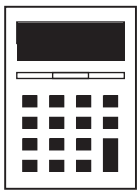
GCSE MATHEMATICS

Trigonometric Graphs



AQA These questions have been taken or modified from previous AQA GCSE Mathematics Papers.

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer **all** questions.
- You must answer the questions in the spaces provided.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information

- The marks for questions are shown in brackets.
- The quality of your written communication is specifically assessed in questions that are indicated with an asterisk (*).

Advice

- Read each question carefully before you start to answer it.
- In all calculations, show clearly how you work out your answer.
- Use the number of marks for the question as a guide to the amount of time you need to spend.
- Look at previous parts of the question, e.g. a), b), c) i) as there may be information there you need to answer later parts.
- Check your answer is realistic and appropriate.
- For calculator decimal numbers always write your full calculator display in the working out area and then, if you need to, round the answer on the answer line.

This booklet was curated and modified using AQA examination papers between 2010-2016, for thecalculatorguide.com , where you can find many more booklets on further topics. All questions used are reproduced for educational purposes only.

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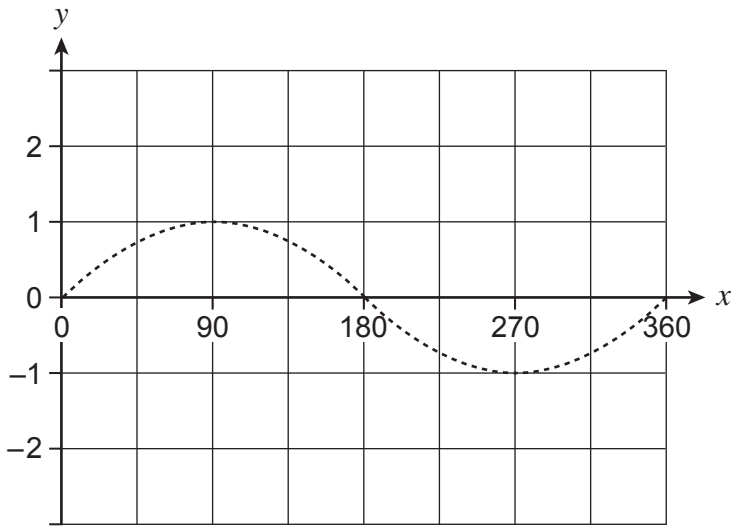
1 (a) On this grid draw the graph of $y = 1 + \sin x$ for values of x from 0º to 360º.

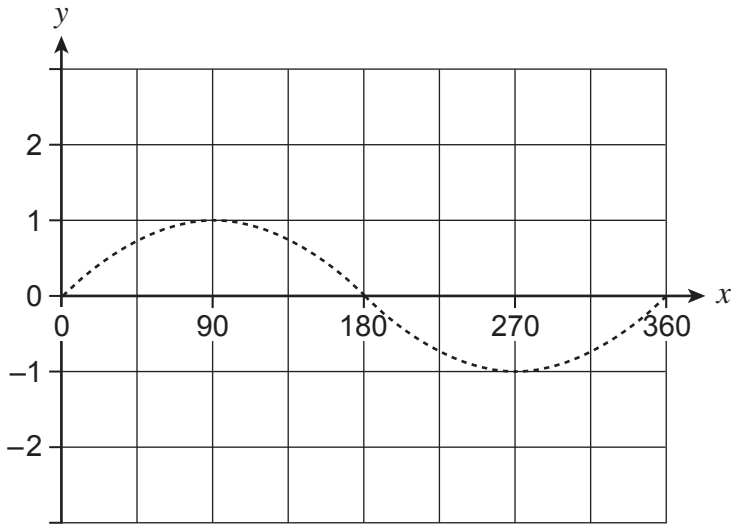
The graph of $y = \sin x$ has been drawn to help you.



