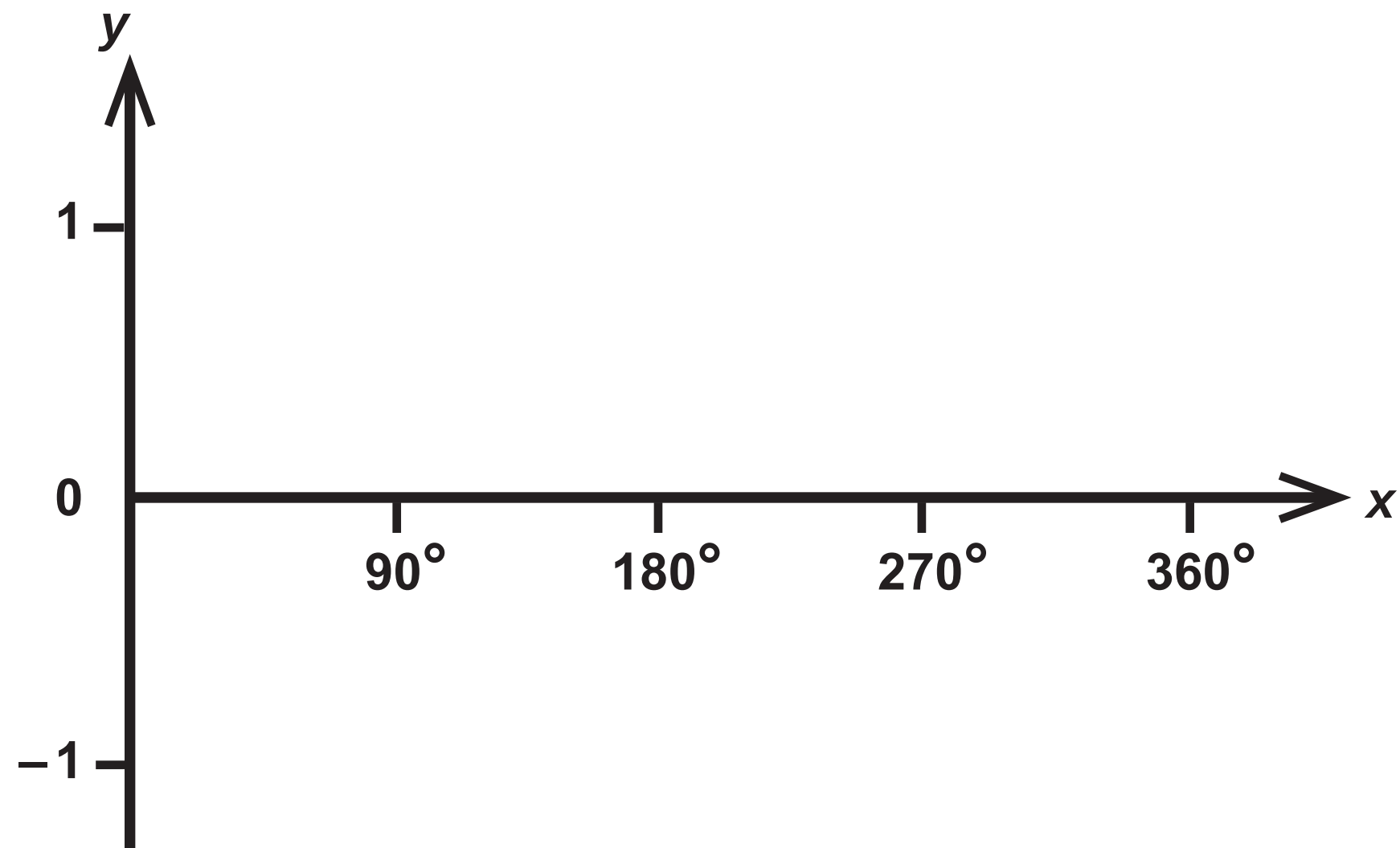
Question 18

Simplified 2D diagram

Diagram NOT drawn to scale



Question 20 (a)





