OCR
RECOGNISING ACHIEVEMENT

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Thursday 8 November 2012 – Afternoon

GCSE MATHEMATICS B

J567/04 Paper 4 (Higher Tier)

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Geometrical instruments
- Tracing paper (optional)
- Scientific or graphical calculator

Duration: 1 hour 45 minutes

J567040

J517181112

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

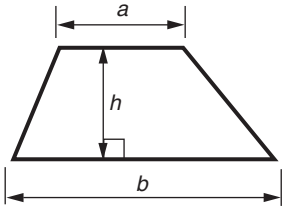
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **100**.
- This document consists of **24** pages. Any blank pages are indicated.

You are permitted to use a calculator for this paper

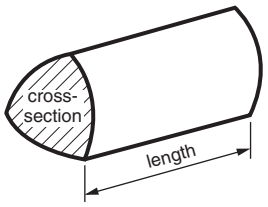
This paper has been pre modified for carrier language

Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a + b)h$



Volume of prism = (area of cross-section) × length

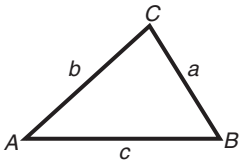


In any triangle *ABC*

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

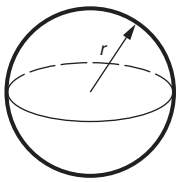
Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

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



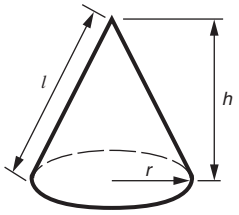
Volume of sphere $= \frac{4}{3}\pi r^3$

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



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

Curved surface area of cone $= \pi rl$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by

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

PLEASE DO NOT WRITE ON THIS PAGE

1 Here are the heights, in centimetres, of some students.

191	167	185	170	184	161	172	170
180	169	161	193	185	177	179	188
171	163	176					

(a) Complete the stem and leaf diagram for these heights.

16	
17	
18	
19	

Key : 16 \| 7 represents 167 centimetres

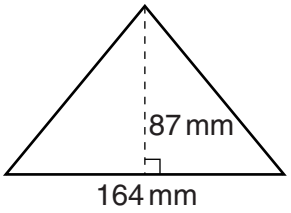
[3]

(b) Find the median height of these students.

(b) _____ cm **[1]**

2 Calculate the area of each of these shapes.

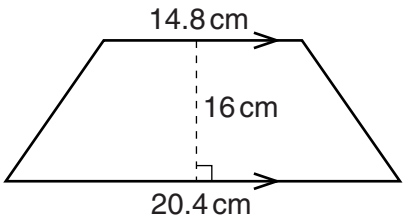
(a)



Not to scale

(a) _____ mm^2 **[2]**

(b)



Not to scale

(b) _____ cm^2 **[2]**

3 Here are the first four terms of a sequence.

4 10 16 22

(a) Write an expression for the nth term of this sequence.

(a) _____ **[2]**

(b) Work out the 20th term of this sequence.

