Maximum marks will be given for correct answers. Where an answer is wrong, some marks may be given for correct method, provided this is shown by written working. Working may be continued below the box, if necessary. Solutions found from a graphic display calculator should be supported by suitable working, e.g. if graphs are used to find a solution, you should sketch these as part of your answer.

1. The first five terms of an arithmetic sequence are shown below.

2, 6, 10, 14, 18

(a) Write down the sixth number in the sequence.

(b) Calculate the 200^{th} term.

(c) Calculate the sum of the first 90 terms of the sequence.

Working:

Answers:

(a) _____

(b) _____

(c) _____

2. The numbers of games played in each set of a tennis tournament were

9, 7, 8, 11, 9, 6, 10, 8, 12, 6, 8, 13, 7, 9, 10, 9, 10, 11,
12, 8, 7, 13, 10, 7, 7.

The raw data has been organised in the frequency table below.

games	frequency
6	2
7	5
8	*n*
9	4
10	4
11	2
12	2
13	2

(a) Write down the value of n.

(b) Calculate the mean number of games played per set.

(c) What percentage of the sets had more than 10 games?

(d) What is the modal number of games?

Working:

Answers:

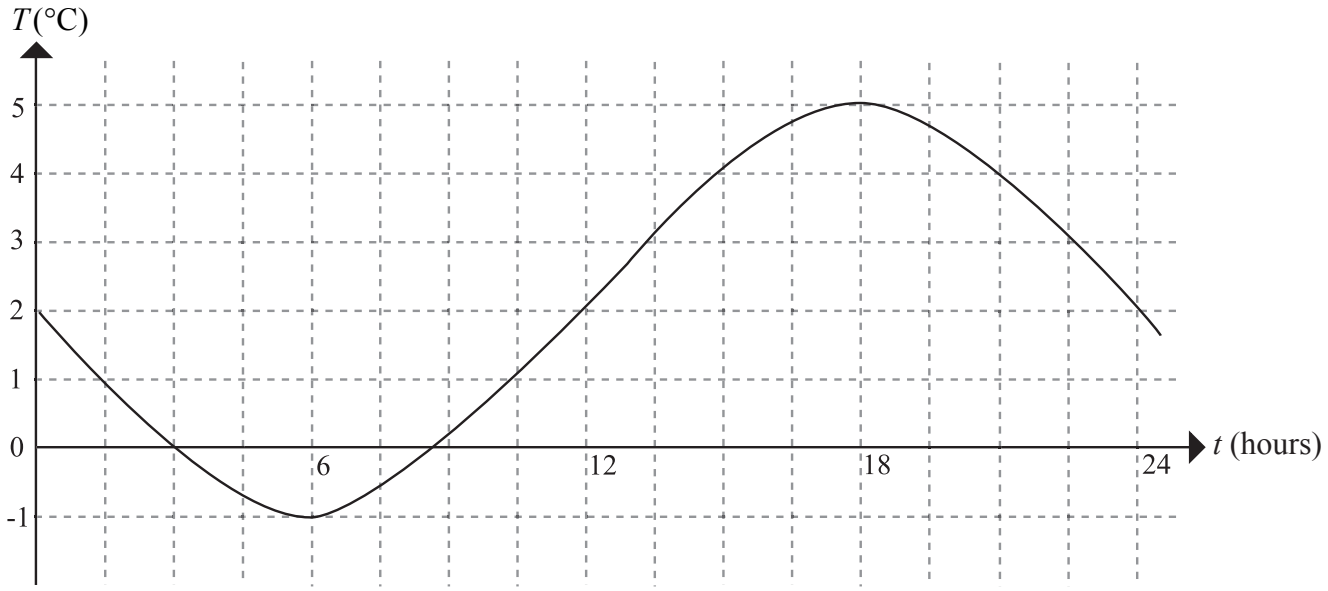
(a) _____

(b) _____

(c) _____

(d) _____

7. The temperature (°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.



(a) Determine how many times the temperature is exactly $0°C$ during this 24 hour period.

(b) Write down the time at which the temperature reaches its maximum value.

(c) Write down the interval of time in which the temperature changes from $-1°C$ to $2°C$.

(d) Calculate the value of b.

Working:

Answers:

(a) _____

(b) _____

(c) _____

(d) _____

8. The figure shows a triangular area in a park surrounded by the paths AB, BC and CA, where $AB = 400\text{ m}$, $A\hat{B}C = 50^\circ$ and $B\hat{C}A = 30^\circ$.

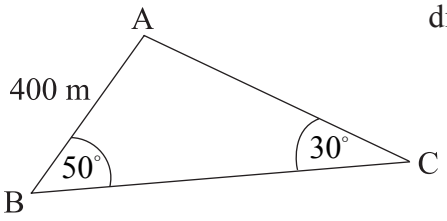


diagram not to scale

(a) Find the length of AC using the above information.

Diana goes along these three paths in the park at an average speed of 1.8 m s^{-1}.

(b) Given that $BC = 788\text{ m}$, calculate how many minutes she takes to walk once around the park.

