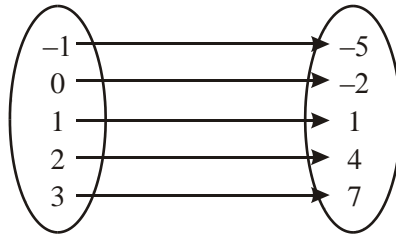


Trig Functions Review Problems from November and Specimen Papers

1. (a) A function f is represented by the following mapping diagram.



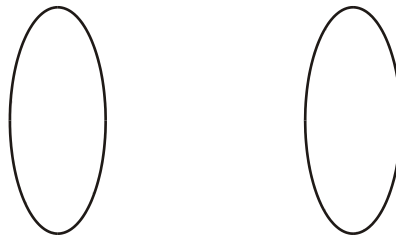
Write down the function f in the form

$$f: x \mapsto y, \quad x \in \{\text{the domain of } f\}.$$

- (b) The function g is defined as follows

$$g: x \mapsto \sin 15x^\circ, \quad \{x \in \mathbb{N} \text{ and } 0 < x \leq 4\}.$$

Complete the following mapping diagram to represent the function g .



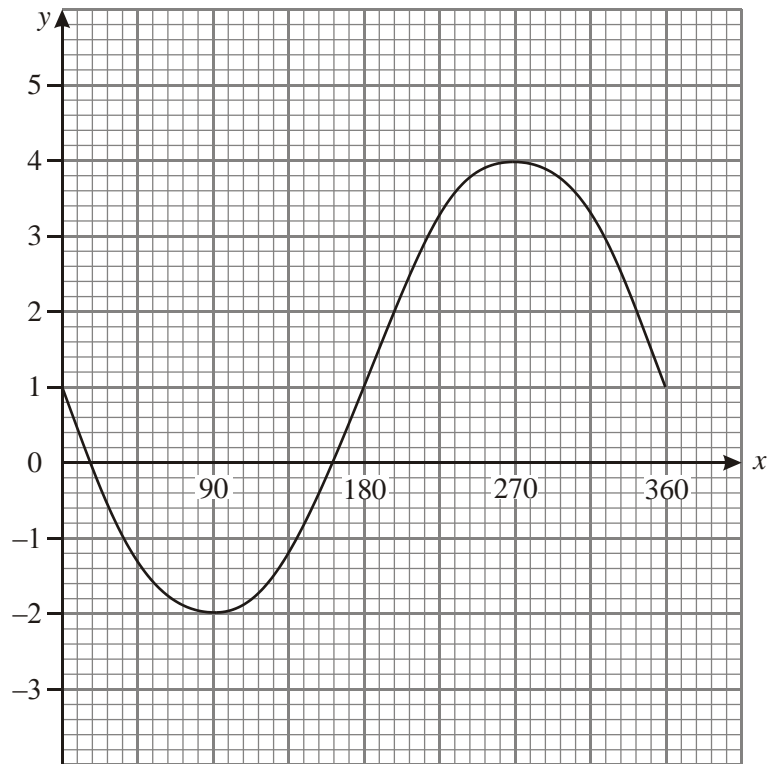
Working:

Answer:

(a)

(Total 4 marks)

2. The diagram below shows the graph of $y = -a \sin x^\circ + c$, $0 \leq x \leq 360$.



Use the graph to find the values of

- (a) c ;
- (b) a .

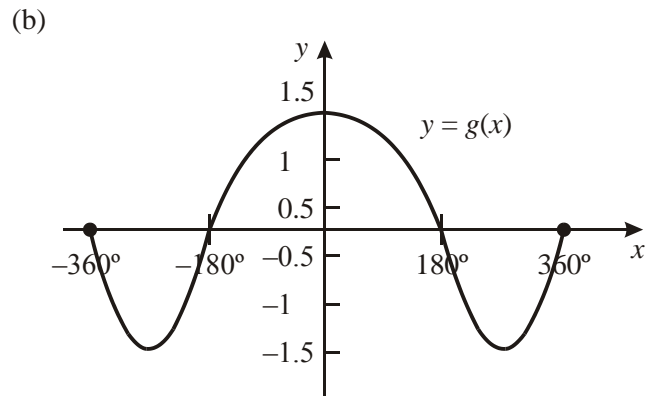
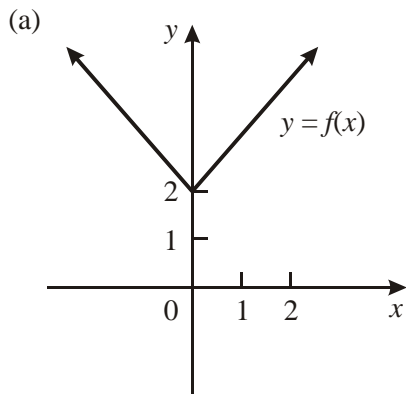
Working:

Answers:

- (a)
- (b)

(Total 4 marks)

3. The diagrams below show the graphs of two functions, $y = f(x)$, and $y = g(x)$.



State the domain and range of

(a) the function f ;

(b) the function g .

Working:

Answers:

(a) Domain of f

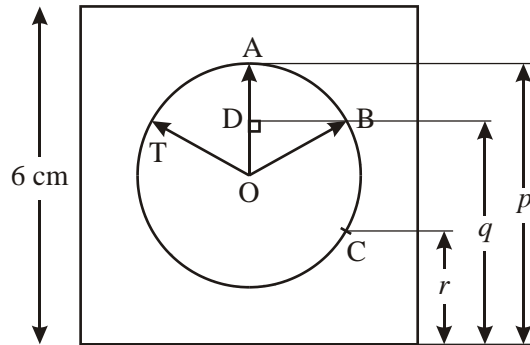
Range of f

(b) Domain of g

Range of g

(Total 8 marks)

4. The diagram below represents a stopwatch. This is a circle, centre O , inside a square of side 6 cm, also with centre O . The stopwatch has a minutes hand and a seconds hand. The seconds hand, with end point T , is shown in the diagram, and has a radius of 2 cm.

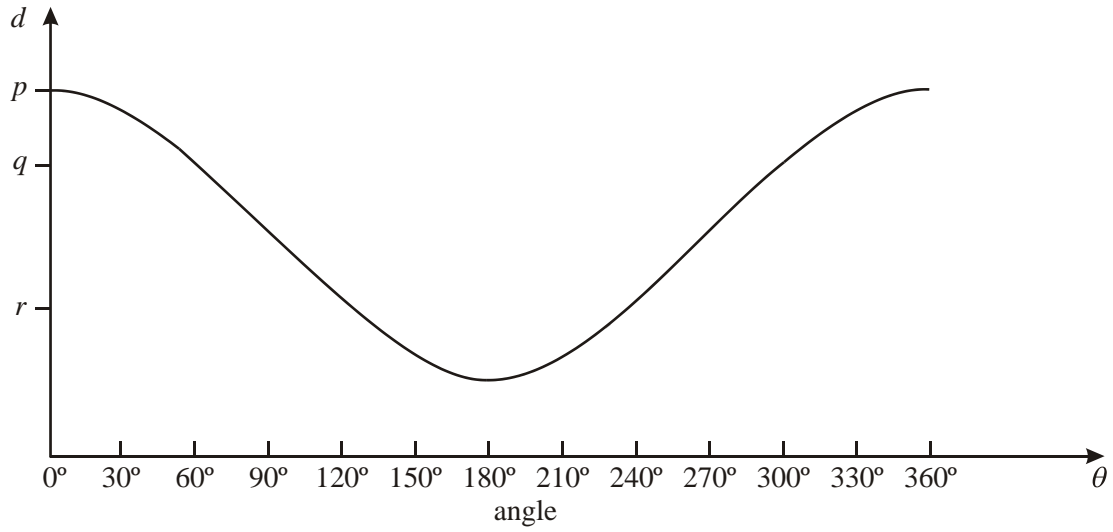


- (a) When T is at the point A , the shortest distance from T to the base of the square is p . Calculate the value of p . (2)
- (b) In 10 seconds, T moves from point A to point B . When T is at the point B , the shortest distance from T to the base of the square is q . Calculate
- (i) the size of angle AOB ;
 - (ii) the distance OD ;
 - (iii) the value of q .
- (5)
- (c) In another 10 seconds, T moves from point B to point C . When T is at the point C , the shortest distance from T to the base of the square is r . Calculate the value of r . (4)

Let d be the shortest distance from T to the base of the square, when the seconds hand has moved through an angle θ . The following table gives values of d and θ .

Angle θ	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
Distance d	p	4.7	q	3	r	1.3	1	1.3	r	3	q	4.7	p

The graph representing this information is as follows.

