

Year 11 Foundations of Maths – Practice Exam 4

1. [1 + 2 + 3 + 2 = 8 marks]

A ship is sailing **north** at a constant speed of 10 km/hr. At 9.00 am a lighthouse, L is observed at a bearing of 040° . At 1.00 pm the lighthouse is observed at a bearing of 155° .

- (a) How far has the ship travelled between 9.00 am and 1.00 pm?
- (b) Draw a diagram to represent this situation.
- (c) Calculate the distance of the lighthouse from the ship at 1.00 pm. Express your answer to the nearest 0.1 km.
- (d) What is the bearing of the ship (S) from the lighthouse (L) at 1.00 pm? (Express your answer to the nearest degree).

2. [5 + 3 + 1 + 2 + 1 + 1 = 13 marks]

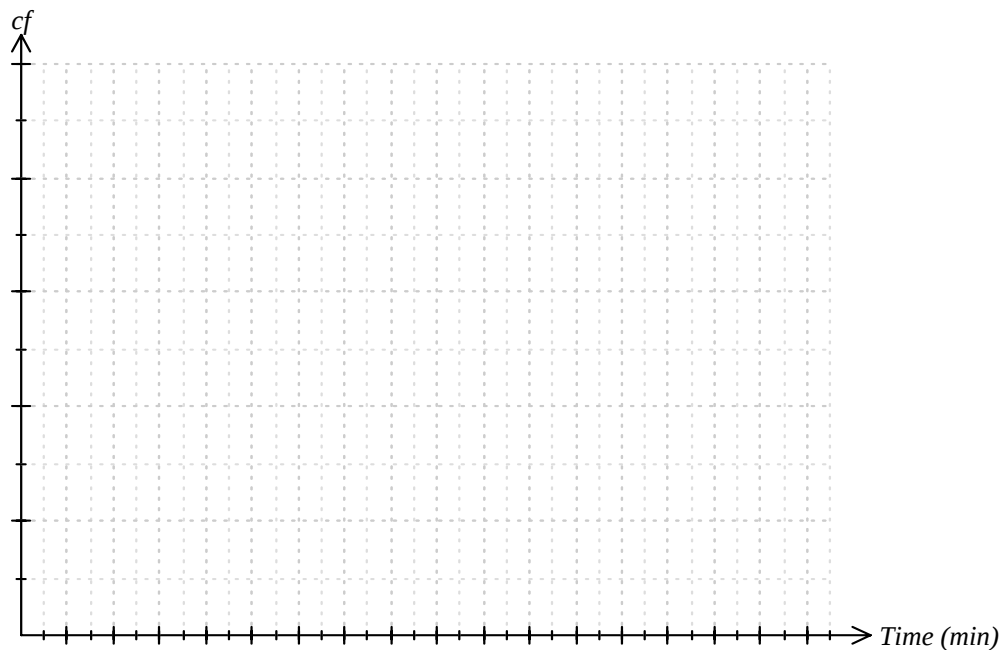
After a particularly excessive electricity bill, a mother timed the lengths of the next 50 of her teenage son's showers (in minutes).

- (a) Below is a frequency table showing time taken for 50 showers in class intervals. Complete the frequency table.

Class interval (Time - minutes)	Class boundaries	Frequency (f)	Cum Freq (cf)	% Cum Freq (%cf)
0 - 4			5	10
5 - 9		17		
10 - 14			37	74
15 - 19		7		
20 - 24		3	47	
25 - 29		2		98
30 - 34			50	100

- (b) Draw a cumulative frequency graph using the frequency table above on the grid provided below.

Cumulative Frequency Graph



2. [Continued...]

(c) Use the cumulative frequency graph to estimate the answers to the following:

(i) What is the median length of the son's showers?

(ii) Determine the interquartile range.

(iii) What percentage of showers exceeded 12 minutes?

(iv) The mother tried to reward her son with \$1 extra pocket money for every shower under 9 minutes in length. How much extra pocket money should the son receive?

