

Name: \_\_\_\_\_

## GCSE (1 – 9)

# Trig and Exponential Graphs

### Instructions

- Use **black** ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

### Information

- The marks for each question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

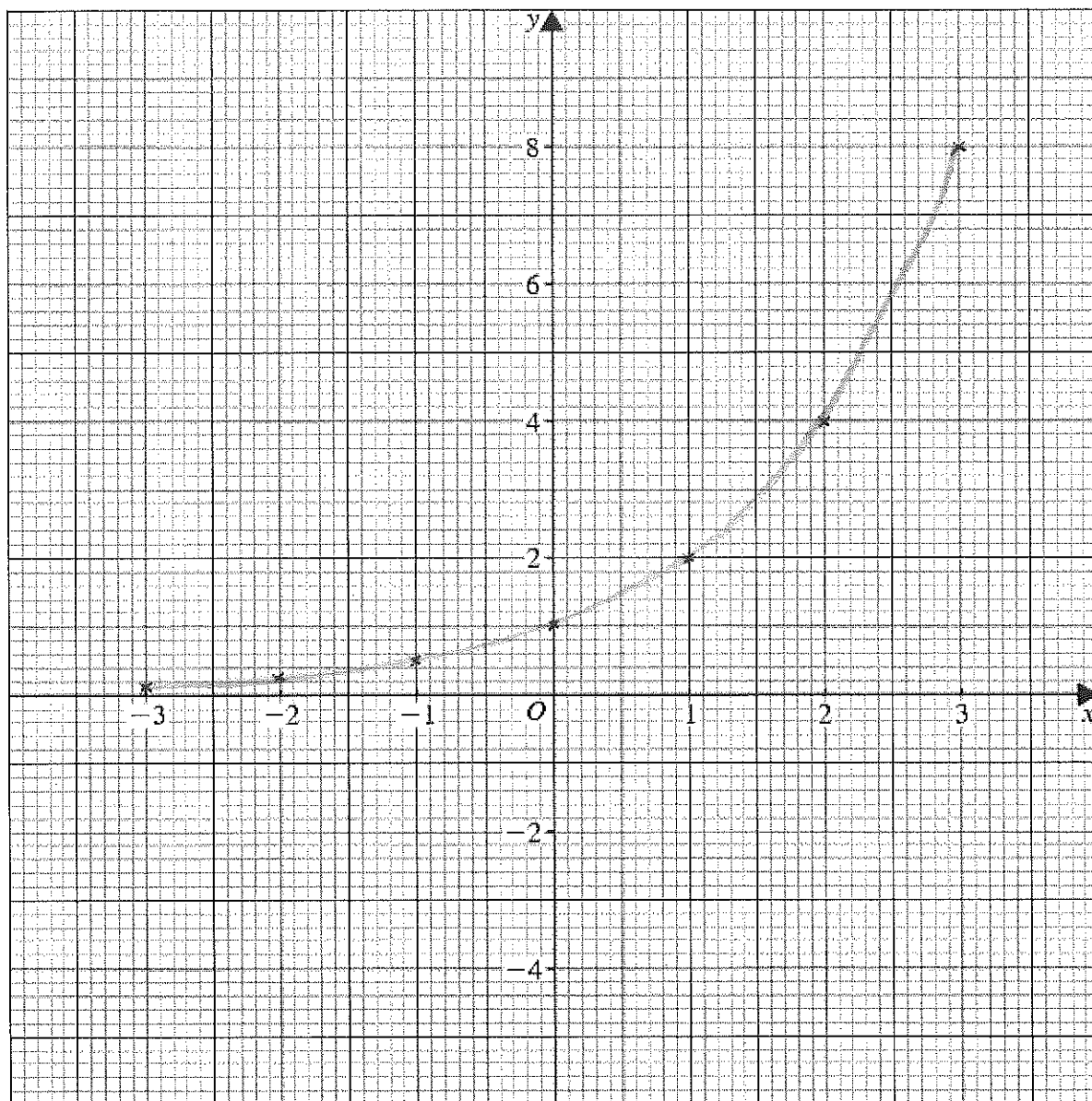
### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end