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MATHEMATICS – COMPONENT 2
CALCULATOR – ALLOWED MATHEMATICS
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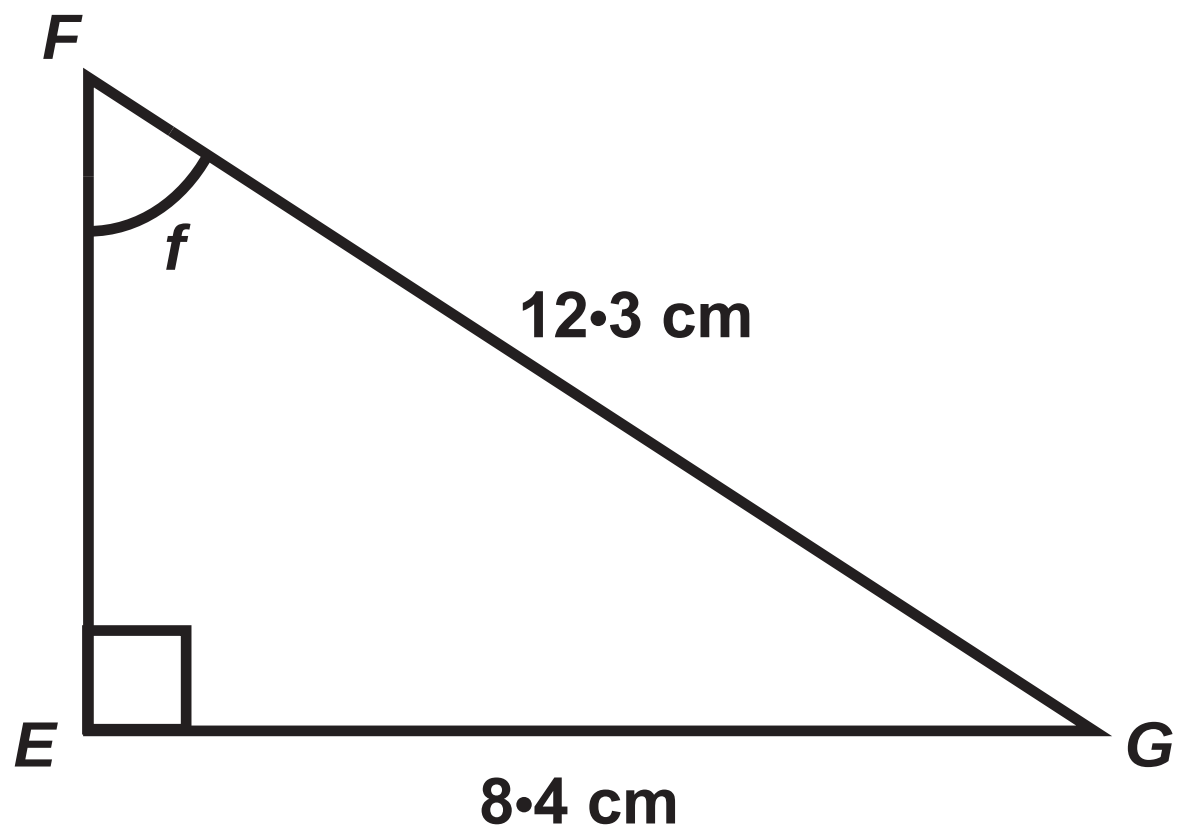
THURSDAY, 6 JUNE 2019 – MORNING

