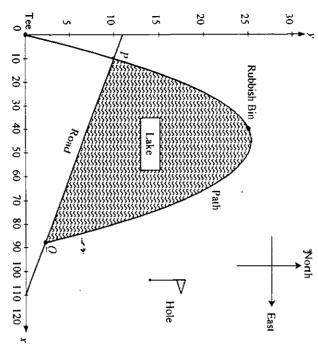
#### Question 1

Betty Irons is playing golf at Sanctuary Bay Golf Club. She is standing on the first tee and notices that there is a large lake between her and the hole. On one edge of the lake is a curved path for the golfers to walk to the hole. On the other edge is a straight road for golf carts to travel on.

The straight road and curved path intersect at each end of the lake. The first intersection point,  $P_1$  is 10 metres north and 10 metres east of the first tee. Part way along the path is a rubbish bin. The rubbish bin is a further 30 metres east and 15 metres north of this intersection.

If the tee is taken to be the origin (0,0), then the diagram below represents Sanctuary Bay's first hole.



**a.** Give the coordinates of the first intersection point, P, of the path and the road

mai		1
	Give the coordinates of the rubbish bin.	亨
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	e. Show that the coordinates of the second intersection point between the road and path, $Q$ , are (88, $\frac{11}{5}$ ).	d. Given that the road is 11 metres directly north of the tee, find a linear equation that describes the road.		c. The curved path follows a general quadratic shape given by the rule $y = ax^2 + bx + c$ , where $a$ , $b$ and $c$ are real constants. Find the exact values for $a$ , $b$ and $c$ and thus the equation of the path.
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Assuming that the lake has a constant depth, what is the volume of water in the lake? Give your answer to the nearest cubic metre.  I marks	
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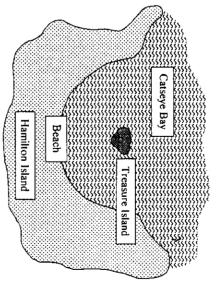
says, "No diving! Lake is only 1.2 metres deep!"

lake. She notices that the lake is full to each edge and that there is a sign next to the lake which Betty works for The Southern Water Company and is interested in the amount of water in the

#### Question 2

walk out to Treasure Island without getting wet At high tide, Treasure Island is almost covered with water. At low tide Mark and Joanne can known as Catseye Bay. In Catseye Bay there is a small, off-shore island called Treasure Island Mark and Joanne are holidaying in a resort on Hamilton Island, which overlooks a small bay While lying on the beach, Mark and Joanne notice the dramatic tidal changes in Catseye Bay

A map of Hamilton Island and Catseye Bay is shown below



The tidal movements in Catseye Bay can be approximated by the following equation:

$$D(t) = 3 + 3.5\cos\frac{\pi}{6}(t - 8)^{n/3}$$

where D is the maximum depth of the water in Catseye Bay in metres and t is the time in hours. Time, t = 0 is taken to be midnight, Saturday the 18th of April.

How many hours are there between consecutive high tides?

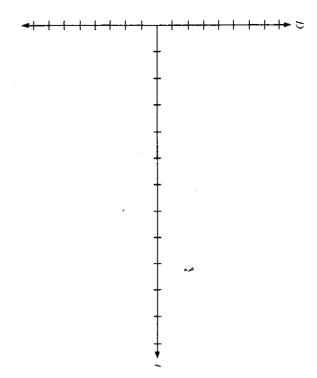
l mark	
What is the maximum depth of the water at high tide?	<b>=</b> :
l mark	

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minute

Between what times during daylight hours on Sunday would Mark and Joanne be able to walk out to Treasure Island without getting wet? Give your answers to the nearest

5 Graph the equation of  $D(t) = 3 + 3.5\cos\frac{\pi}{6}(t-8)$ ,  $0 \le t \le 24$  on the axes below. Make sure you show an appropriate scale on both the  $\it l$  and  $\it l$ ) axes.



3 marks

Harry's Boat Shed operates a sailing boat hire service from the beach on Hamilton

4 marks

Island. Harry only hires his boats out if he can operate continuously for 2 hours. His

normal operating hours are 9 am to 5 pm, if conditions are favourable. What are his

operating hours on Sunday April 19th? Explain.

From this graph, or by some other method, determine the answer to parts c, d and e.

At what two times on Sunday 19th of April is it high tide?

2 marks

How many hours are there between high and low tides?