1.(a) Complete the table of values for  $y=2^x$  (2)

$x$	-3	-2	-1	0	1	2	3
$y$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8

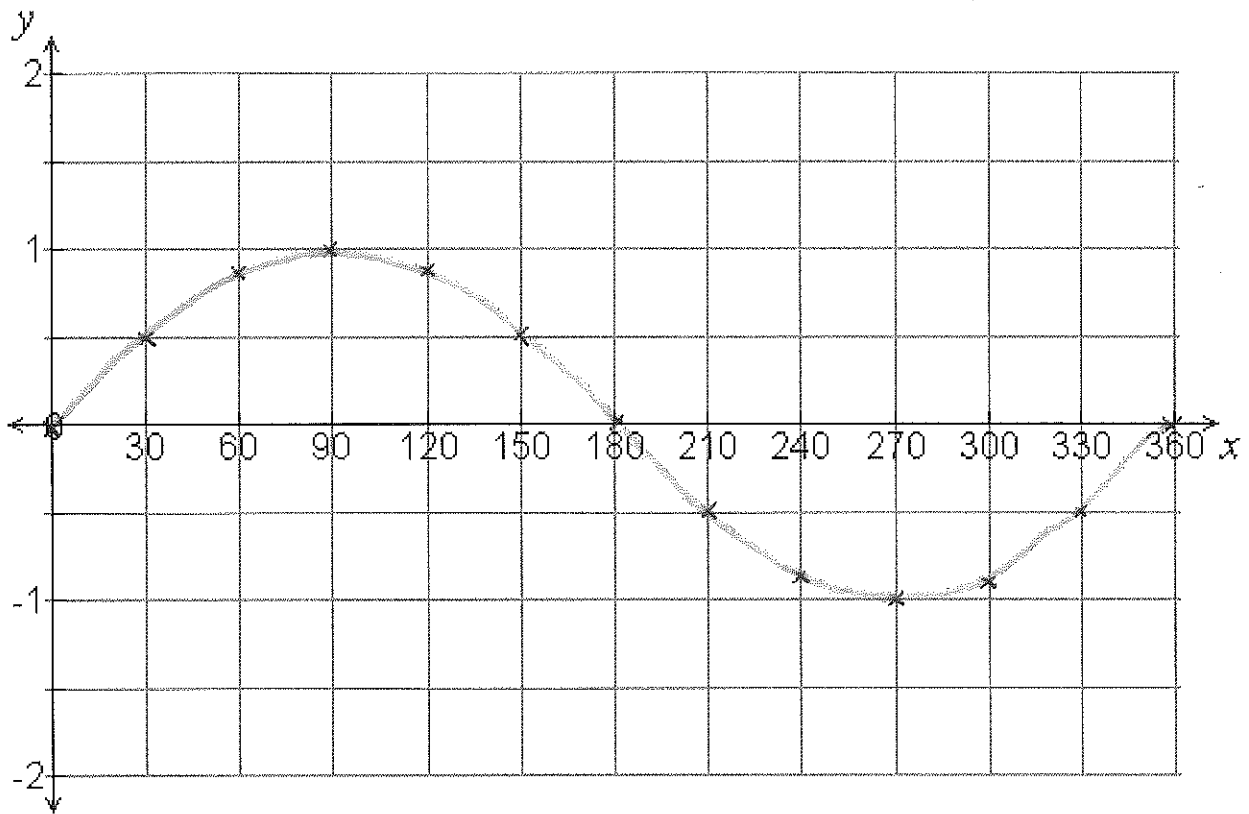
b) On the grid, draw the graph of  $y=2^x$  (2)



2.(a) Complete the table of values for  $y = \sin(x)$  (2)

$x$	0	30	60	90	120	150	180	210	240	270	300	330	360
$y$	0	$\frac{1}{2}$	0.866	1	0.866	$\frac{1}{2}$	0	$-\frac{1}{2}$	-0.866	-1	-0.866	$-\frac{1}{2}$	0