Spare Diagram Booklet

Surname:	
Other Names:	
Centre Number:	
Candidate Number:	0

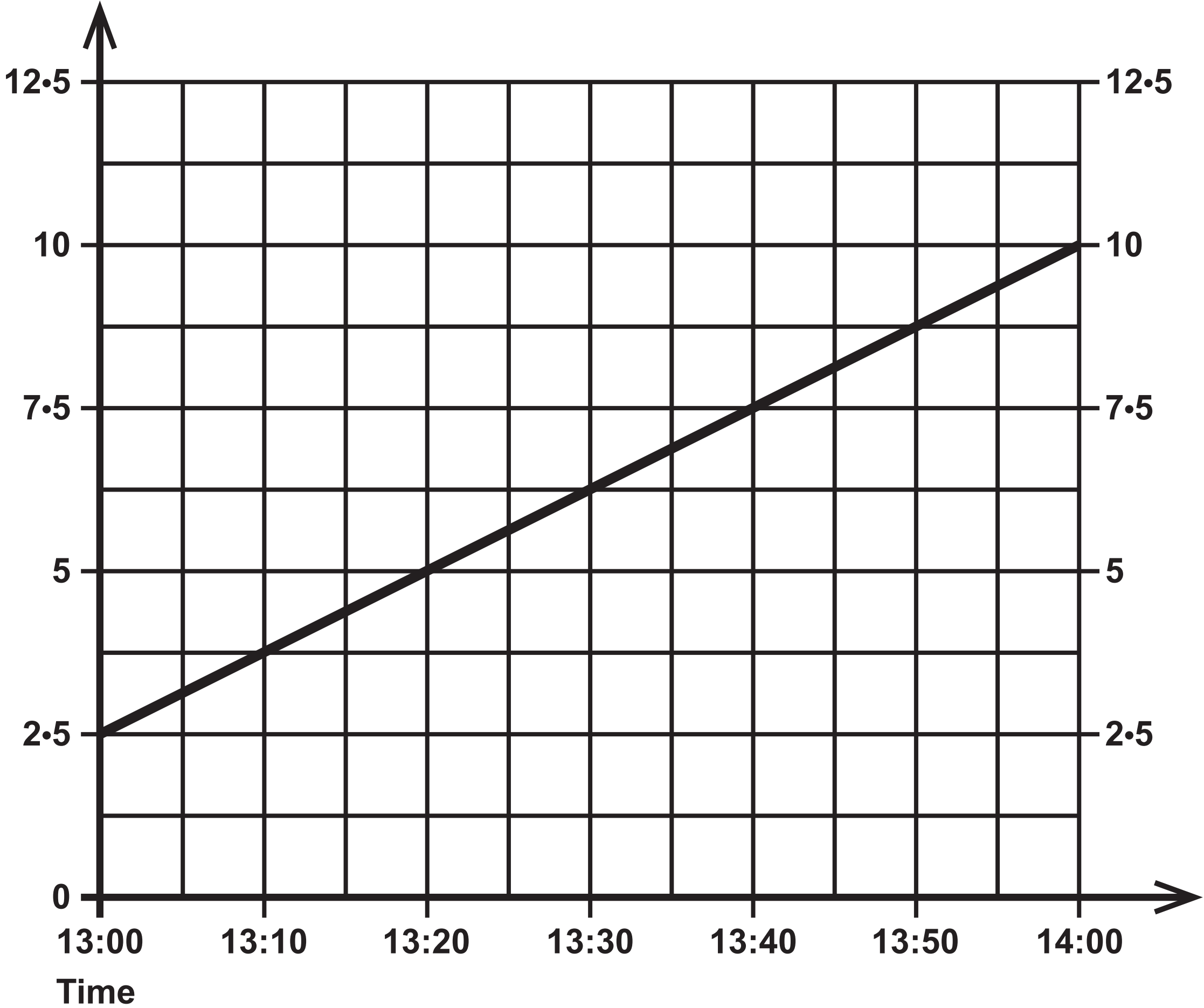
