

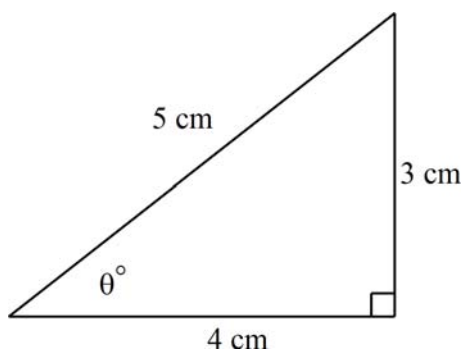
Section I:**Multiple Choice Answer on Multiple Choice Page provided****18 marks, 1 mark each question.****Question 1**In the diagram at right, $\sin \theta =$

A. $\frac{4}{5}$

B. $\frac{3}{5}$

C. $\frac{4}{3}$

D. $\frac{3}{4}$

**Question 2**

A ladder is 12 m long, and for safety reasons cannot be at an angle greater than 40° to the wall. The maximum height on the wall that the ladder can reach is given by

A. $12\cos 40^\circ$.

B. $12 \sin 40^\circ$

C. $12\tan 40^\circ$

D. $12\cos 50^\circ$.

Question 3

An observer sees a plane at an altitude of 10000 m and 12 km away in a horizontal direction. The angle of elevation, to the nearest degree is given by,

A. 56° .

B. 34° .

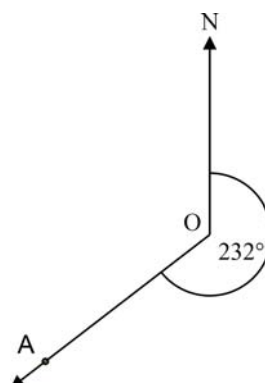
C. 40° .

D. 50° .

Question 4

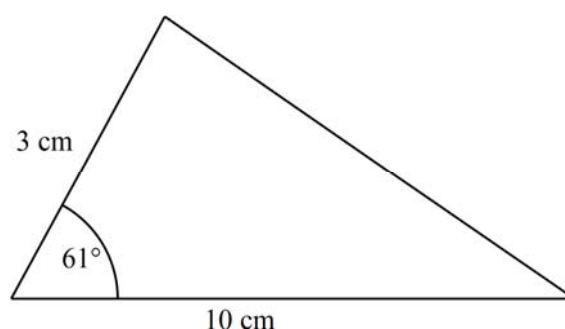
The bearing of O from A, in the diagram, is

- A. 232° T
- B. 052° T
- C. 128° T
- D. 308° T

**Question 5**

The area of the triangle shown, is given by

- A. $\text{Area} = \frac{1}{2} \times 3 \times 10$
- B. $\text{Area} = \frac{1}{2} \times 3 \times 10 \times \sin 61^\circ$
- C. $\text{Area} = \frac{1}{2} \times 3 \times 10 \times \cos 61^\circ$
- D. $\text{Area} = \frac{1}{2} \times 3 \times 10 \times \tan 61^\circ$

**Question 6**

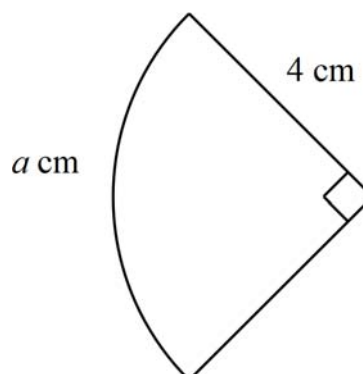
Three towns A, B and C form an isosceles triangle. Towns A and B are both 105 km from town C. If the angle between the bearings of both these towns from C is 25° , then the distance between these two towns is found by solving which equation:

- A. $x^2 = 2 \times 105^2 (1 - \cos 25^\circ)$
- B. $x^2 = 25 + 25 - 2 \times 25 \times 25 \times \cos 25^\circ$
- C. $x^2 = 105^2 + 25^2 - 2 \times 105 \times 25 \times \cos 25^\circ$
- D. $x^2 = 105^2 + 105^2 - 2 \times 25 \times 25 \times \cos 105^\circ$

Question 7

In the sector shown at right, the arc length a cm, is given by,

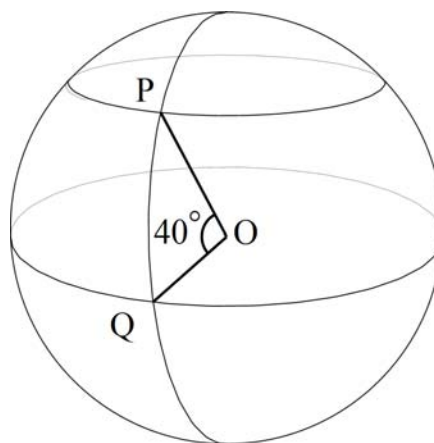
- A. $a = 2 \times \pi \times 4^2$
- B. $a = 2 \times \pi \times 4$
- C. $a = \frac{1}{2} \times 2 \times \pi \times 4$
- D. $a = \frac{1}{4} \times 2 \times \pi \times 4$

**Question 8**

In the diagram shown the point Q has a latitude and longitude of $0^\circ 50^\circ\text{E}$.