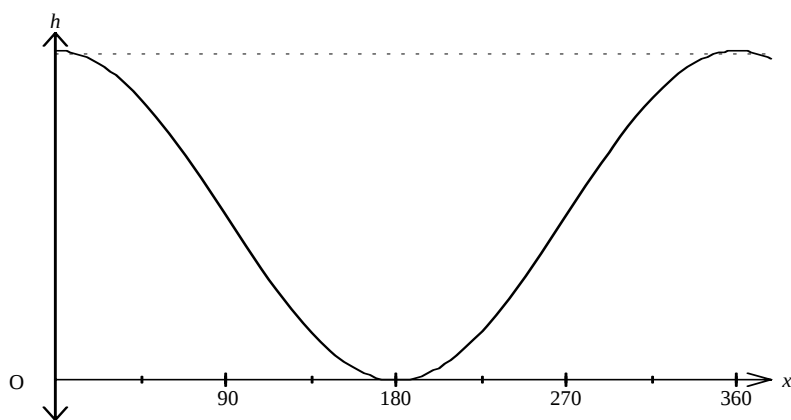
3. [2 + 2 + 3 = 7 marks]

A section of roller coaster in an amusement park is described by the function,

$$h = 15 \cos x^\circ + 15 \quad ,$$

where h metres is the height above ground level (the x -axis) and x metres is the horizontal distance from the point O (the origin).

3. [Continued...]



Determine:

- (a) The height at the top of the track.
- (b) The height of the roller coaster when its horizontal distance from point O is 50 metres.
- (c) For what value(s) of x is the height (h) of the roller coaster 20 metres?

4. [4 marks]