Question 3

Diagram NOT drawn to scale



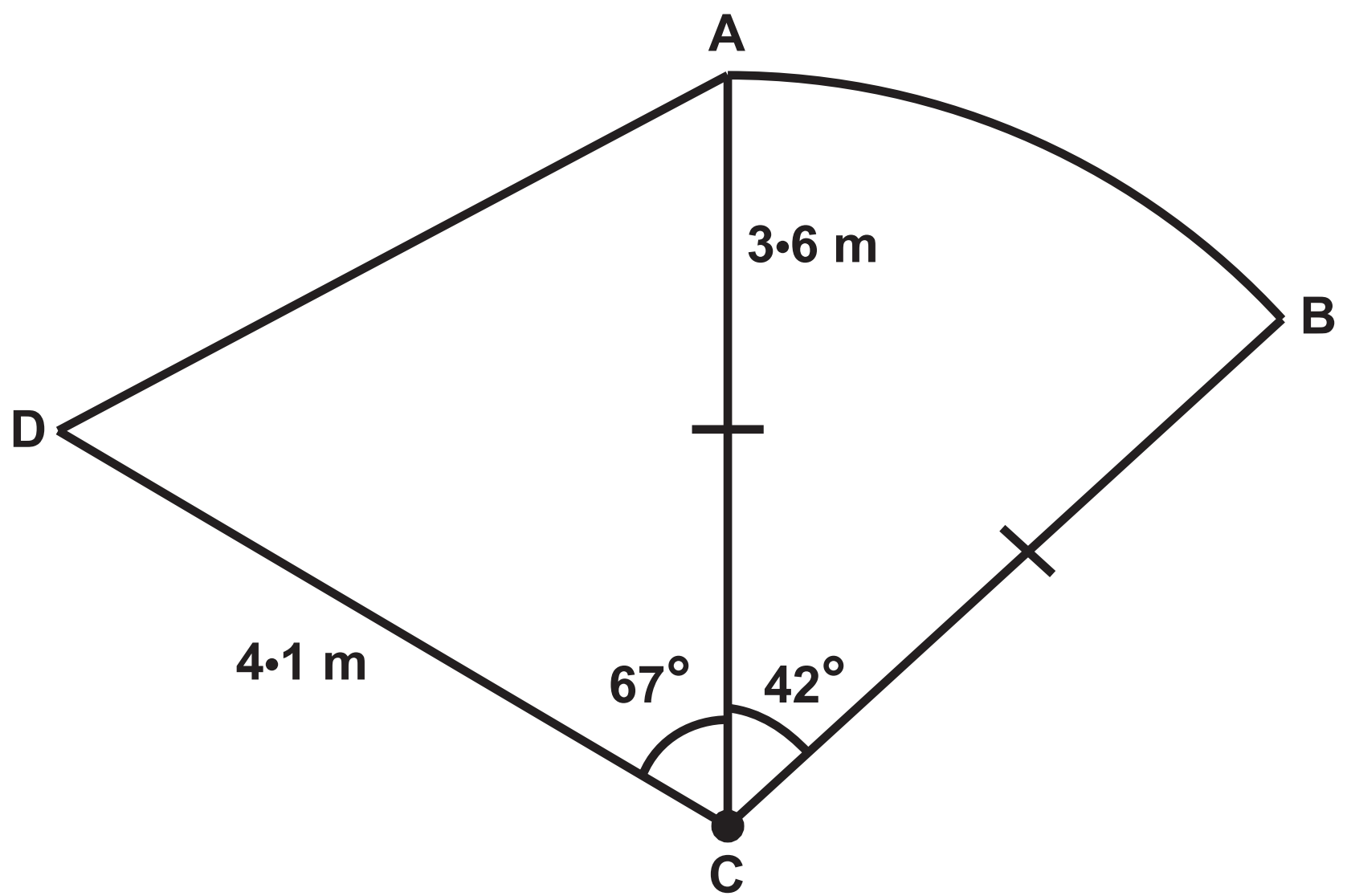
Question 14

Depth of water (cm)