(1 mark)

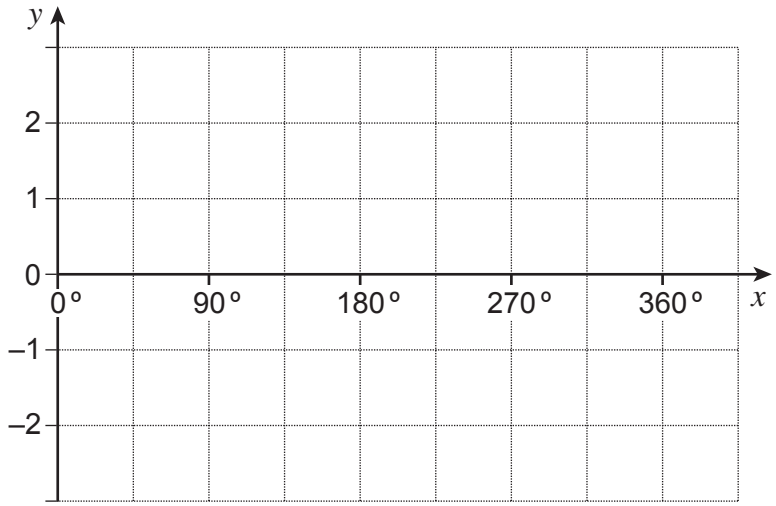
1 (b) On this grid draw the graph of $y = 2\sin x$ for values of x from 0º to 360º.

The graph of $y = \sin x$ has been drawn to help you.



(1 mark)

2 (a) Draw the graph of $y = \cos x$ for $0^\circ \leqslant x \leqslant 360^\circ$



(1 mark)

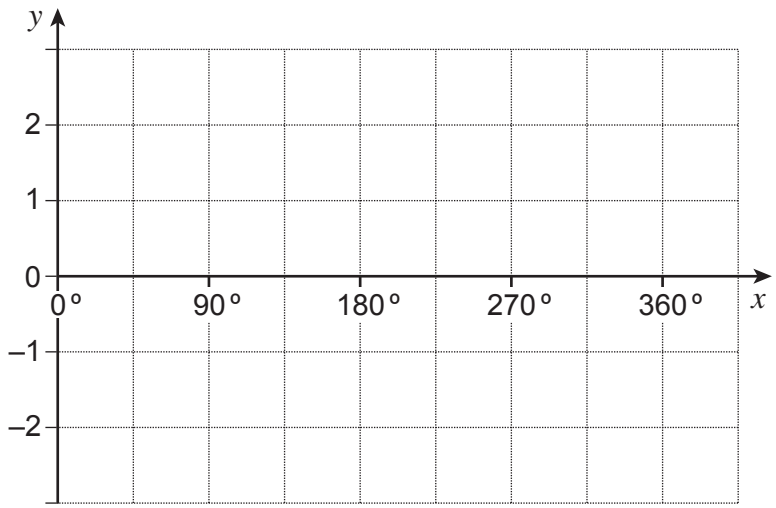
2 (b) Write down the **two** solutions to the equation $\cos x = 0.5$ for $0^\circ \leqslant x \leqslant 360^\circ$

(1 mark)

Answer _____ degrees

and _____ degrees

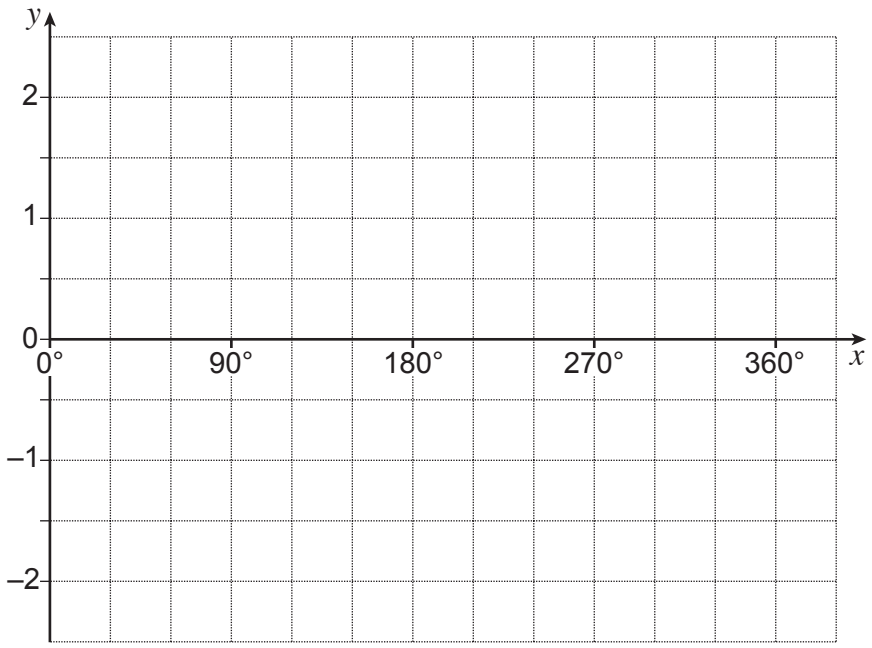
2 (c) Draw the graph of $y = \cos x + 1$ for $0^\circ \leqslant x \leqslant 360^\circ$