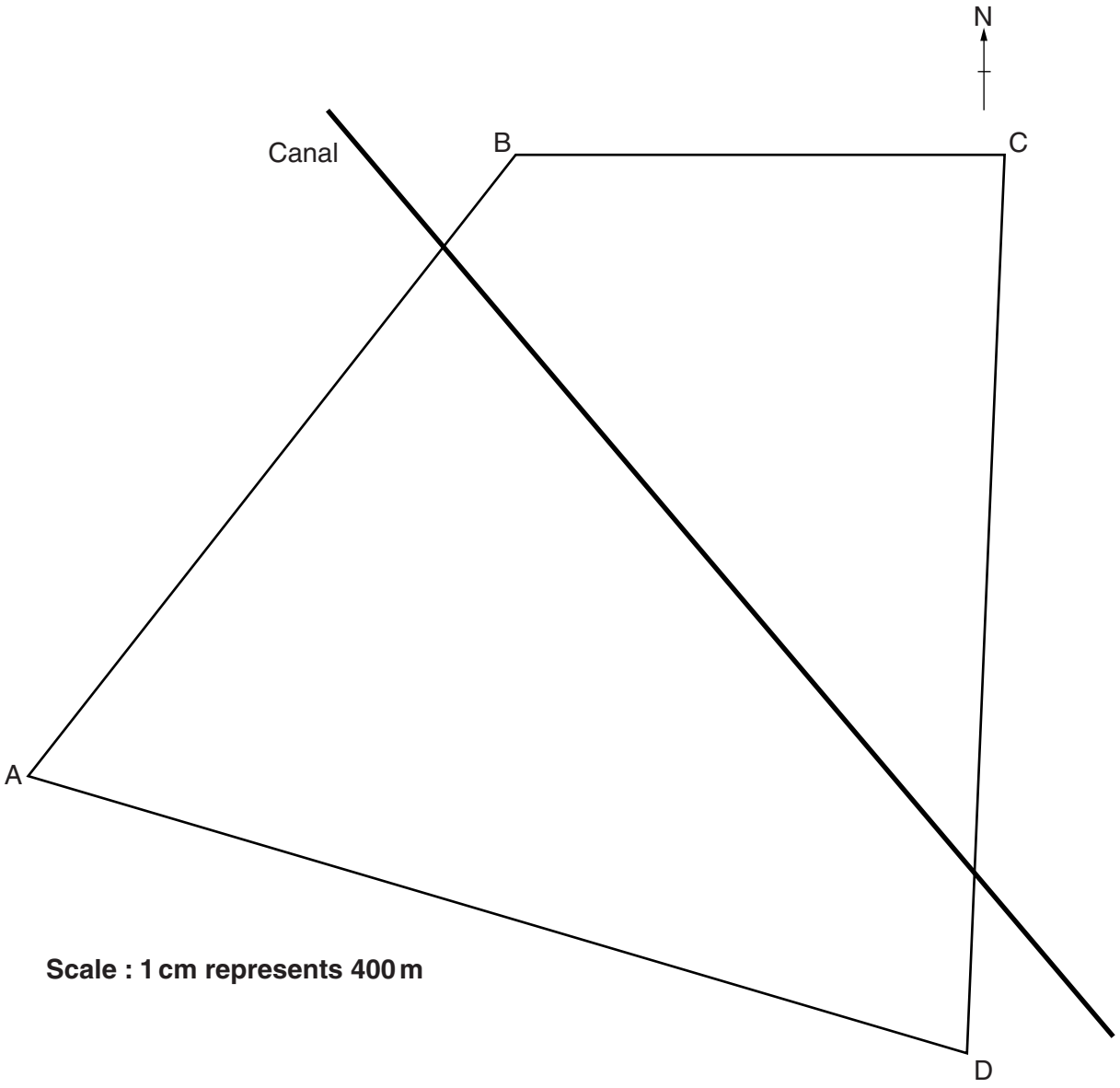
(b) _____ **[1]**

4 Amir is mixing antifreeze and water.
He has 6 litres of a mixture of antifreeze and water in the ratio 1 : 3.

How much antifreeze must he add to make the ratio 1 : 1?

_____ litres **[4]**

5 Here is a scale diagram of a field ABCD with a canal crossing it.



Scale : 1 cm represents 400 m

The council want to put a runway inside the field.

The whole runway has to be:
- nearer to AB than to AD
- at least 800 m from the canal
- in an East-West direction
- 2000 m long.

Show that it is possible to put this runway inside the field.
You must leave in all your construction lines. **[4]**

6 Work out the value of x.

(a) $6^x = 6^4 \times 6^3$

(a) $x =$ _____ **[1]**

(b) $a^x = \dfrac{a^{24}}{a^6}$

(b) $x =$ _____ **[1]**

(c) $p^x = (p^2)^5$

(c) $x =$ _____ **[1]**

7 Calculate.

$$\frac{4.87 - 2.31}{5.6} + 18.2$$

Give your answer correct to 2 decimal places.

_____ **[2]**

8 **(a)** This table shows the probability that a car is a certain colour.

Colour	White	Green	Blue	Other
Probability	0.38	0.17		0.31

Calculate the probability that a car is blue.