Match the graphs with the appropriate equation from the list below

1. $y = (x - 2)^2 + 3$

7. $y = (x + 2)^2 - 3$

2. $y = (x - 2)^3 + 3$

8. $y = x^2 + 4x + 4$

3. $y = 2^x$

9. $y = \sqrt{x + 2} - 4$

4. $y = \sqrt{x - 2} - 4$

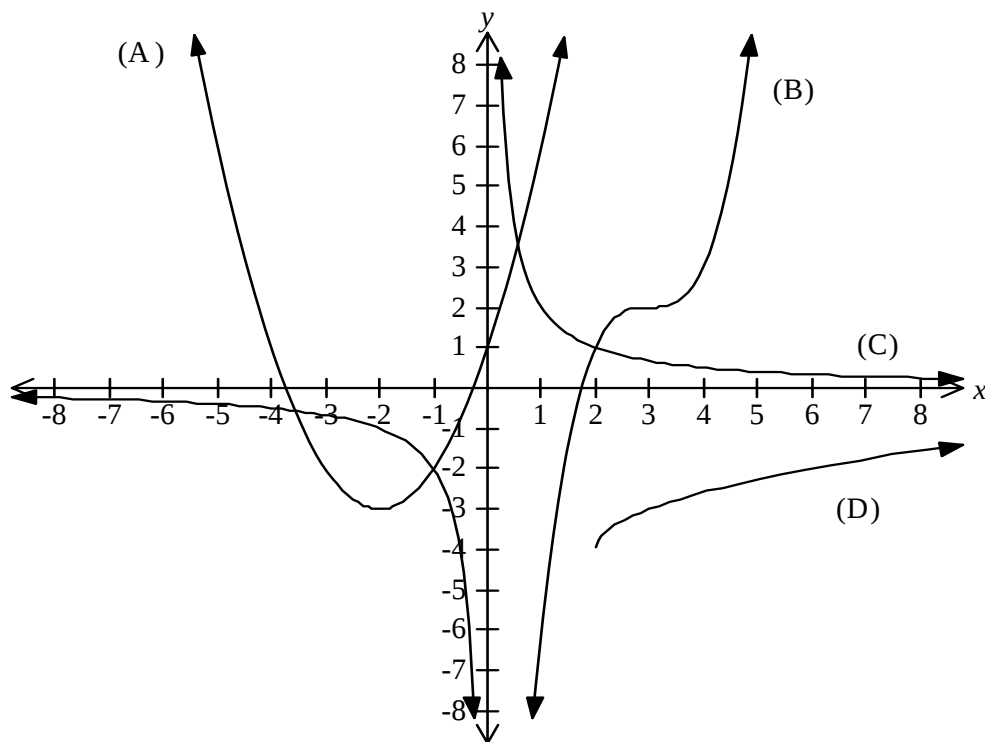
10. $y = \frac{1}{x}$

5. $y = \sqrt{x - 4} - 2$

11. $y = (x - 3)^3 + 2$

6. $y = x^3 + 2$

12. $y = \frac{2}{x}$



Graph A = _____

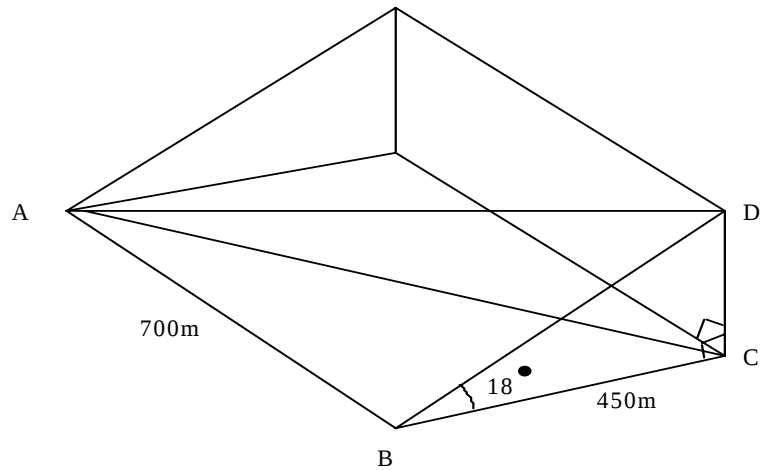
Graph B = _____

Graph C = _____

Graph D = _____

5. [2 + 2 + 2 + 3 + 2 = 11 marks]

- (a) The wedge below models a hill up which engineers have to construct a road. The length of AB is 700m, BC is 450m and the angle of greatest slope $\angle CBD$ is 18° .

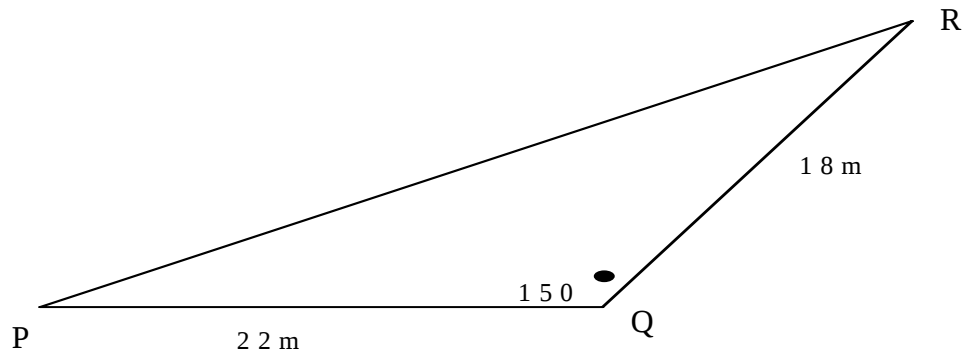


Calculate:

- (i) the height of the hill CD,
- (ii) the length of the diagonal AC,
- (iii) the size of the angle of the least slope $\angle CAD$.

5. [Continued...]

- (b) A farmer has a paddock for ewes and lambs and he decides to fence off the corner PQR as shown in the diagram.