(1 mark)

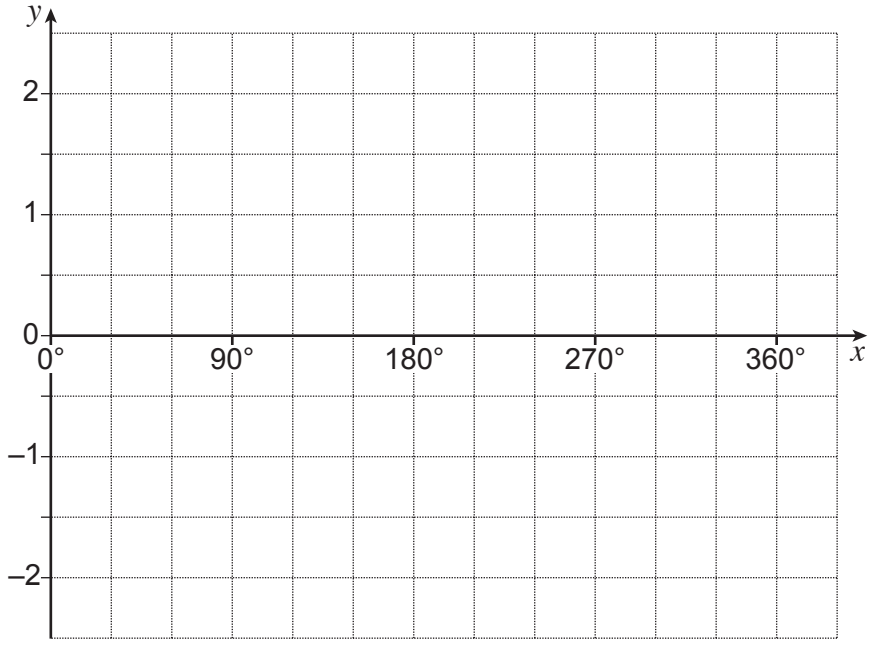
2 (d) On the grid below, draw the graph of $y = \frac{1}{2}\cos x$ for $0° \leqslant x \leqslant 360°$

[1 mark]

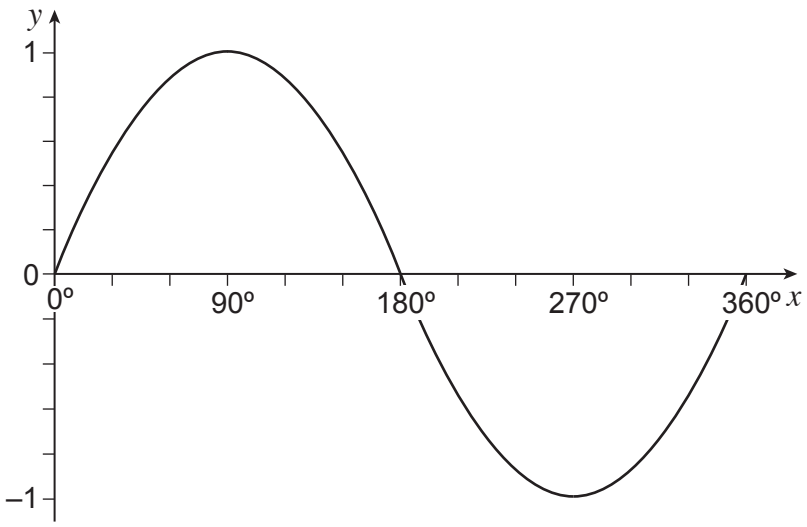


2 (e) On the grid below, draw the graph of $y = \cos 2x$ for $0° \leqslant x \leqslant 360°$

[1 mark]



3 The graph shows $y = \sin x$ for $0^\circ \leqslant x \leqslant 360^\circ$



3 (a) $\sin x = \sin 60^\circ$ and $90^\circ < x < 360^\circ$

Work out the value of x.