(a) _____ **[2]**

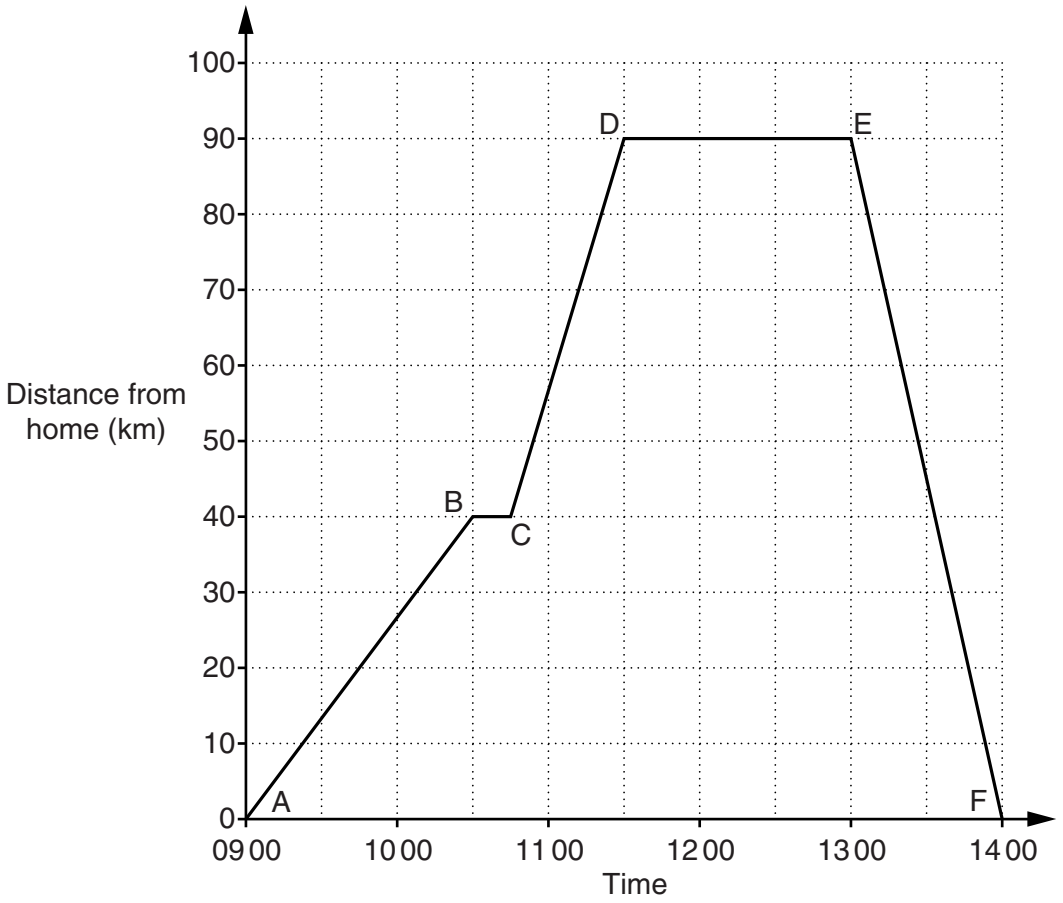
(b) One morning Sam records the number of people in each car passing his house.
Here are his results.

Number of people in a car	Frequency	
1	26	
2	38	
3	24	
4	16	
5	8	

Calculate the mean number of people in the cars passing Sam's house.

(b) _____ **[3]**

(c) Sam went on a journey in his car to the beach and back.
The graph shows Sam's distance, in kilometres, from home.



Use the graph to answer these questions.

(i) What happened at 10 30?

_____ **[1]**

(ii) In which section of the journey did Sam travel the fastest?

(c)(ii) _____ to _____ **[1]**

(d) Sam's car weighs 840 kg without petrol and 880 kg with a full tank of petrol.
Both weights are correct to two significant figures.

Calculate the upper bound of the weight of petrol in the tank.