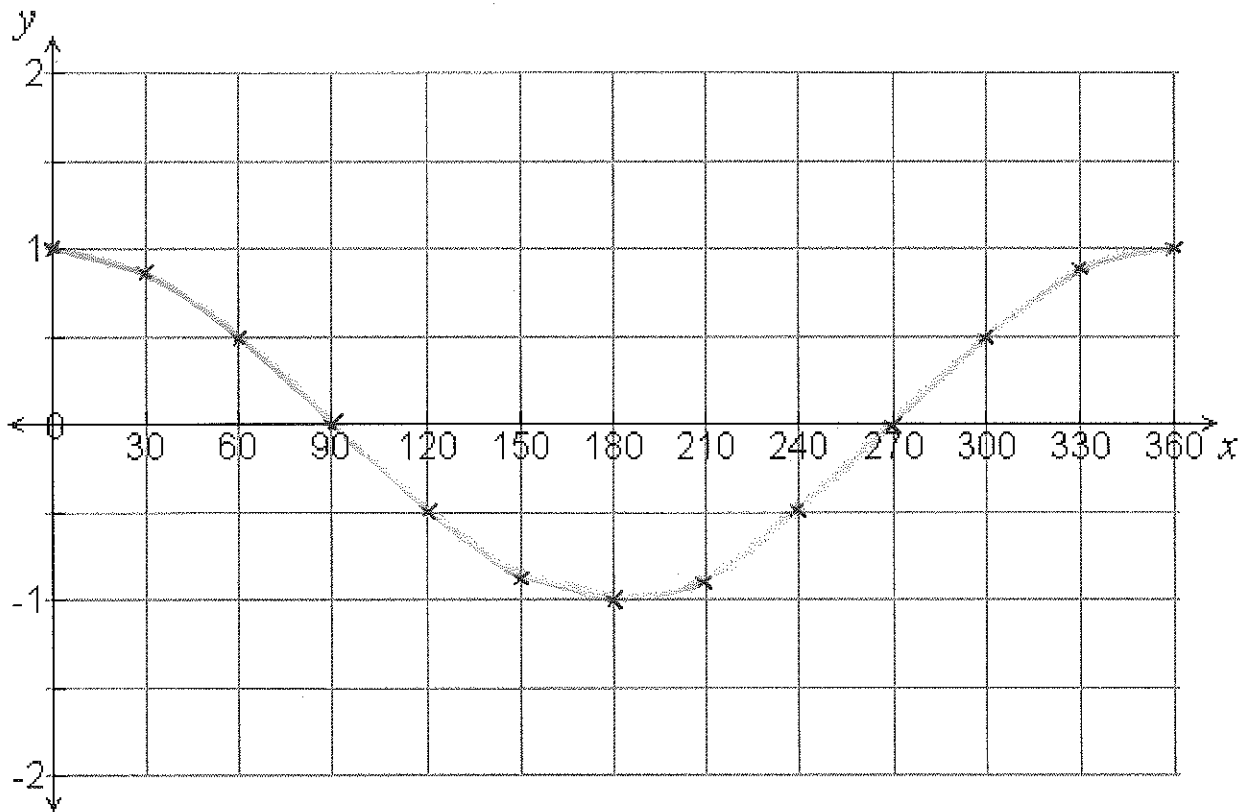
b) On the grid, draw the graph of  $y = \sin(x)$  (2)