[1 mark]

.....

Answer .....

3 (b) $\sin x = -\sin 60^\circ$ and $180^\circ < x < 360^\circ$

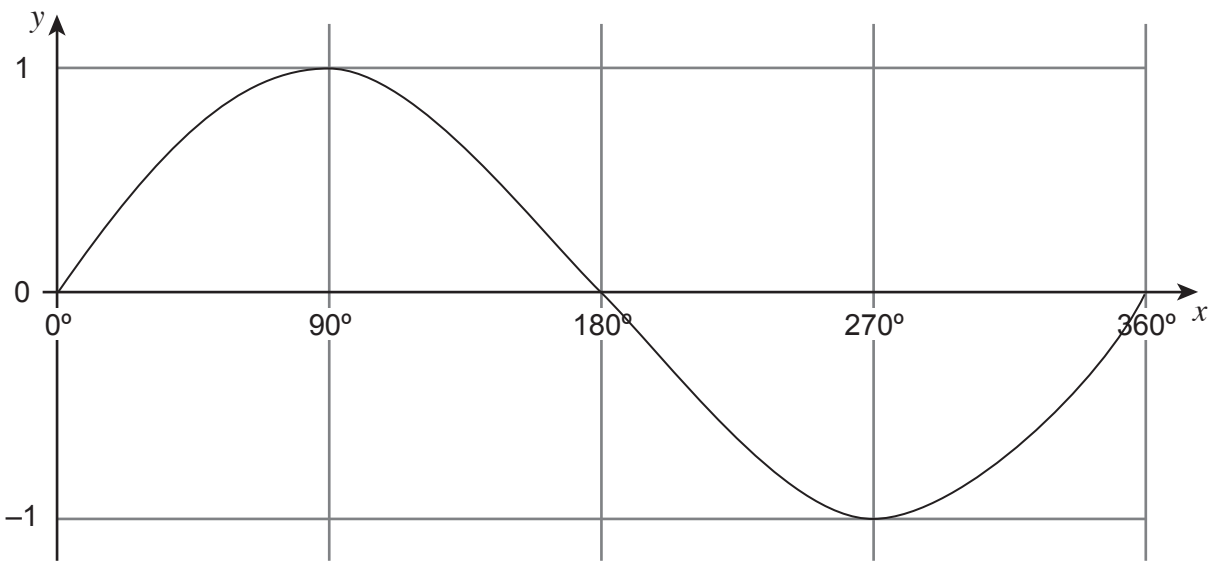
Work out **one** of the values of x.

[1 mark]

.....

Answer .....

4 This is a sketch graph of $y = \sin x$ for $0^\circ \leqslant x \leqslant 360^\circ$



4 (a) Write down the number of solutions for $\sin x = 0.5$ for $0^\circ \leqslant x \leqslant 360^\circ$

[1 mark]

.....

Answer .....

4 (b) $\sin x = \sin 10$

Write down the value of x for $90^\circ \leqslant x \leqslant 180^\circ$

[1 mark]

.....

Answer .....