(d) _____ kg **[2]**

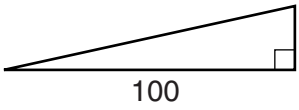
9* Teresa is moving packets of A4 paper using a trolley.
Each packet contains 500 sheets and each sheet measures 210 mm by 297 mm.
The paper has a density of 80 g per m^2.

Her trolley has a maximum safe load of 60 kg.

How many packets can the trolley hold safely?

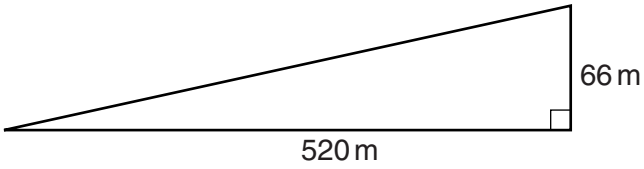
_____ **[5]**

10 The diagram shows the steepest slope that a tram can go up.



Not to scale

The diagram below shows a slope for a planned tramline.



Not to scale

Can a tram go up this slope?
You must show your calculations.

_____ because _____

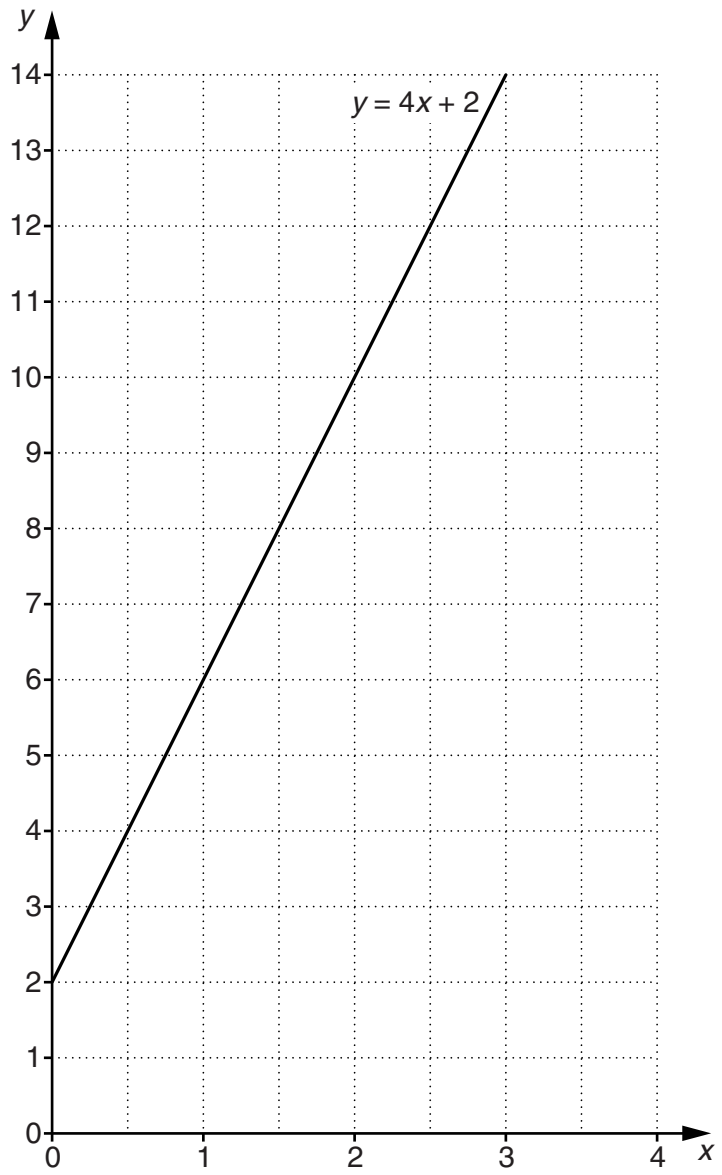
_____ **[3]**

11 **(a)** Complete this table for $y = 2x + 6$.

x	0	1	3
y			12

[1]

(b) Plot these points on the grid and draw the graph of $y = 2x + 6$.



[2]

(c) The graph of $y = 4x + 2$ has been drawn on the grid.

Use the graph to find the value of x which satisfies the simultaneous equations $y = 4x + 2$ and $y = 2x + 6$.