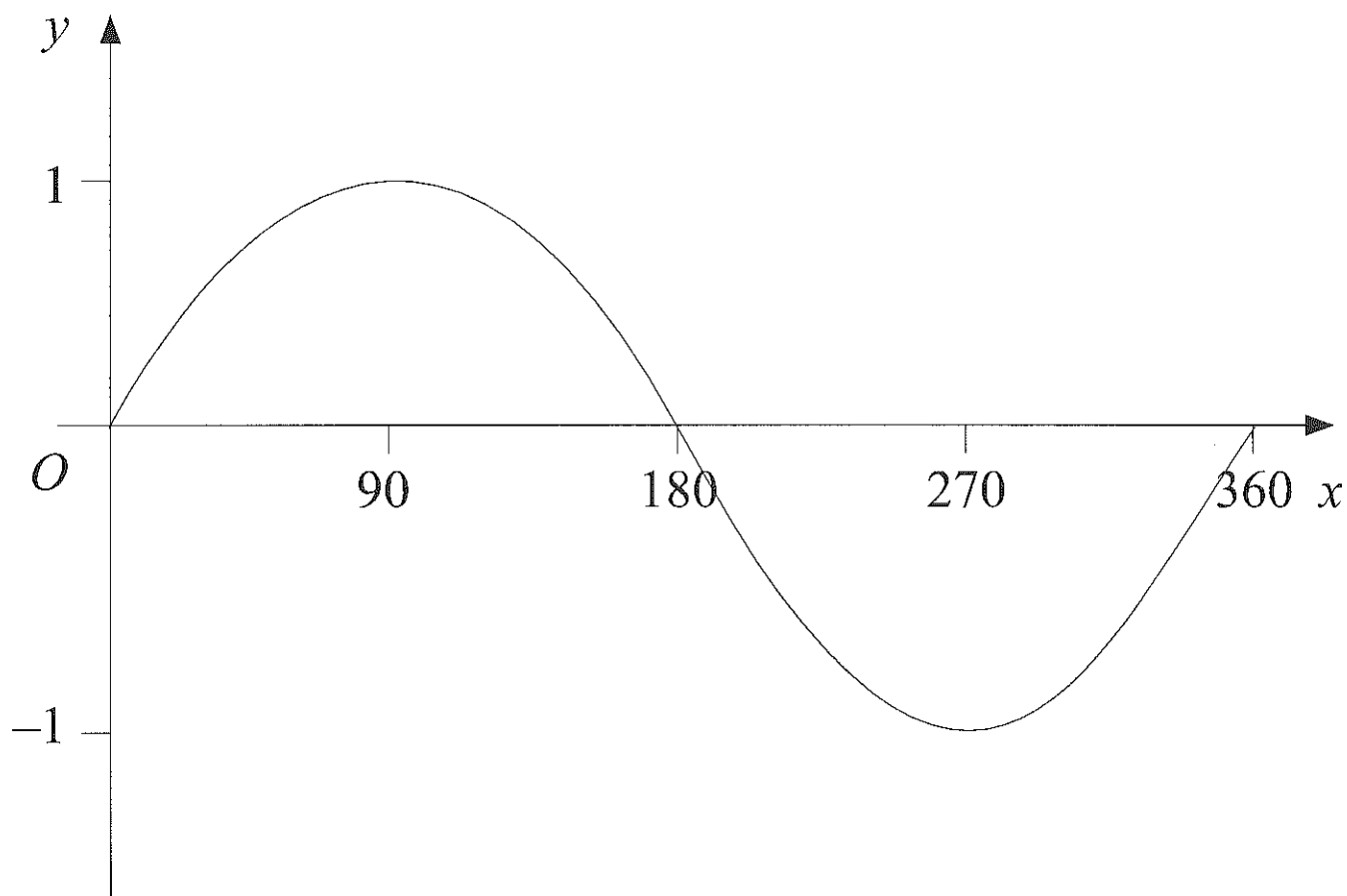
3.(a) Complete the table of values for  $y = \cos(x)$  (2)

$x$	0	30	60	90	120	150	180	210	240	270	300	330	360
$y$	1	0.866	$\frac{1}{2}$	0	$-\frac{1}{2}$	-0.866	-1	-0.866	$-\frac{1}{2}$	0	$\frac{1}{2}$	0.866	1

b) On the grid, draw the graph of  $y = \cos(x)$  (2)