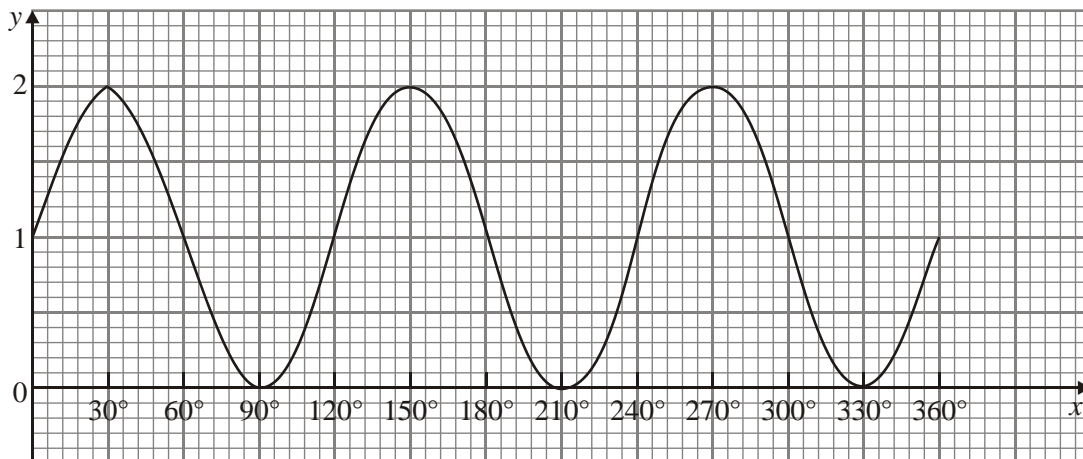


The equation of this graph can be written in the form $d = c + k \cos(\theta)$.

(d) Find the values of c and k .

(4)
(Total 15 marks)

5. The diagram shows the graph of $y = \sin ax + b$.



(a) Using the graph, write down the following values

- (i) the period;
- (ii) the amplitude;
- (iii) b .

(b) Calculate the value of a .

Working:

Answers:

- (a) (i)
- (ii)
- (iii)
- (b)

(Total 8 marks)

6. Consider the function $f(x) = 2 \sin x - 1$ where $0 \leq x \leq 720^\circ$.

- (a) Write down the period of the function.
- (b) Find the minimum value of the function.
- (c) Solve $f(x) = 1$.

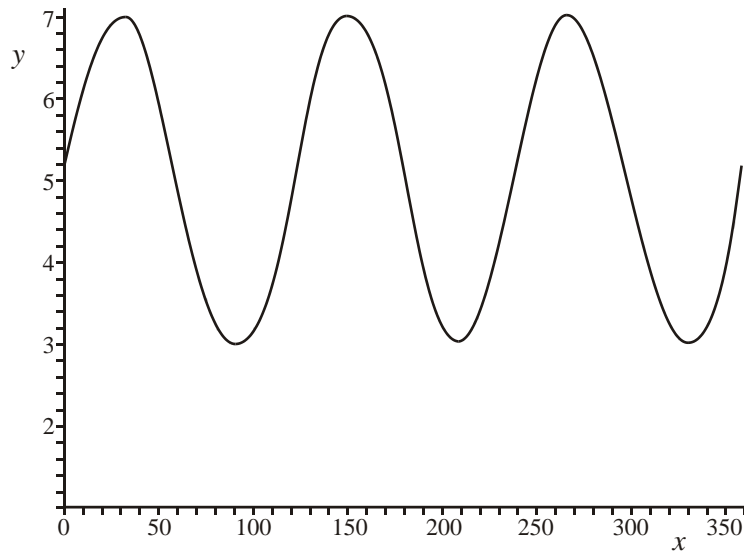
Working:

Answers:

- (a)
- (b)
- (c)

(Total 8 marks)

7. Below is a graph of the function $y = a + b \sin(cx)$ where a , b and c are positive integers and x is measured in degrees.