(c) $x =$ _____ **[1]**

12 A is the point (3, 4) and B is the point (8, 12).

(a) Calculate the coordinates of the midpoint of AB.

(a) (_____ , _____) **[2]**

(b) Calculate the length AB.

(b) _____ **[3]**

13 **(a)** Calculate the value of these expressions when $a = -3$.

(i) $4a - 6$

(a)(i) _____ **[1]**

(ii) $5a^2$

(ii) _____ **[1]**

(b) For $y = 5x + 3$, calculate the value of x when $y = 11$.

(b) $x =$ _____ **[2]**

(c) Rearrange $T = \frac{n-5}{2}$ to make n the subject.

(c) $n =$ _____ **[2]**

14 (a) Evie invests £16 800 for 4 years at 2.4% compound interest each year.

Calculate the value of Evie's investment at the end of 4 years.

(a) £ _____ **[3]**

(b) In 2009 the USA had a Gross Domestic Product (GDP) of $\$1.42 \times 10^{13}$ and the UK had a GDP of $\$2.18 \times 10^{12}$.

Calculate the difference in the GDP of the two countries.
Give your answer in standard form, correct to 2 significant figures.

(b) $ _____ **[3]**

15 **(a)** Factorise $x^2 + 7x - 30$.

(a) _____ **[2]**

(b) **(i)** Factorise $xy + 2x$.

(b)(i) _____ **[1]**

(ii) Hence rearrange $xy = 3y + 15 - 2x$ to make x the subject.

(ii) $x =$ _____ **[3]**

(c) Solve algebraically these simultaneous equations.

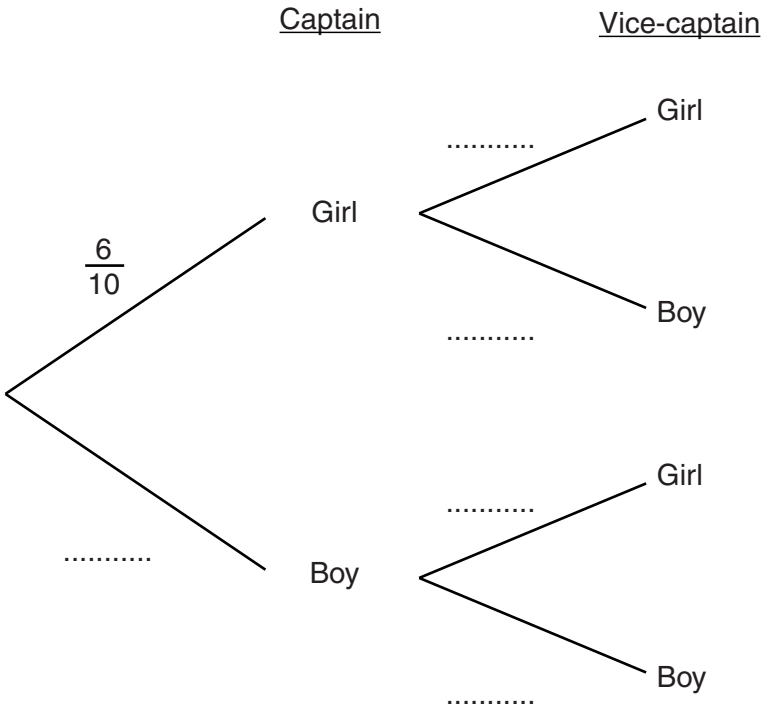
$$3x - 2y = -21$$
$$2x + 5y = 5$$

(c) $x =$ _____

$y =$ _____ **[4]**

16 A class is selecting a captain and a vice-captain.
Ten students, 6 girls and 4 boys, volunteer.
The ten names are put into a bag and drawn at random.

(a) Complete the tree diagram.



[2]

(b) Calculate the probability that one of them is a girl and the other is a boy.

(b) _____ **[3]**

17 The population of the world can be estimated using the formula

$$P = 6.9 \times (1.012)^n$$

where P is the population of the world in billions
n is the number of years after 2010.

(a) Write down the population of the world, in billions, in 2010.

(a) _____ billion **[1]**

(b) Write down the estimated annual percentage increase of the world population.