At what time on Sunday does the first low tide occur?

l mark

l mark

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Ļ Total 17 marks 4 marks

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#### Question 3

percentage of carbon-14 in a sample of paper was the same when it was buried as in a sample involving the decay of the radioactive isotope carbon-14. Carbon dating assumes that the "Paper Number 6", he prepares to have it dated. He does this using carbon dating, a process Professor Digger Jones, the world-renowned archaeologist, decides to study an ancient of paper today. document unearthed at a Melbourne construction site. Suspecting that it is the mysterious

The percentage, $P$ , of carbon-14 in a sample of paper
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.	Find the initial percentage of carbon-14. That is, at time, $t = 0$ .
	l mark
rofe	rofessor Jones finds that the unearthed document has 90% of the carbon-14 of a present-day ample of paper.

sample of paper.

Find the age of the document to the nearest year

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t.	,		ļ	
What is the instantaneous rate of change of the percentage of carbon-14 in a sample after 5730 years, accurate to four decimal places?		2 marks		

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Professor Jones' rival, Doctor Kelvin, discovers a new secret radioisotope, dawnitium-28.

The amount, 1) grams, of dawnitium-28 in a sample of paper after 1 years can be modelled by

$$D(t) = D_0 e^{4t}$$
, where  $t \ge 0$  and  $D_0$  and  $k$  are real constants

and that a 2000-year-old document contains only 24.90 grams of dawnitium-28 Doctor Kelvin finds that a 1000-year-old document contains 111.57 grams of dawnitum-28

	Ġ
whole number.	Use this data to find $k$ , accurate to four decimal places, and $D_0$ accurate to the nearest
	decimal
-	places.
	and D
	accurate to
	the nearest

				•		نلمز ۸
5 marks						

He rearranges the above expression for 1) in terms of 1 to develop a linear model for 1 in terms Unlike Professor Jones, Doctor Kelvin is a fairly straight felfow and so dislikes curved graphs

	Show that the gradient of this model
	Show that the gradient of this model is $\frac{-1}{0.0015}$ and that the y-intercept is $\frac{\log_2 500}{0.0015}$
	)015 )015

2 marks

at they lay and finds that the weights are normally distributed with a mean of of grams and ard deviation of 8 grams.  One afternoon Uncle Albert checks to find a freshly laid egg in the chicken coop. Calculate the probability, correct to four decimal places, that the egg weights it more than 67 grams  ii. less than 59 grams.  2 marks  iii. more than 67 grams, given that he knows it weighs more than 61 grams.  2 marks  2 marks at least two of these eggs weigh more than 67 grams.  2 marks  4 marks  4 marks  1 marks  4 marks  1 marks  1 marks  1 marks  1 marks  4 marks  1 marks  1 marks  4 marks  1 marks  2 marks  2 marks  2 marks  3 marks  4 marks  4 marks  1 marks  1 marks  4 marks  1 marks  1 marks  1 marks  4 marks  1 marks  1 marks  1 marks  1 marks  1 marks  2 marks  2 marks  2 marks  3 marks  4 marks  4 marks  1 marks  1 marks  4 marks  1 marks  1 marks  1 marks  1 marks  1 marks  1 marks  2 marks  2 marks  2 marks  2 marks  3 marks  4 marks  4 marks  1 marks  1 marks  4 marks  1 marks  1 marks  1 marks  1 marks  1 marks  2 marks  2 marks  2 marks  2 marks  3 marks  4 ma	f. Northwestical Association				,	<ul> <li>The next morn at least two of</li> </ul>		iii. more than	ii. less than 59 grams		a. One afternoon Uncle Albe Calculate the probability, of more than 67 grams	eggs that they lay and finds that the and a standard deviation of 8 grams.
	of Victoria 1998	<i>r</i> s.	1 .			ing, Albert finds 6 freshly laid eggs these eggs weigh more than 67 grar		1 67 grams, given that he knows it w	59 grams		Incle Albert checks to find a freshly obability, correct to four decimal pla 67 grams	eggs that they lay and finds that the weights are normally distributed with a mean of 61 grams and a standard deviation of 8 grams.

Uncle Albert's neighbour, Victor Cab, also keeps chickens which lay eggs whose weights are

t.	norma
Victor brags that 98% of his eggs weigh more than 67 grams. What would the mean weight of Victor's eggs be? Give your answer correct to one decimal place.	normally distributed with a variance of only 4 grams
ms. Wha	
at would the mean nal place.	ţ

Uncle Albert decides to sneak over to Victor's coop and see the results for himself. He finds that of the 12 eggs that Victor's chickens have laid that day, 7 of them weigh more than 67

2 marks

### END OF TRIAL CAT 3

Total 15 marks

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