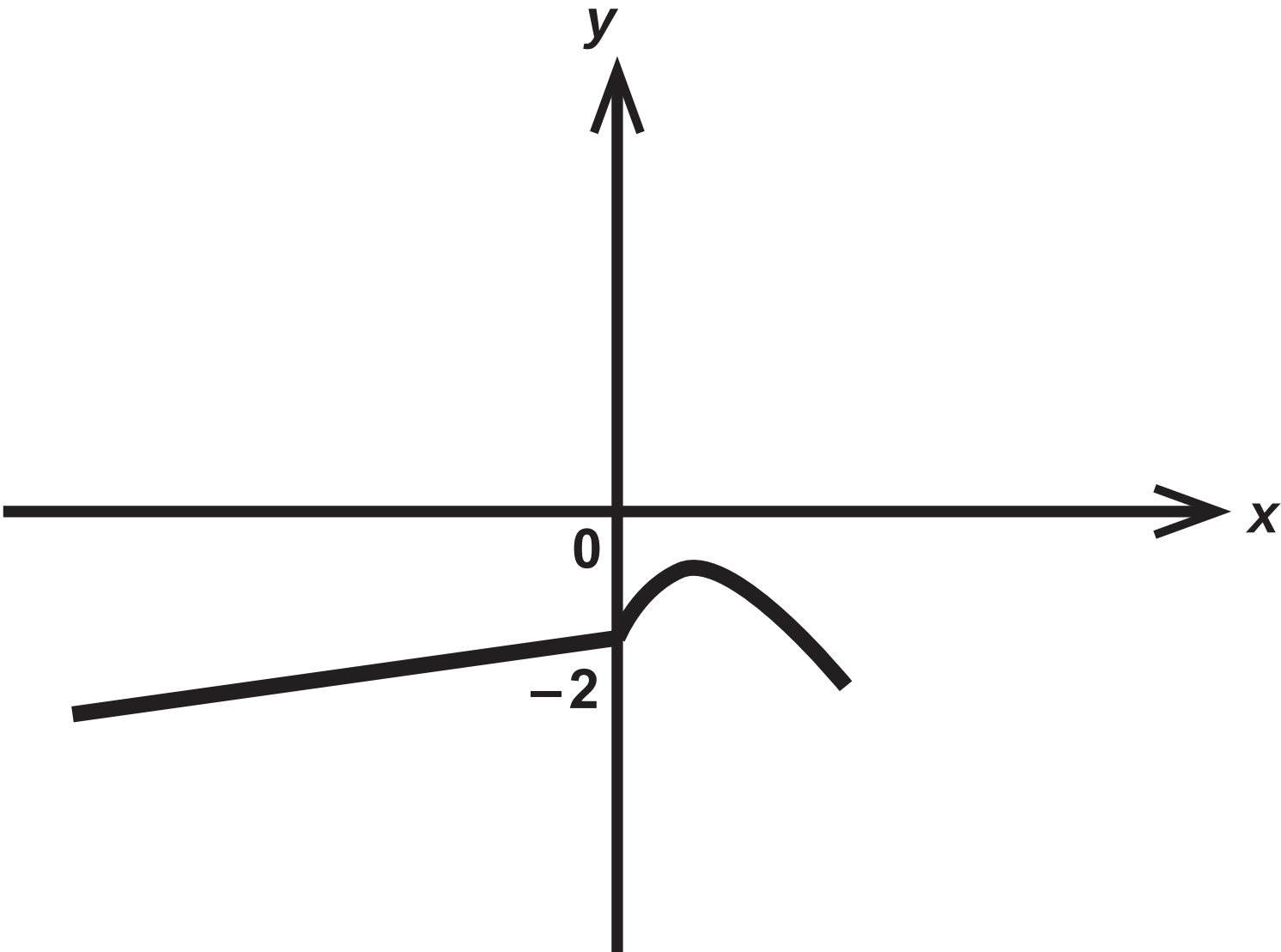


Question 16

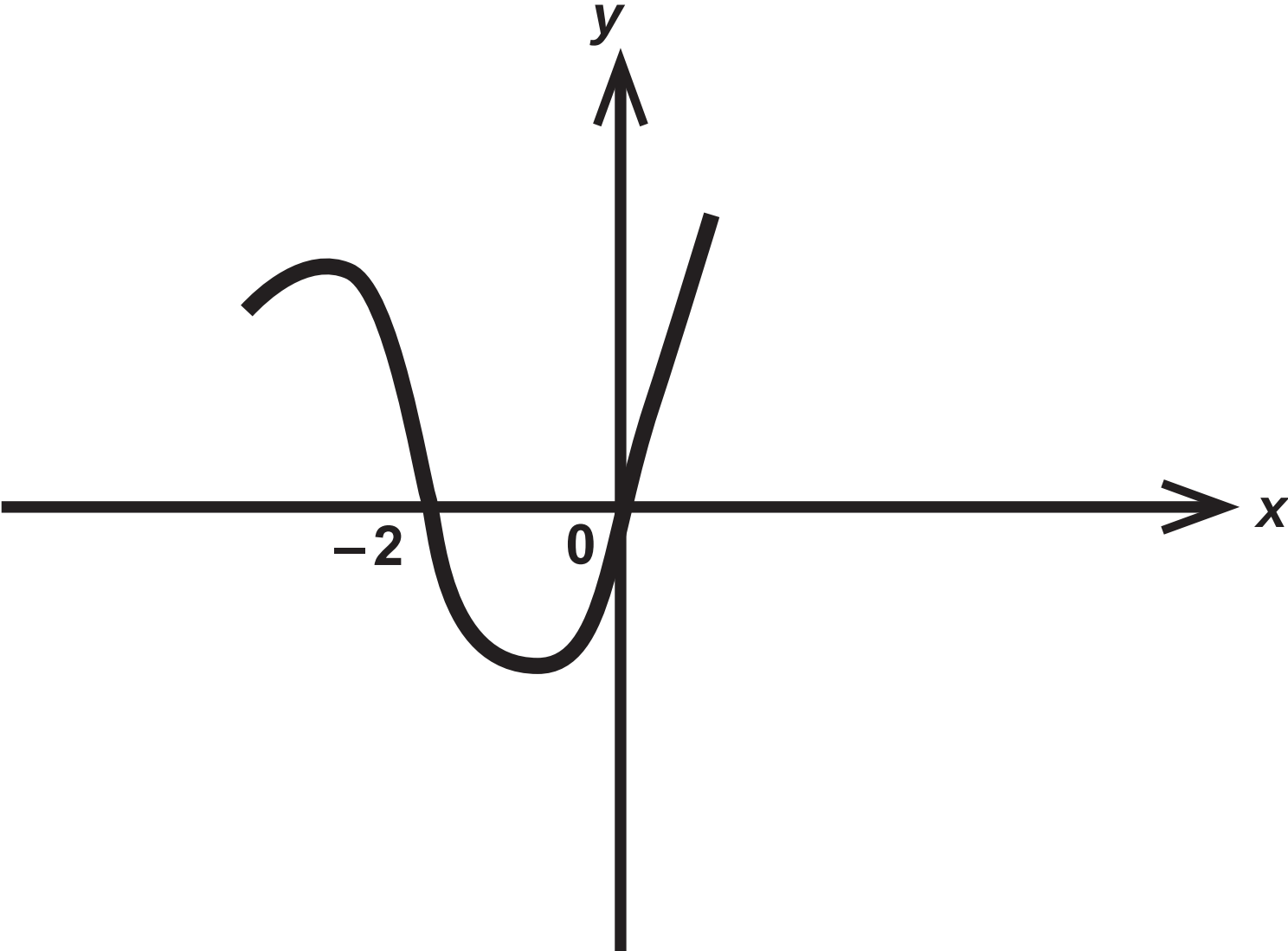