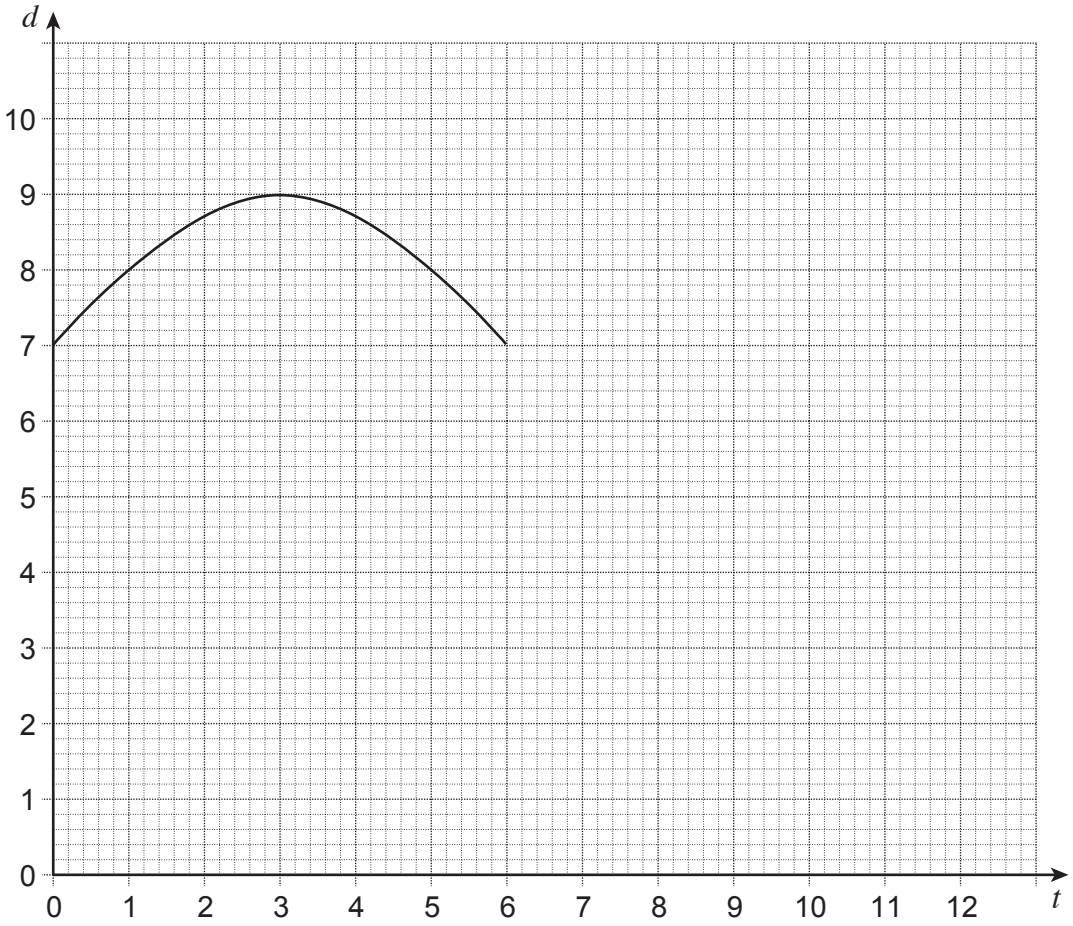
5 The depth of water in a harbour is modelled by the equation

$$d = 7 + 2 \sin (30t)^{\circ}$$

d is the depth of water in metres.

t is the number of hours after 4.00 am

The graph shows the depth of water for values of t from 0 to 6



5 (a) Complete the table. **[2 marks]**

t	7	8	9	10	11	12
d	6	5.268		5.268		

5 (b) On the grid above, draw the graph for values of t from 6 to 12

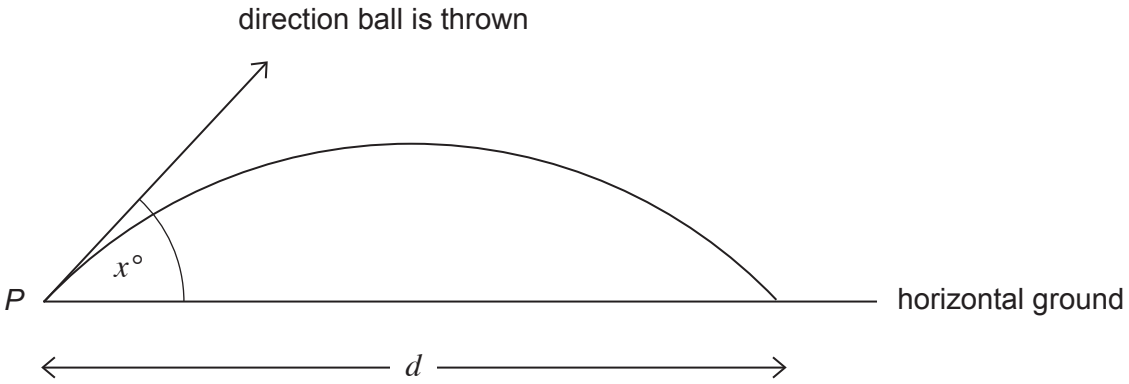
[1 mark]

5 (c) Between what times of day is the depth at least 8 metres?