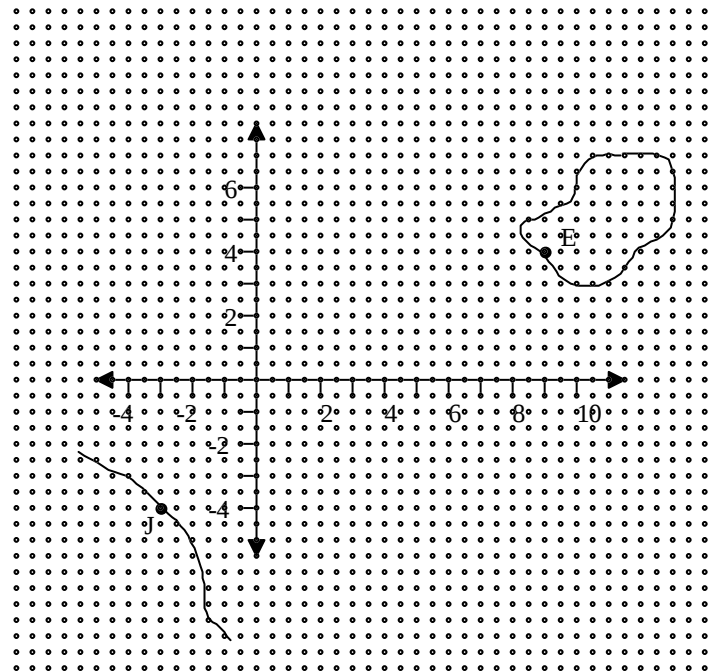


If PQ and QR are already fenced and are 22 metres and 18 metres respectively, find:

- (i) the length PR still to be fenced (to two one decimal place).
- (ii) the area of the enclosed paddock PQR .

6. [2 + 2 + 3 + 3 + 2 = 12 marks]

A ferry boat leaves the jetty (J) , to travel to Eagle Island (E).



(1 Unit = 1 km)

(a) How far is the journey? (Assume the ferry travels in a straight line).

Half way there the ferry boat breaks down and has to signal for help.

(b) What are the coordinates of the ferry's breakdown position?

(c) Find the equation of the line representing the ferry boat's journey.

6. [Continued...]

A Sea Rescue boat at $(1,4)$ picks up the ferry's distress signal and immediately heads towards the breakdown position.

- (d) What is the equation of the line representing the rescue boat's course, given that the line is perpendicular to the ferry boat's course?

A large rock is observed at $(1.4, 3.2)$.

- (e) If the Sea Rescue boat maintains its present course will it hit the rock?
(Justify your answer mathematically)

7. $[2 + 3 + 2 + 1 + 1 + 1 = 10 \text{ marks}]$

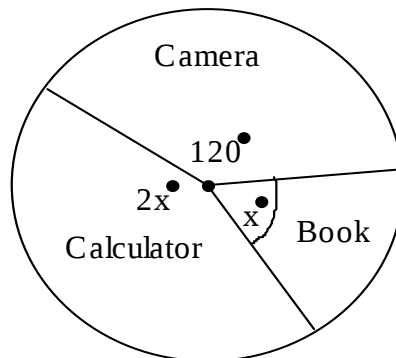
- (a) The three numbers x , y and 25 have a mean of 27.
The five numbers x , y , 25, p and q have a mean of 41.

Find:

- (i) the value of $x + y$.
- (ii) the mean of p and q .

7. [Continued...]

- (b) Each child in a group of 120 was asked to choose a camera or a book or a calculator as a present. Their choices are represented on the given pie chart.



Calculate:

- (i) the value of x ,
- (ii) the fraction of the group that chose a calculator,
- (iii) the number of children who chose a camera,
- (iv) the percentage of children who chose a book.

8. [1 + 2 + 1 + 1 = 5 marks]

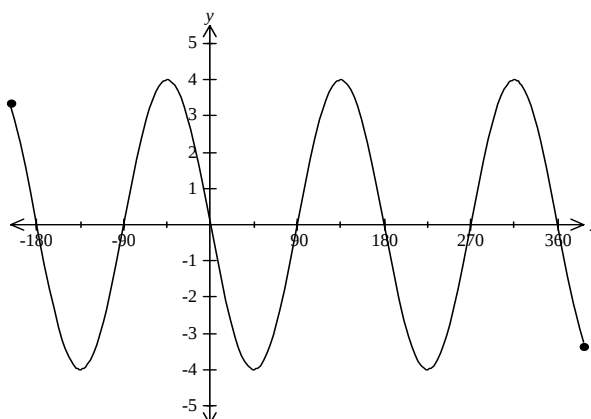
The Magellan Cricket Club is planning a film night to raise funds for sporting equipment. The cost of hiring the theatre is made up of two parts, a fixed charge for the hire of the theatre and a charge of \$5 per person who attends. An attendance of 45 people will cost the club \$ 475 .