Working:

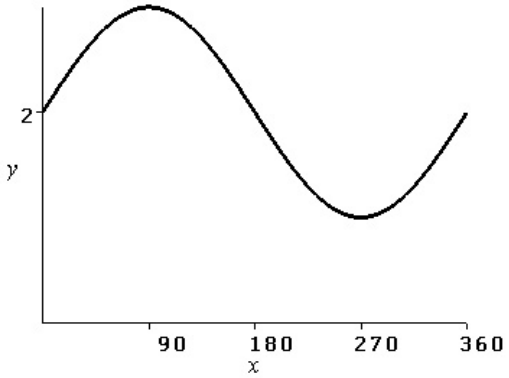
Answers:

(a) _____

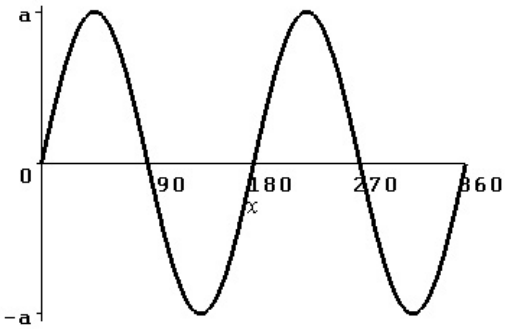
(b) _____

8. The graphs of three trigonometric functions are drawn below. The x variable is measured in degrees, with $0 \le x \le 360$. The amplitude 'a' is a positive constant with $0 < a \le 1$.

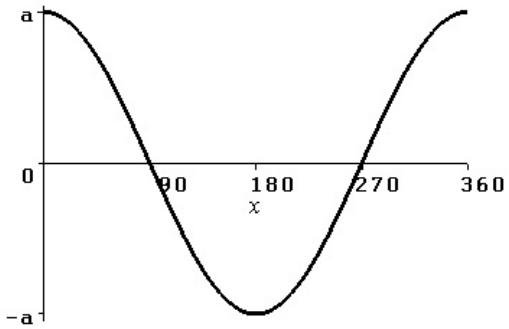
Graph A



Graph B



Graph C



(a) Write the letter of the graph next to the function representing that graph in the box below.

FUNCTION	GRAPH
$y = a\cos(x)$	
$y = a\sin(2x)$	
$y = 2 + a\sin(x)$	

(b) State the period of the function shown in graph B.

(c) State the range of the function $2 + a\sin(x)$ in terms of the constant a.

(This question continues on the following page)

13. Peter has marked 80 exam scripts. He has calculated the mean mark for the scripts to be 62.1. Maria has marked 60 scripts with a mean mark of 56.8.

(a) Peter discovers an error in his marking. He gives two extra marks each to eleven of the scripts. Calculate the new value of the mean for Peter's scripts.

(b) After the corrections have been made and the marks changed, Peter and Maria put all their scripts together. Calculate the value of the mean for all the scripts.

Working:

Answers:

(a) _____

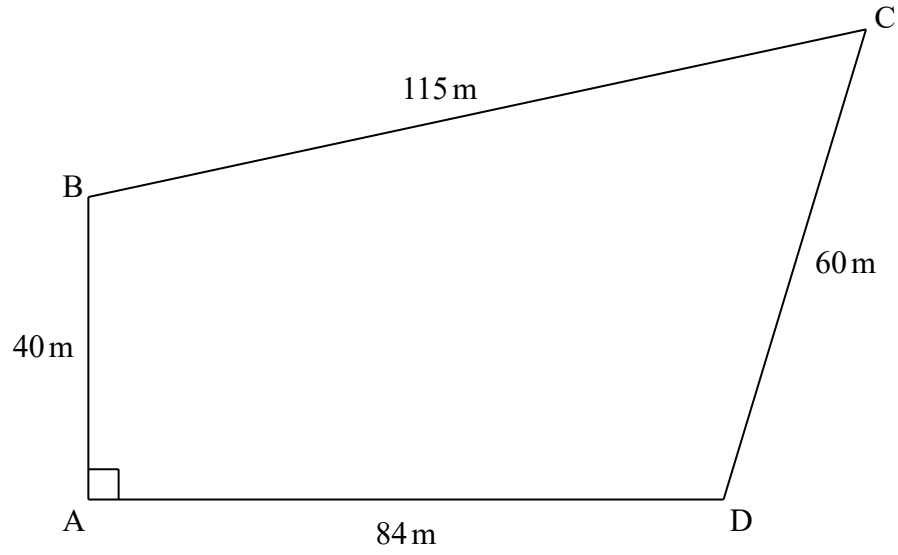
(b) _____

3. [Maximum mark: 13]

Abdallah owns a plot of land, near the river Nile, in the form of a quadrilateral $ABCD$. The lengths of the sides are $AB = 40\,\text{m}$, $BC = 115\,\text{m}$, $CD = 60\,\text{m}$, $AD = 84\,\text{m}$ and angle $B\hat{A}D = 90^\circ$.

This information is shown on the diagram.

diagram not to scale



(a) Show that $BD = 93\,\text{m}$ correct to the nearest metre. [2]

(b) Calculate angle $B\hat{C}D$. [3]

(c) Find the area of $ABCD$. [4]

The formula that the ancient Egyptians used to estimate the area of a quadrilateral $ABCD$ is

$$\text{area} = \frac{(AB + CD)(AD + BC)}{4}.$$

Abdallah uses this formula to estimate the area of his plot of land.

(d) (i) Calculate Abdallah's estimate for the area.

(ii) Find the percentage error in Abdallah's estimate. [4]