Diagram NOT drawn to scale



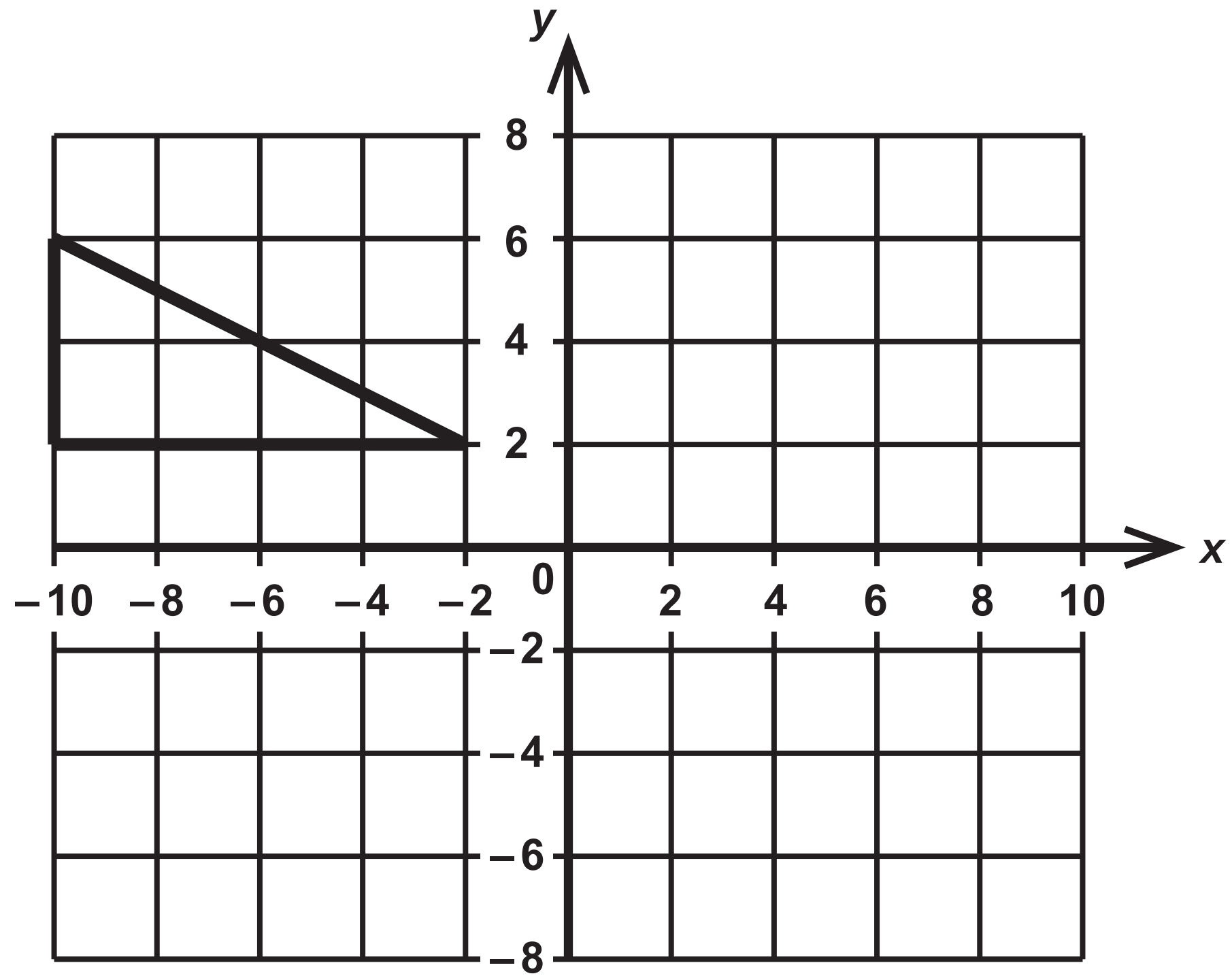
Question 17 (a)