- (a) Find the fixed cost of hiring the theatre.
- (b) Write an equation for the cost (C) of hiring the theatre in terms of the number (n) of people attending.
- (c) Calculate the cost if 70 people attended the film night.
- (d) How many people attended if the cost is \$ 400.

9. [3 + 3 + 4+ 1 + 2 = 13 marks]

- (a) State the period and amplitude and hence the equation for the following two graphs.

(i)



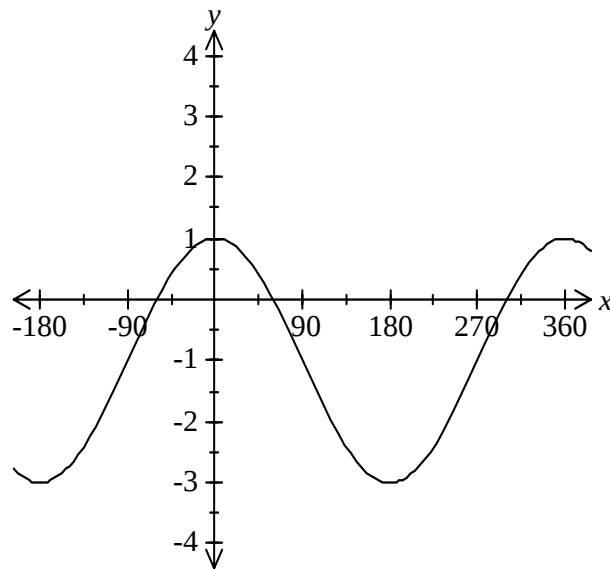
Period _____

Amplitude _____

Equation _____

9. [Continued...]

(ii)



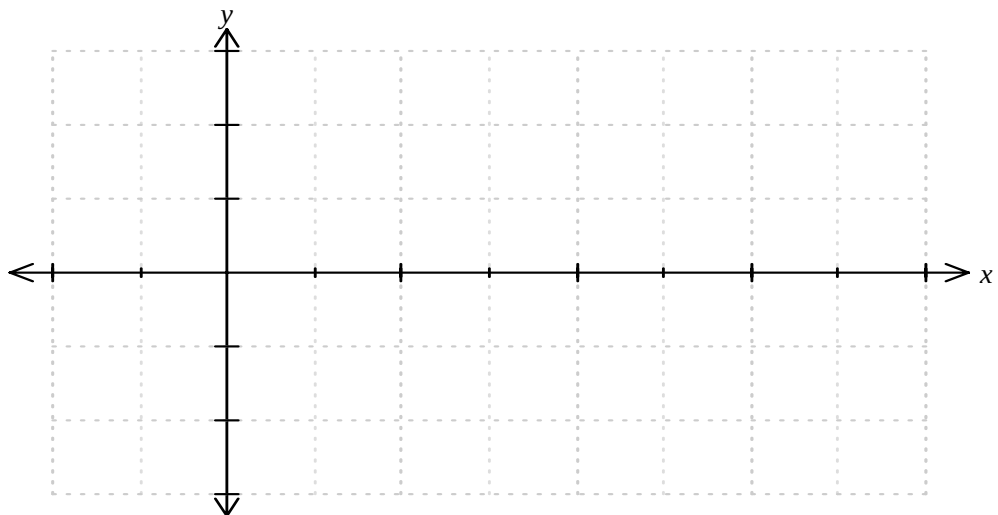
Period _____

Amplitude _____

Equation _____

(b) Sketch the following trigonometric equations on the same set of axes below for the domain $0^\circ \leq x \leq 360^\circ$. (Show your scale clearly for the x and y axes)

(i) $y = \sin x + 1$ and $y = -2 \cos x$



9. [Continued...]