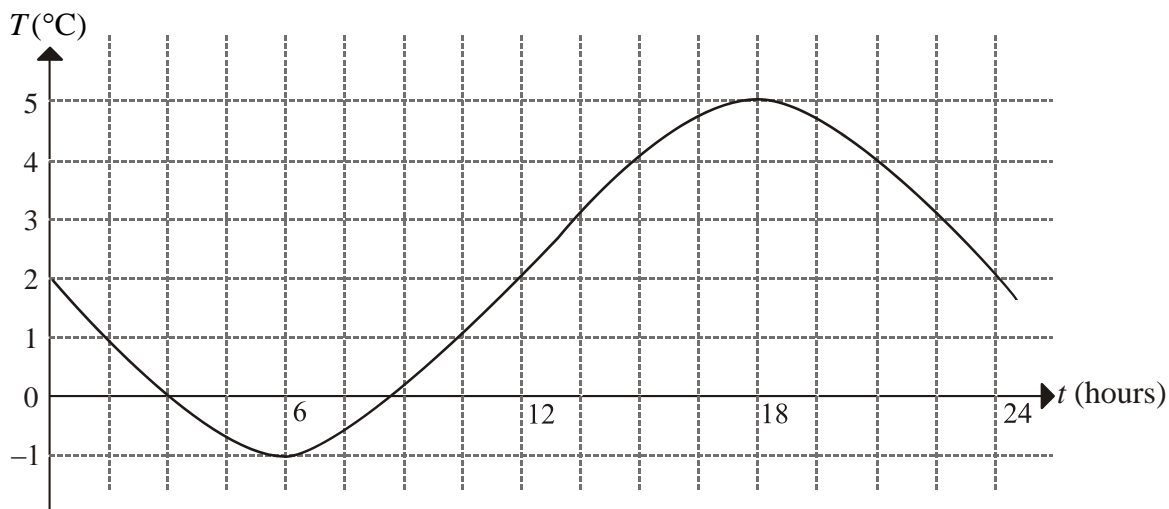
Find the values of a , b and c .

(Total 6 marks)

8. (a) Sketch the graph of the function $f: x \mapsto 1 + 2 \sin x$, where $x \in \mathbb{R}, -360^\circ \leq x \leq 360^\circ$. (4)
- (b) Write down the range of this function for the given domain. (2)
- (c) Write down the amplitude of this function. (1)
- (d) On the same diagram sketch the graph of the function $g: x \mapsto \sin 2x$, where $x \in \mathbb{R}, -360^\circ \leq x \leq 360^\circ$. (4)
- (e) Write down the period of this function. (1)
- (f) Use the sketch graphs drawn to find the number of solutions to the equation $f(x) = g(x)$ in the given domain. (1)
- (g) Hence solve the equation $1 + 2 \sin x = \sin 2x$ for $0^\circ \leq x \leq 360^\circ$. (4)

(Total 17 marks)

9. The temperature ($^{\circ}\text{C}$) during a 24 hour period in a certain city can be modelled by the function $T(t) = -3 \sin(bt) + 2$, where b is a constant, t is the time in hours and bt is measured in degrees. The graph of this function is illustrated below.



- Determine how many times the temperature is exactly 0°C during this 24 hour period.
- Write down the time at which the temperature reaches its maximum value.
- Write down the interval of time in which the temperature changes from -1°C to 2°C .
- Calculate the value of b .

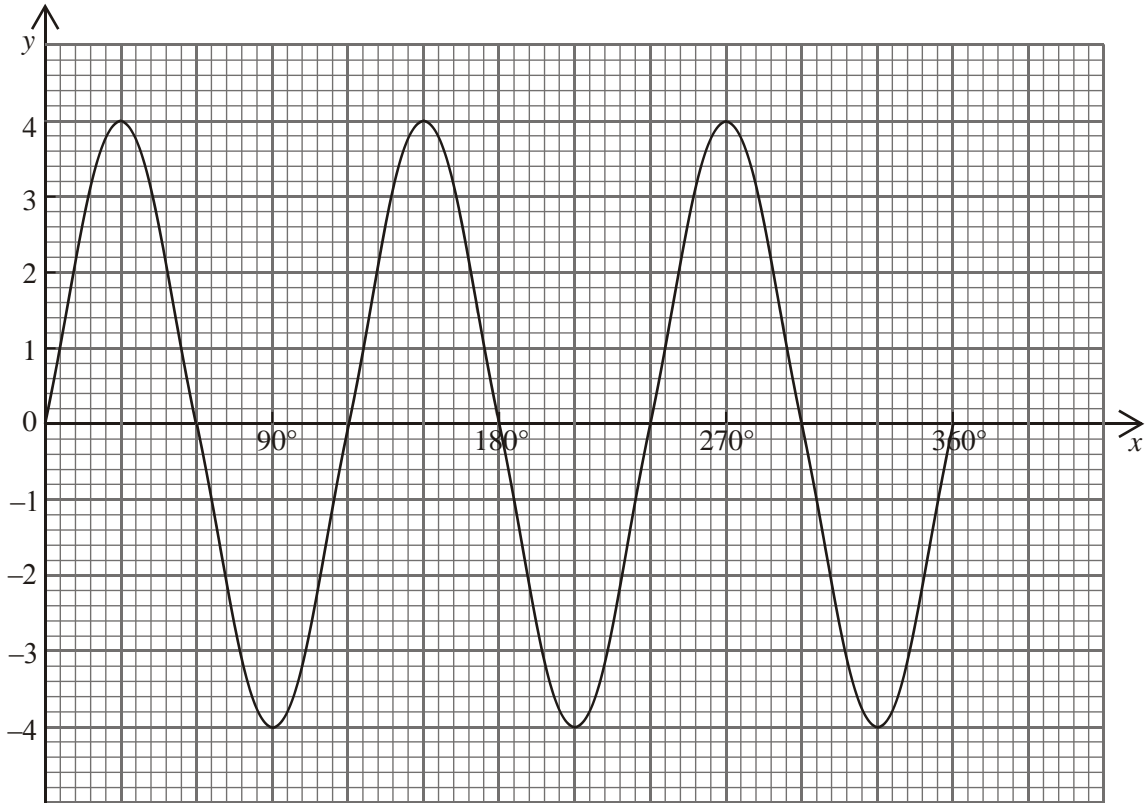
Working:

Answers:

-
-
-
-

(Total 6 marks)

10.



The graph represents the function $y = 4 \sin(3x)$.

- (a) (i) Write down the period of the function.
- (ii) Write down the amplitude of the function.
- (b) Draw the line $y = 2$ on the diagram.
- (c) Using the graph, or otherwise, solve the equation $4 \sin(3x) = 2$ for $0^\circ \leq x \leq 90^\circ$.

Working:

Answers:

(a) (i).....

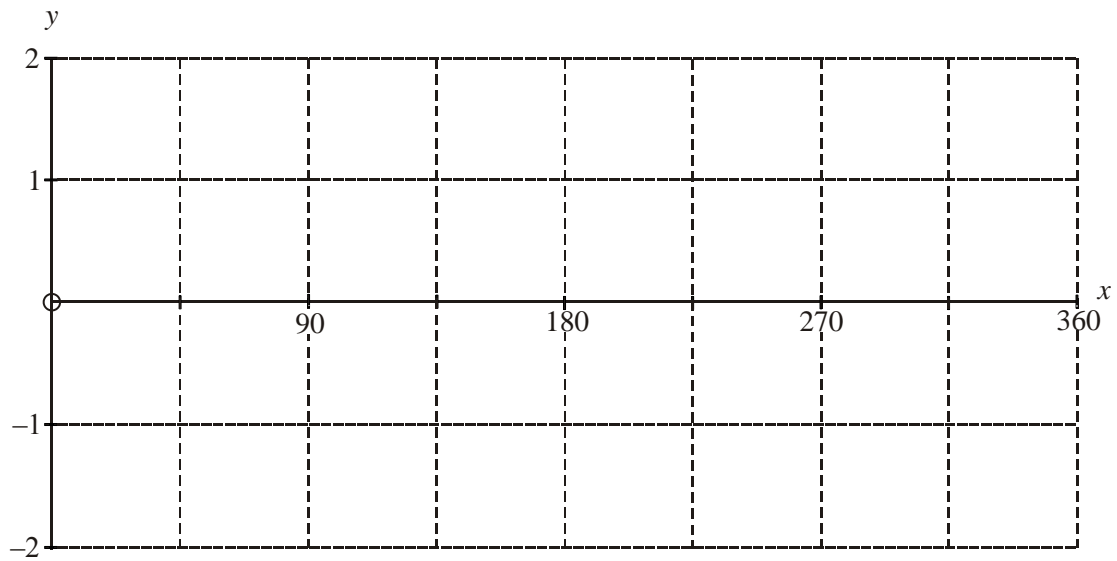
(ii).....

(c)

(Total 8 marks)

11. (a) Sketch the graph of the function $y = 1 + \frac{\sin(2x)}{2}$ for $0^\circ \leq x \leq 360^\circ$ on the axes below.

(4)



- (b) Write down the period of the function.

(1)

- (c) Write down the amplitude of the function.

(1)

Working:

Answers:

(b)

(c)

(Total 6 marks)