4. Here is a sketch of the curve  $y = \sin x^\circ$  for  $0 \leq x \leq 360$

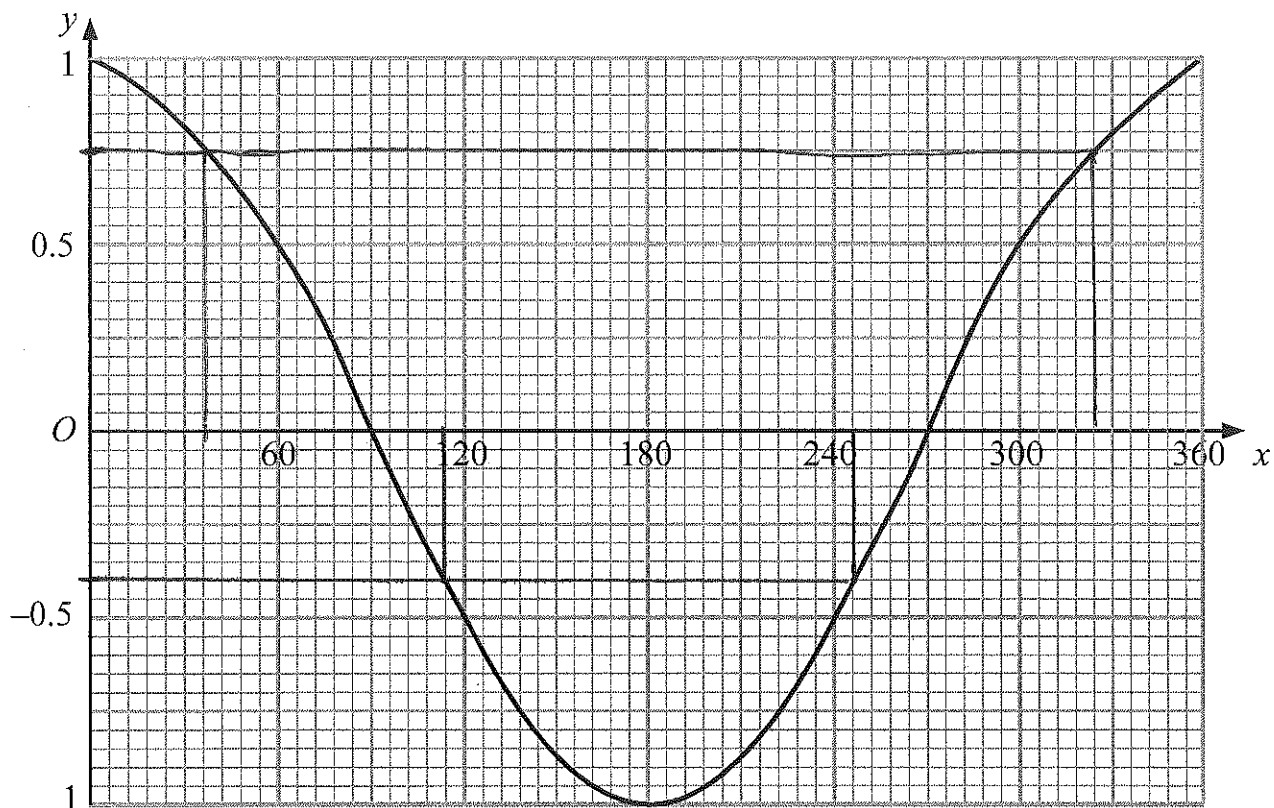


a) Given that  $\sin 30^\circ = \frac{1}{2}$ , write down the value of:

i)  $\sin 150^\circ$  .....  $\frac{1}{2}$  ..... (1)

ii)  $\sin 330^\circ$  .....  $-\frac{1}{2}$  ..... (1)