Find the solution(s) to the following equations. (All solutions to the nearest degree).

(ii) $\sin x + 1 = 0$

(iii) $\sin x + 1 + 2 \cos x = 0$

10. [4 + 1 + 1 + 2 + 2 = 10 marks]

A total of 80 cars were observed in a car park in Paris. Of these, 50 had car radios, 60 had fog lights and 10 had neither.

(a) Complete the two way table below.

	Radio	No radio	Totals
Fog lights			
No fog lights			
Totals			

(b) Use your two way table of results to determine

(i) how many cars had fog lights and a radio,

(ii) the number of cars which had a radio but no fog lights,

(iii) the percentage of cars which had fog lights only.

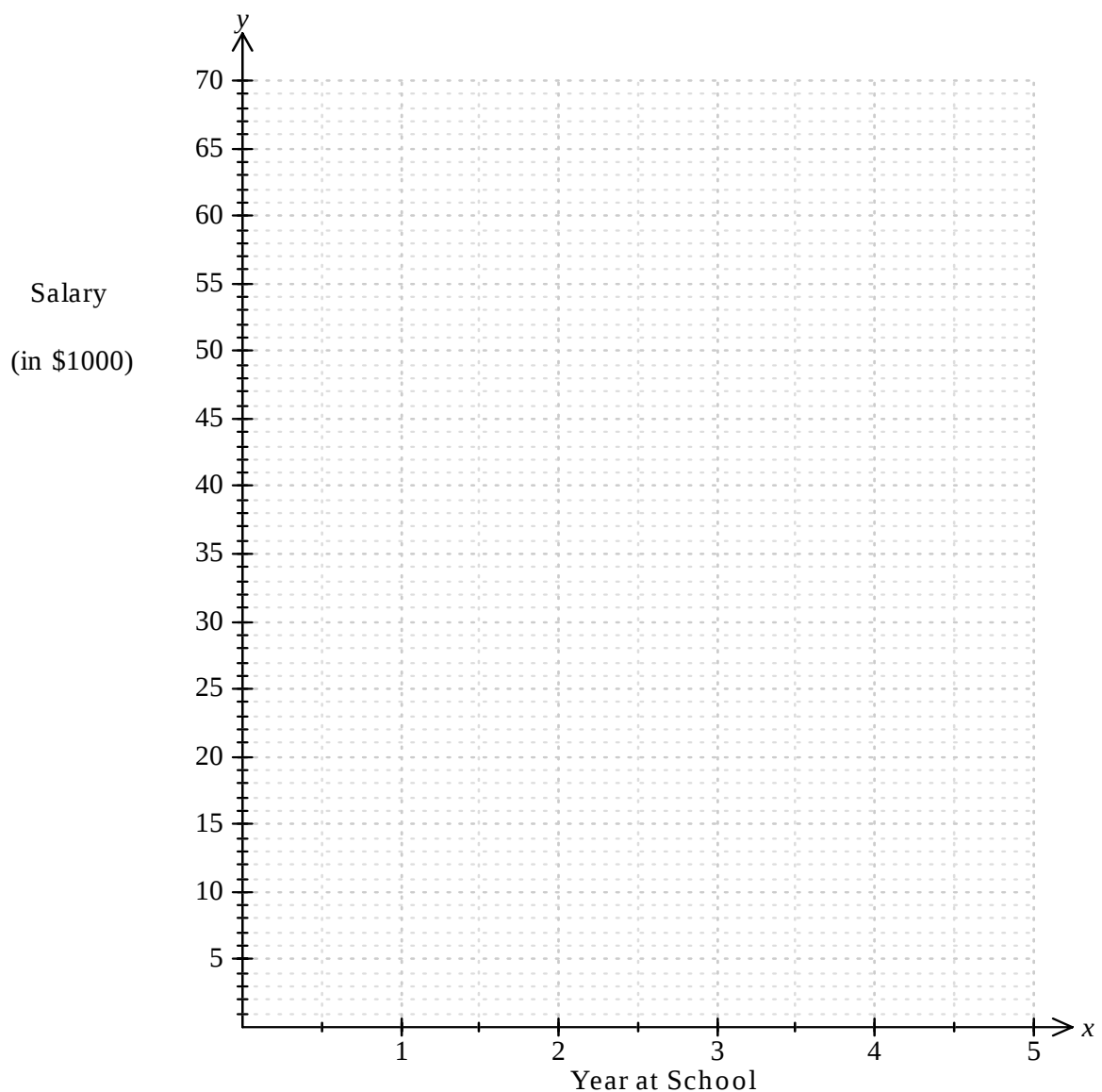
(c) What percentage of those who had radios also had fog lights?