[2 marks]

Between ..... and .....

6 A ball is thrown from point *P* at an angle x° to horizontal ground.
The ball lands a distance d metres from *P*.
The path of the ball is a curve.



Changing the size of angle x will change the distance d.

The connection between x and d is modelled by

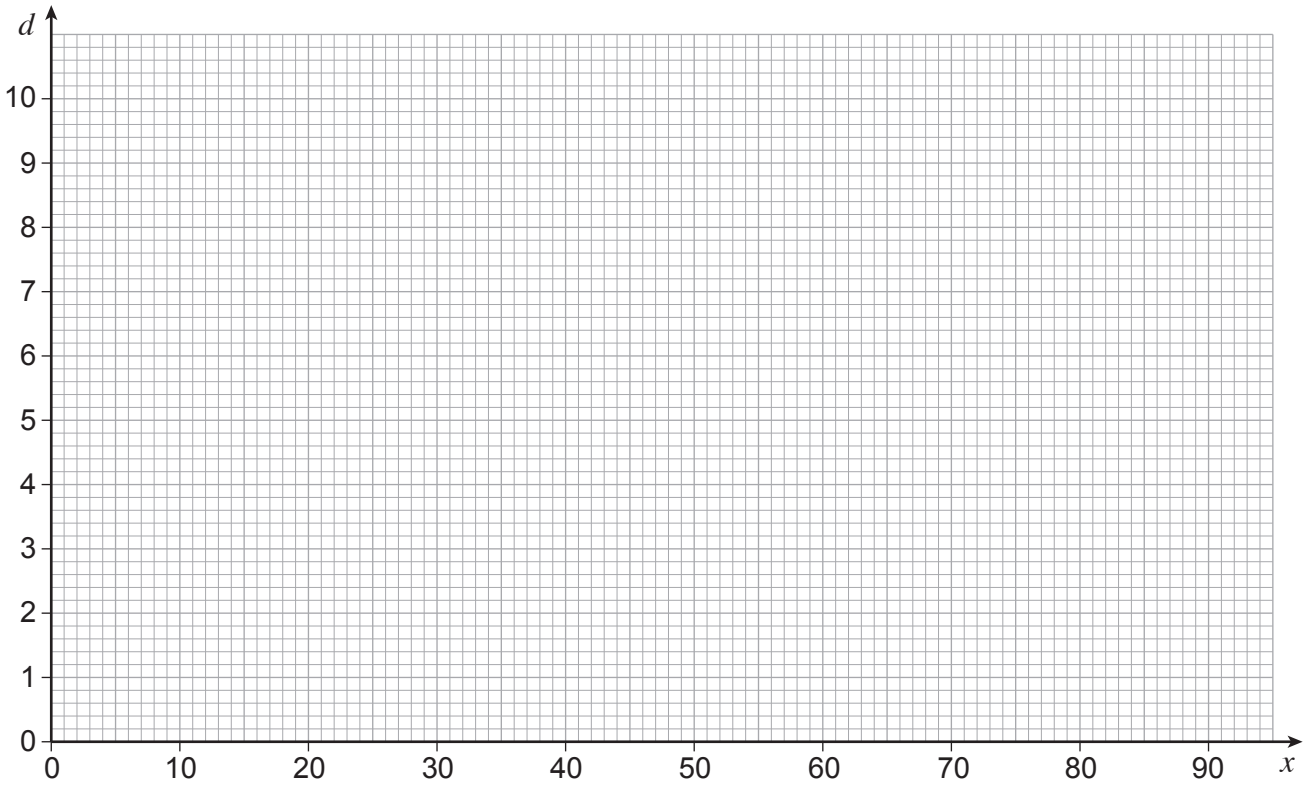
$$d = 20 \times \sin x \times \cos x$$

6 (a) Here is a table of values for x and d.

x	0	10	20	30	40	45	50	60	70	80	90
d	0	3.4	6.4	8.7	9.8	10	9.8	8.7	6.4	3.4	0

On the grid opposite, draw the graph of $d = 20 \times \sin x \times \cos x$
for values of x from 0 to 90

[2 marks]



6 (b) In this question, you **must** show your working on the graph above.

Complete this statement.