(b) _____ % **[1]**

(c) Find the year in which the world population is expected to reach 7.5 billion.
You must show your working.

(c) _____ **[3]**

18 Alysia keeps a record of the number of newspapers she sells each day.
She calculates a 7-point moving average of her daily sales.
The information is shown in the tables below.

Week 1

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of newspapers	86	92	101	86	112	164	189
Moving Average				118.6	119.3	118.7	120.3

Week 2

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of newspapers	91	88	112	90	110	174	Y
Moving Average	120.9	120.6	X	123			

(a) Calculate the 7-point moving average, X, for Wednesday of Week 2.

(a) _____ **[2]**

(b) Calculate the number of newspapers, Y, sold on Sunday of Week 2.

(b) _____ **[3]**

19 **(a)** Write $x^2 - 6x + 2$ in the form $(x + a)^2 + b$.

(a) _____ **[3]**

(b) Hence write down the minimum value of $x^2 - 6x + 2$.

(b) _____ **[1]**

20 Write down the values of c and d to make these statements correct.

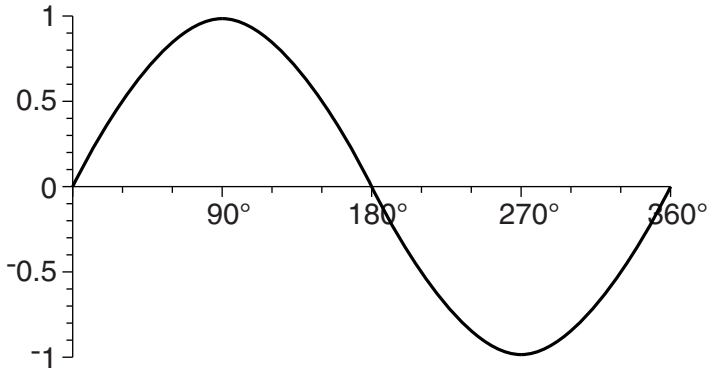
(a) $y = \mathrm{f}(x + 5)$ is a translation of $y = \mathrm{f}(x)$ by vector $\begin{pmatrix} c \\ 0 \end{pmatrix}$.

(a) $c =$ _____ **[1]**

(b) $y = \mathrm{f}(x) - 1$ is a translation of $y = \mathrm{f}(x)$ by vector $\begin{pmatrix} 0 \\ d \end{pmatrix}$.

(b) $d =$ _____ **[1]**

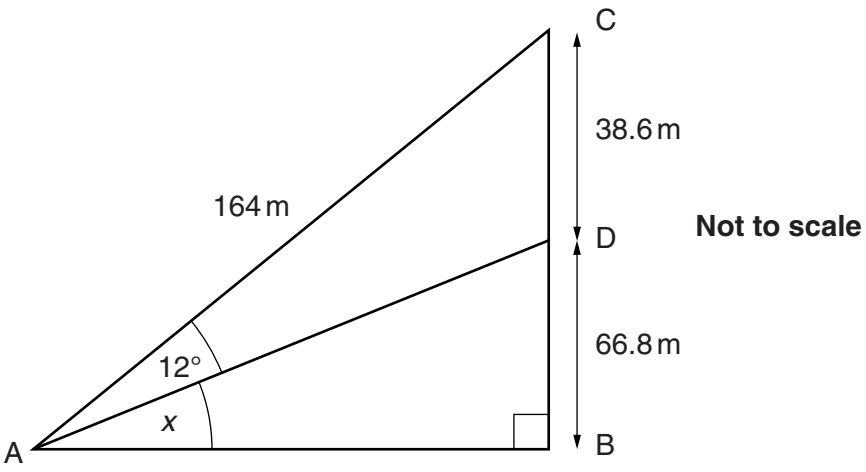
21 **(a)** Here is the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.



Calculate the two solutions of the equation $\sin x = 0.2$ for values of x between 0° and 360°.

(a) $x =$ _____ ° and _____ ° **[3]**

(b) In triangle ABC, D is a point on BC.



Calculate the angle *x*.

(b) _____ ° **[4]**

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