11. [3 + 1 + 1 + 1 + 1 + 1 = 8 marks]

A survey was conducted to investigate the relationship between the number of years spent in high school and the annual salary of workers. The results are shown in the table below.

Years at school	5	4	5	2	3	4	5	3	4	2	4.5	3
Salary (in \$1000)	30	25	64	12	21	14	42	16	20	44	28	9

(a) Draw a scattergraph of this information. Use the grid below:



11. [Continued...]

- (b) Using the "eyeballing" technique, draw the line of best fit.
- (c) How many people were in the survey?
- (d) Comment on the relationship by completing the statement below:
"As the number of years spent in high schoolso does the salary".
- (e) Use the graph to predict the years spent at high school for a person earning \$ 35 000 annually?
- (f) Comment in the reliability of this prediction. Give reasons based on the strength of the relationship.

12. [1 + 1 + 4 = 6 marks]

- (a) Solve the following equations:

(i)
$$\frac{5m - 2}{4} = \frac{m + 4}{3}$$

12. [Continued...]

(ii) $2k^2 - 15k + 25 = 0$

- (b) The Tournament Secretary of the Lesmurdie Table Tennis Club is preparing the financial report but cannot remember what amounts the entry fees were set at. The Secretary finds that 80 senior players and 50 junior players participated on Saturday, when the takings were \$730. On Sunday 90 seniors and 40 junior players participated and the takings were \$740. What were the fees charged to senior and junior players for entry to the tournament.

Use simultaneous equations to solve the problem.

13. [9 marks]

The weights (in kilograms) of 16 students were recorded for a health and fitness test.

68, 47, 61, 50, 54, 58, 46, 68

57, 49, 49, 53, 48, 59, 60, 68

For these weights find the:

- (a) mean,
(b) mode,
(c) standard deviation.

13. [Continued...]

It was discovered that the scales used for measuring the weights were defective. The scales were recording a weight of 2 kilograms less than the actual amount.

For the actual weights, find the

(d) mean,

(e) mode,

(f) standard deviation.

A new slimming diet states that, “it will reduce your weight by 10% after two weeks”. If all 16 students underwent the slimming diet, predict the following given that they are all successful.

(g) mean,

(h) mode,

(i) standard deviation.

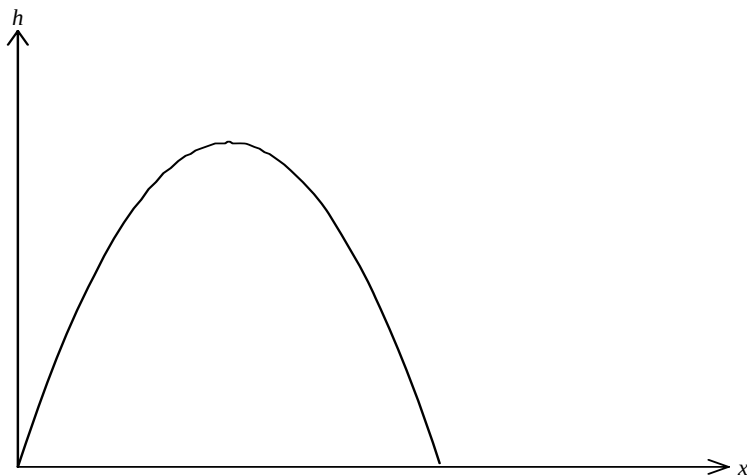
14. [4 + 4 + 1 = 9 marks]

A distress call received by the Royal Australian Navy, gives a yacht's location at $(30^{\circ}S, 90^{\circ}E)$. Rescue vessel A is located at $(30^{\circ}S, 105^{\circ}E)$ while rescue vessel B is located $(20^{\circ}S, 90^{\circ}E)$. Assume that the radius of the earth is 6 400 km.