[2 marks]

For d to be more than 7 metres, x must be between ..... and .....

7 The depth of water, d metres, in a harbour at a time, t hours after 12 noon, is given by

$$d = 10 - 4\cos(30t)^\circ$$

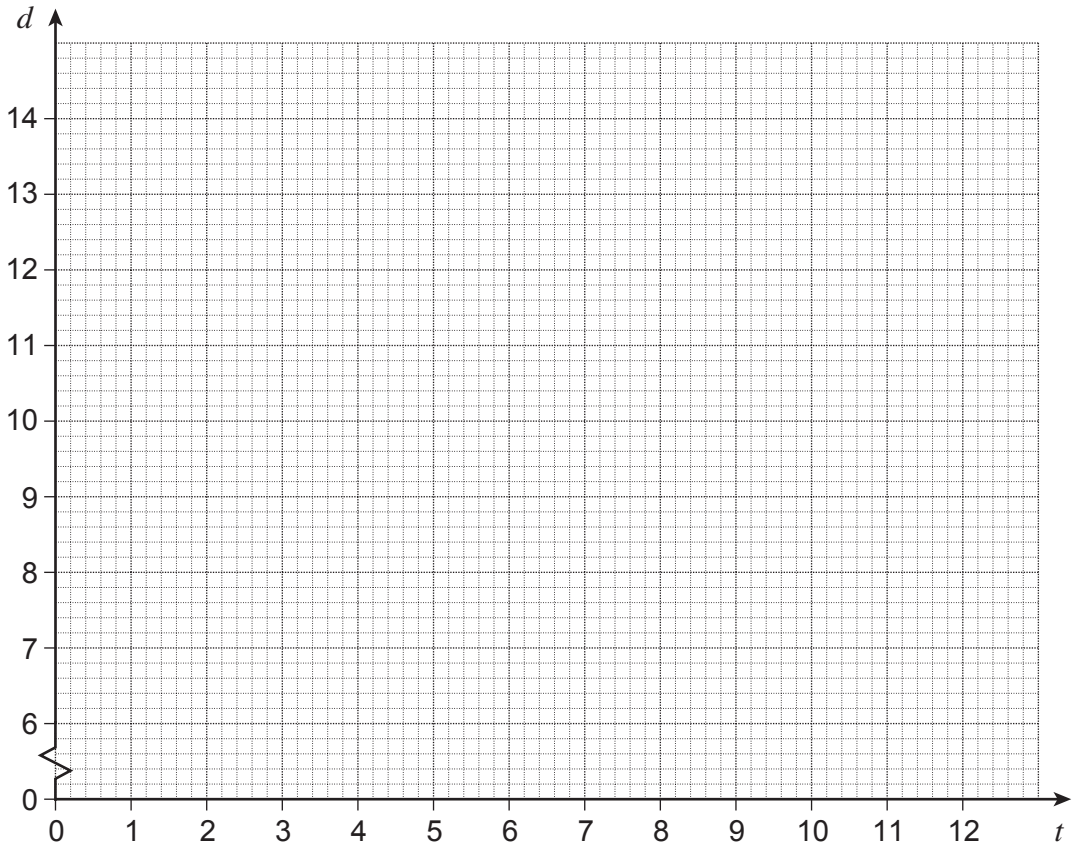
7 (a) Complete the table of values.

t	0	1	2	3	4	5	6	7	8	9	10	11	12
d	6	6.5	8	10	12	13.5		13.5	12	10	8	6.5	

.....

(2 marks)

7 (b) On the grid, draw the graph of $d = 10 - 4\cos(30t)^\circ$ for values of t from 0 to 12.



(2 marks)

7 (c) The depth of water must be at least 9 metres for a ship to enter the harbour.
At 12 noon a ship is waiting to enter the harbour.

Use the graph to estimate the **earliest** time the ship can enter.

.....

.....

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

7 (d) A different ship enters the harbour at 4.15 pm.
The ship must leave the harbour before the depth of water falls below 9 metres.

Use the graph to estimate the maximum time the ship can stay in the harbour.
Give your answer in hours and minutes.

.....

.....

.....