5. Here is a sketch of the curve  $y = \cos x^\circ$  for  $0 \leq x \leq 360$



a) Use the graph to find estimates of the solutions, in the interval  $0 \leq x \leq 360$ , of the equation:

i)  $\cos(x) = -0.4$

$114^\circ$  and  $246^\circ$  (2)

ii)  $4 \cos(x) = 3$

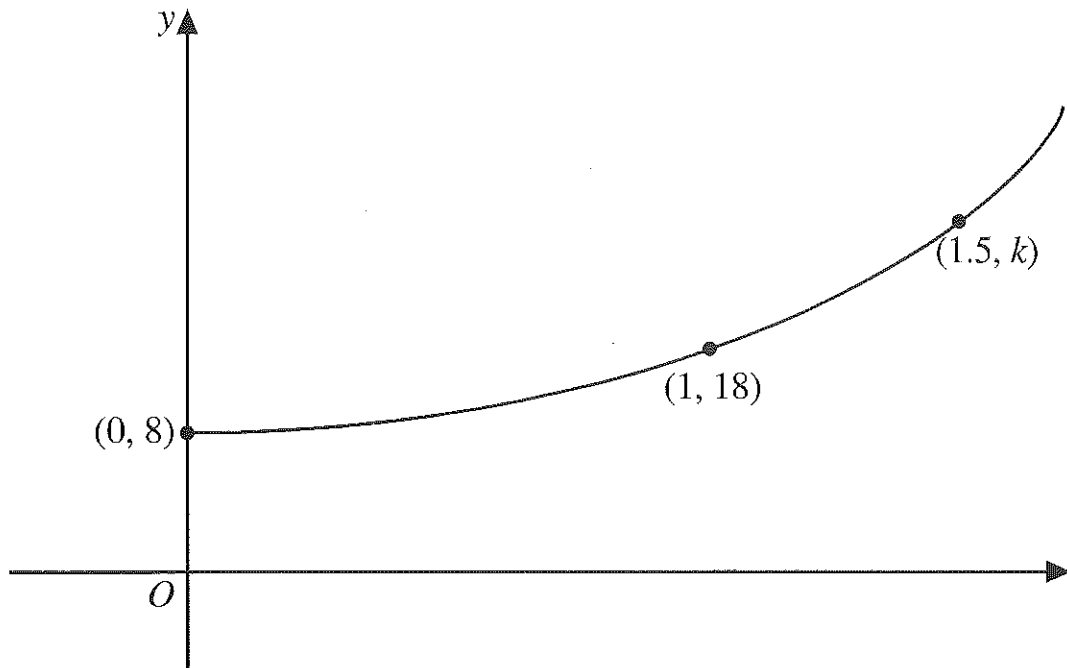
$\cos(x) = \frac{3}{4}$

$= 0.75$

$36^\circ$  and  $324^\circ$  (2)

6.

This sketch shows part of the graph with equation  $y = pq^x$ , where  $p$  and  $q$  are constants.



The points with coordinates  $(0, 8)$ ,  $(1, 18)$  and  $(1.5, k)$  lie on the graph. Calculate the values of  $p$ ,  $q$  and  $k$ .

$$y = pq^x$$

$$\begin{array}{l} (0, 8) \\ x \quad y \end{array} \quad \begin{array}{l} 8 = pq^0 \\ p = 8 \end{array}$$

$$\begin{array}{l} (1, 18) \\ x \quad y \end{array} \quad \begin{array}{l} y = 8q^x \\ 18 = 8q^1 \\ q = \frac{18}{8} = \frac{9}{4} \end{array}$$

$$\begin{array}{l} (1.5, k) \\ x \quad y \end{array} \quad \begin{array}{l} y = 8\left(\frac{9}{4}\right)^x \\ y \quad k = 8\left(\frac{9}{4}\right)^{\frac{3}{2}} \\ = 8\left(\frac{27}{8}\right) \end{array}$$

$$k = 27$$

$$\begin{array}{l} p = 8 \\ q = 9/4 \\ k = 27 \end{array}$$

(6)