- (a) Find the distance along the common line of latitude between the yacht and rescue vessel A.
- (b) Find the distance along the common line of longitude between the yacht and rescue vessel B.
- (c) If both rescue vessels are travelling at the same speed, which vessel will reach the yacht first?

15. [1 + 1 + 1 + 2 + 1 + 2 + 3 = 11 marks]

- (a) A hacienda styled house in Fremantle has a doorway arch whose shape is a parabola.



15. [Continued...]

The equation of the parabola is described by:

$$y = 5x - 2x^2$$

Where h is the height (in metres) of the arch above the floor and x is the horizontal distance (in metres) at floor level from one side of the doorway towards the other.

Using your graphics calculator (or otherwise) , find:

(i) the equation of the axis of symmetry of the arch,

(ii) the maximum height of the arch,

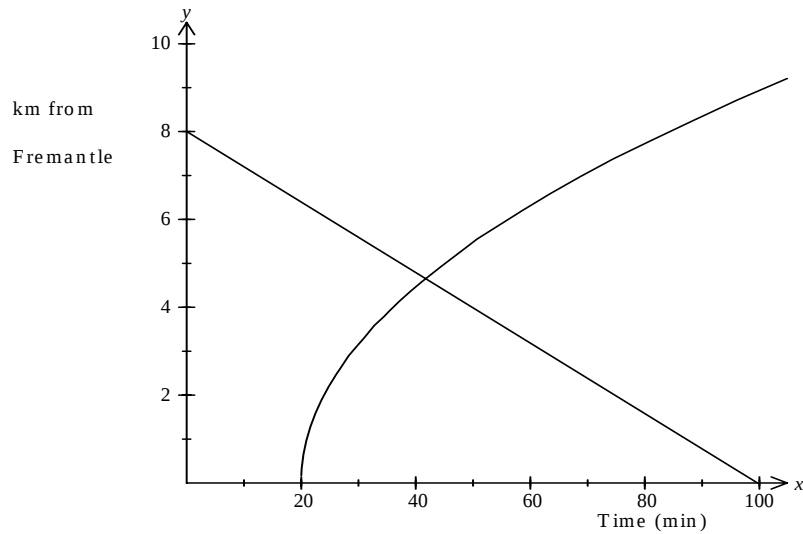
(iii) the width of the arch at floor level.

- (b) The figure below shows the distance versus time graph for Agatha and Gerturde, who were out enjoying the fresh air. They started at opposite ends of a long road. Gertrude started near Fremantle and Agatha started at Fremantle. Agatha's journey is described using the equation

$$y = -0.08x + 8 \text{ ,}$$

while Gertrude's path is described by the equation $y = \sqrt{x - 20}$.

15. [Continued...]



- (i) Who was running and who was walking? Give reasons.
- (ii) How far apart were their starting points?
- (iv) For how many minutes had Agatha been travelling when she met Gertude? (Round answer to the nearest minute. Graphics calculators can be used).

15. [Continued...]

Graph the functions above on your graphics calculators and find the domain and range of each.

(iv) Function A: $y = -0.08x + 8$

Domain: _____

Range: _____

(v) Function G: $y = \sqrt{x - 20}$

Domain: _____

Range: _____

16. [4 marks]

The Coordinator of the Year 11 students at Magellan calls an assembly in the gym because there are less than the 100 students at school.

He asks the students to get into two equal rows, but finds that when they try this there is one student left over.

He then asks the students to get into three equal rows instead but finds there are now two students left over.

When the Coordinator asks the students to get into four equal rows he finds that there are three students left over and when he tries five equal rows he finds there are now four students left over.

In one last attempt, he asks the students to get into six equal rows only to find that there are five students left over.

How many Year 11 students are at the assembly?