Question 17 (b)



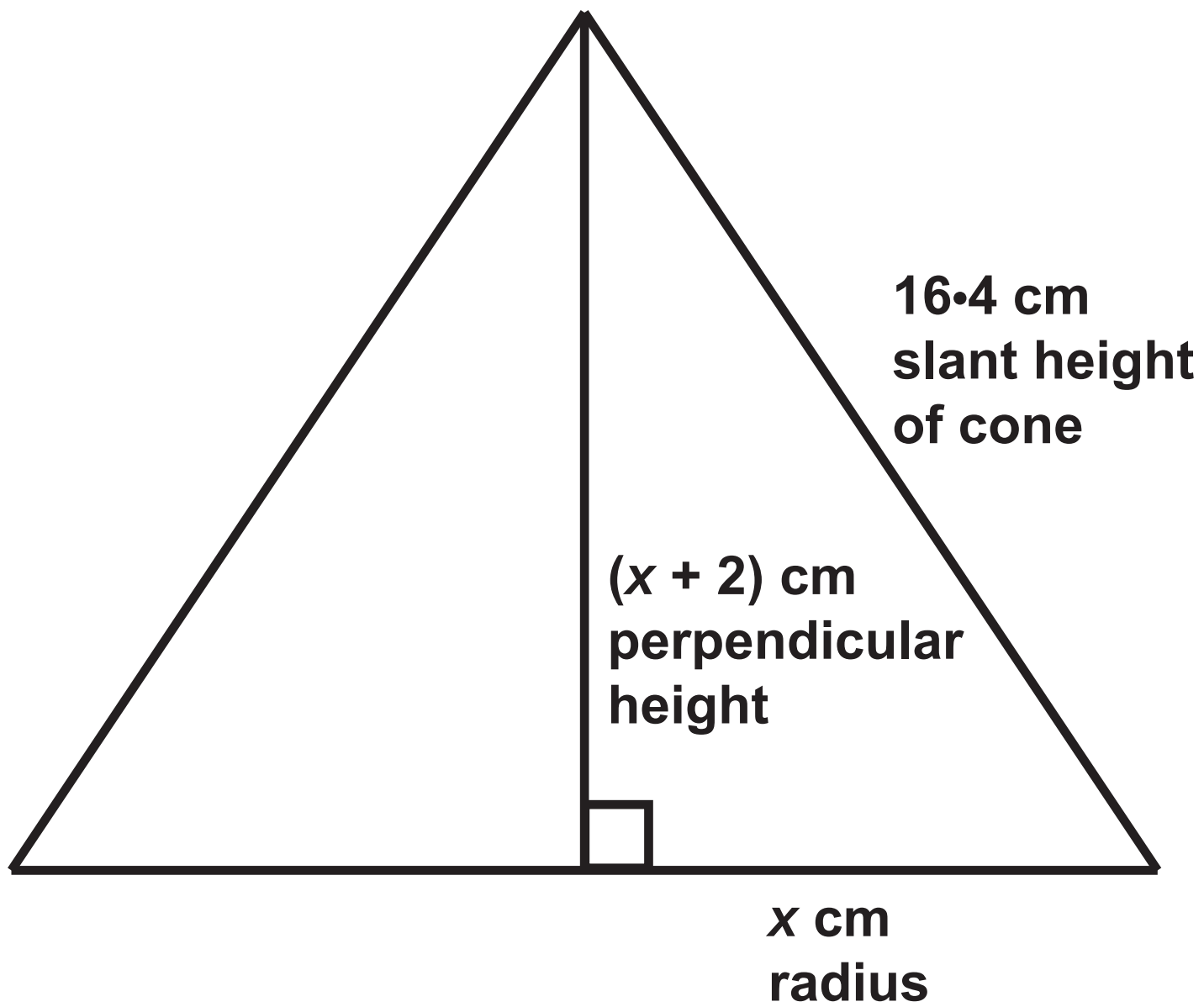
Question 17 (c)