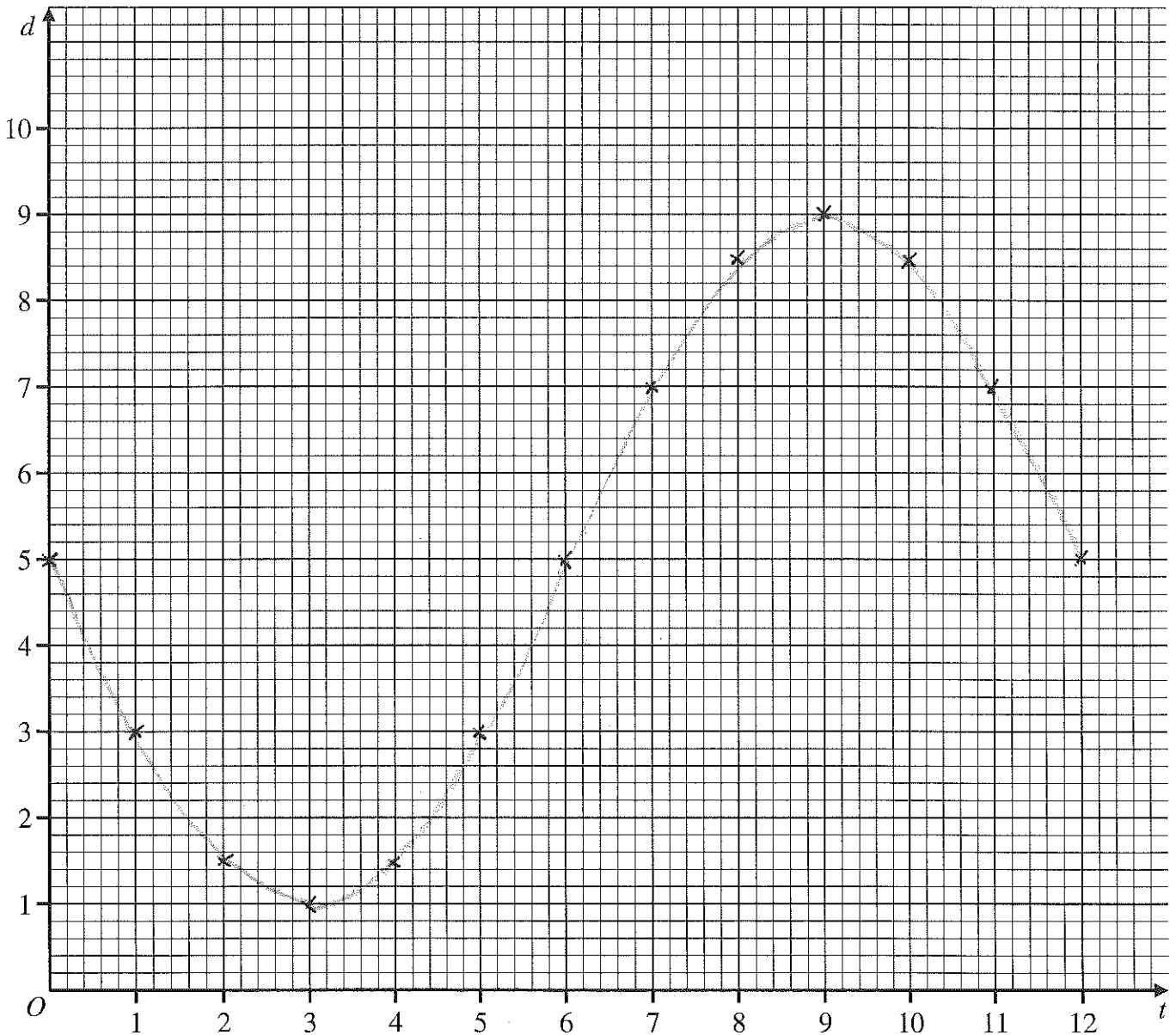
7.

The depth of water,  $d$  metres, at the entrance to a harbour is given by the formula:  $d = 5 - 4 \sin(30t)$  where  $t$  is the time in hours after midnight on one day.

a) On the axes below, draw the graph of  $d$  against  $t$  for  $0 \leq t \leq 12$ . (4)

$t$	0	1	2	3	4	5	6	7	8	9	10	11	12
$d$	5	3	1.54	1	1.54	3	5	7	8.46	9	8.46	7	5

(2dp)



b) Find the two values of  $t$ , where  $0 \leq t \leq 24$ , when the depth is least.

..... 3 ..... and ..... 15 ..... (1)