Answer .....hours .....minutes *(3 marks)*

8 The depth of water in a harbour is d metres.

$$d = 12 - 5\sin(30t)°$$

t is the number of hours after 7.00 am

8 (a) Here is a table of values for $d = 12 - 5\sin(30t)°$

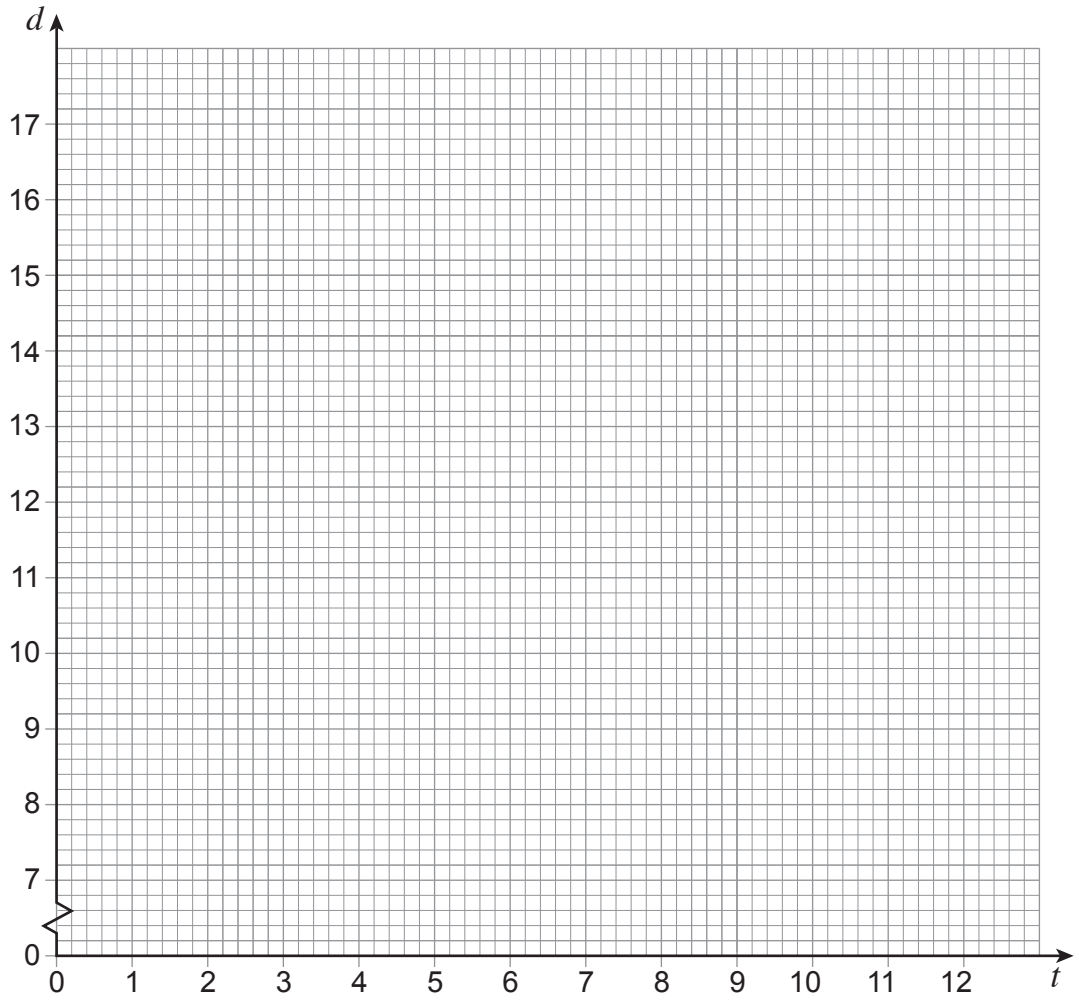
t	0	1	2	3	4	5	6	7	8	9	10	11
d	12	9.5	7.7	7	7.7	9.5	12	14.5	16.3	17	16.3	14.5

Show that when t is 12, the value of d is 12

[1 mark]

8 (b) On the grid draw the graph of $d = 12 - 5\sin(30t)°$ for values of t from 0 to 12

[2 marks]



8 (c) A ship can stay in the harbour when the depth of water is 14 metres or more.

Use the graph to work out the maximum time a ship can stay in the harbour.
Give your answer in hours and minutes.

[2 marks]

Answer _____ hours _____ minutes