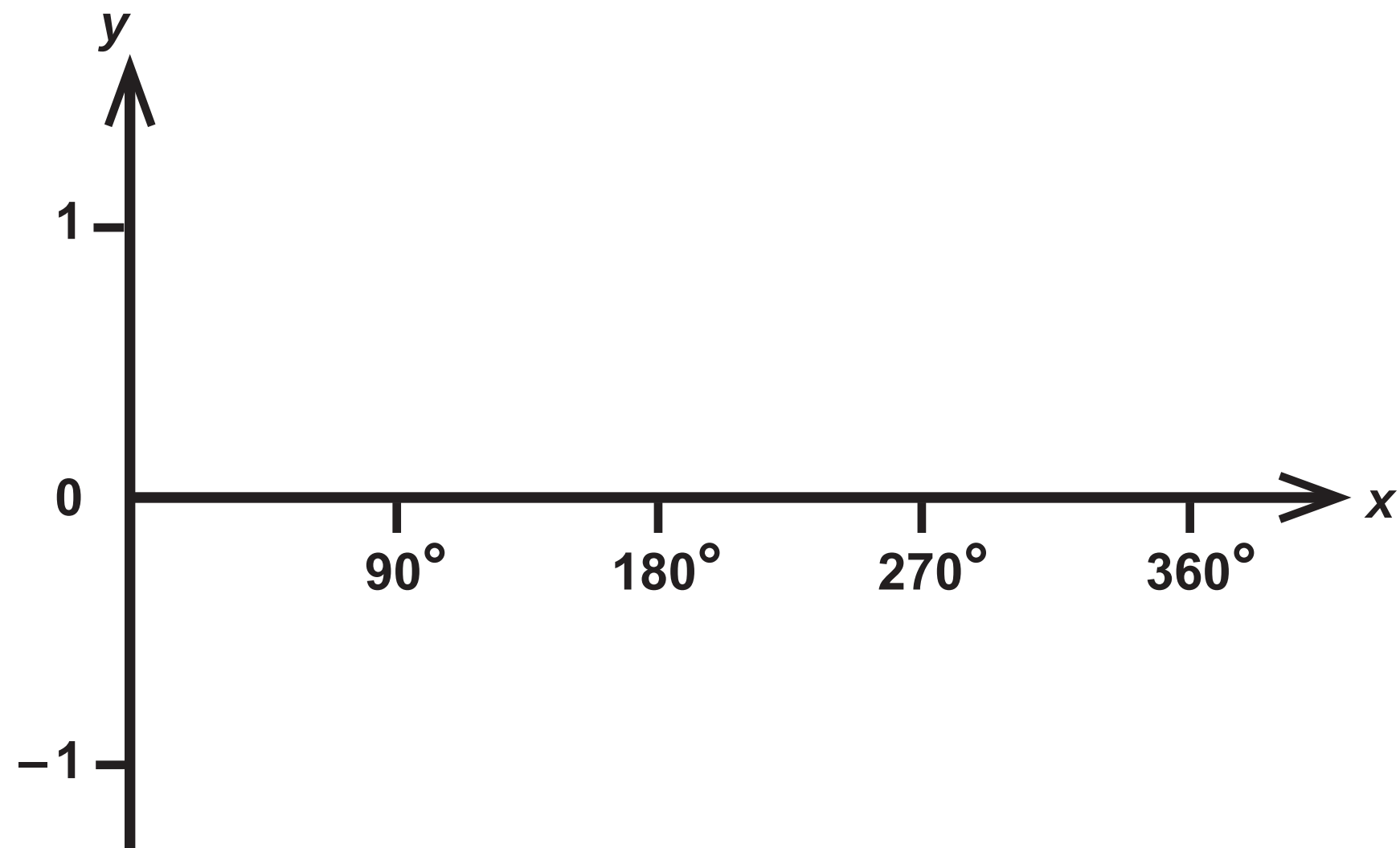
Question 18

Simplified 2D diagram

Diagram NOT drawn to scale



Question 20 (a)



**FORMULA LIST
FOUNDATION TIER
AND HIGHER TIER
GCSE**

You must not write on these formula pages.

Anything you write on these formulae pages will gain NO credit.

AREA AND VOLUME FORMULAE

Where r is the radius of the sphere or cone,
 l is the slant height of a cone and
 h is the perpendicular height of a cone:

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

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

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

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

KINEMATICS FORMULAE

Where a is a constant acceleration,
 u is initial velocity, v is final velocity,
 s is displacement from the position
when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$