The latitude and longitude of P is

- A. $0^\circ 90^\circ\text{E}$
- B. $40^\circ\text{S } 50^\circ\text{E}$
- C. $0^\circ 10^\circ\text{E}$
- D. $40^\circ\text{N } 50^\circ\text{E}$

**Question 9**

When it is noon at Greenwich, the time in Sydney is 10 pm on the same day and it is 6 am in New York. If it is 10 pm on a Thursday in New York, then it is

- A. 4 am, on Friday in London and 2 pm, on Friday in Sydney.
- B. 6 pm, on Thursday in London and 2 am, on Friday in Sydney.
- C. 6 pm, on Friday in London and midnight, on Friday in Sydney.
- D. 10 am, on Friday in London and 6 pm, on Friday in Sydney.

Question 10

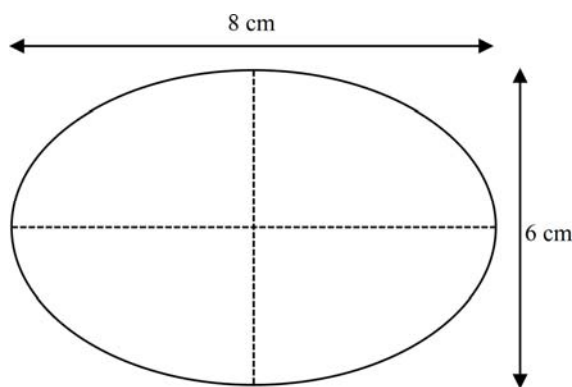
The town of Aye is situated at $33^{\circ}25'S$ $24^{\circ}W$ and the town of Bee is situated at $33^{\circ}45'S$ $24^{\circ}W$. The distance between them is

- A. 20 nautical miles
- B. 120 nautical miles
- C. 360 nautical miles
- D. 600 nautical miles

Question 11

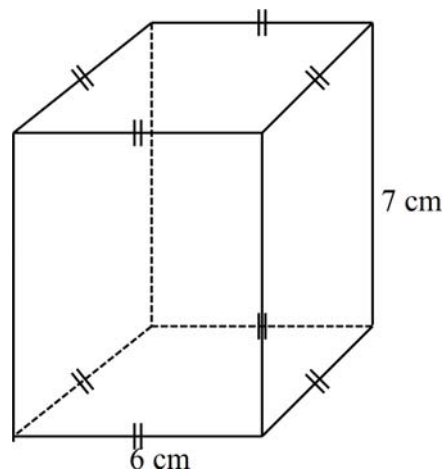
The area of the ellipse, shown, is

- A. $12\pi \text{ cm}^2$
- B. $18\pi \text{ cm}^2$
- C. $24\pi \text{ cm}^2$
- D. $48\pi \text{ cm}^2$

**Question 12**

The surface area (SA) of the figure shown is given by,

- A. $SA = 2 \times 6 \times 7 + 4 \times 7 \times 7$
- B. $SA = 2 \times 7 \times 7 + 4 \times 6 \times 6$
- C. $SA = 2 \times 6 \times 6 + 4 \times 7 \times 7$
- D. $SA = 2 \times 6 \times 6 + 4 \times 6 \times 7$



Question 13

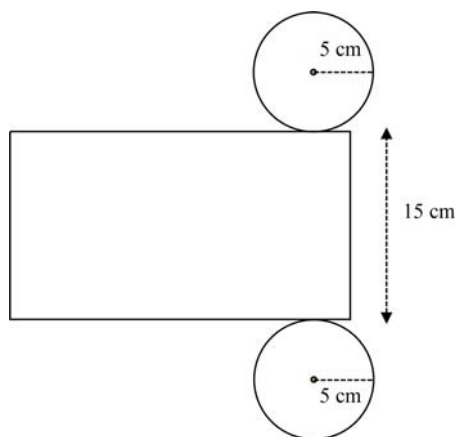
A concrete sculpture is in the shape of a hemisphere of diameter 3 metres, the volume of concrete required to make this is

- A. $V = \frac{2}{3} \times \pi \times 3^3$
- B. $V = \frac{2}{3} \times \pi \times (1.5)^3$
- C. $V = \frac{4}{3} \times \pi \times (1.5)^3$
- D. $V = \frac{4}{3} \times \pi \times 3^3$

Question 14

The volume of the shape defined by the net shown is nearest to

- A. 1150 cm^3
- B. 1175 cm^3
- C. 1200 cm^3
- D. 1225 cm^3

**Question 15**

\$3000 is invested at 6% p.a. flat for 18 months. Find the final value of the investment.

- A. \$2700
- B. \$3270
- C. \$5270
- D. \$3240

Question 16

The table below sets out a payment schedule for the first 3 years of an annuity over 10 years. If the interest rate is 10% p.a. , complete the entry for 4th year,

Payment	Amount	Interest	Balance
1	\$1000	$\$1000(1.1)^{10} = \2593.74	\$2593.74
2	\$1000	$\$1000(1.1)^9 = \2357.95	\$4951.69
3	\$1000	$\$1000(1.1)^8 = \2143.69	\$7095.28
4	\$1000		\$9044

- A. $\$1000(1.1)^8 = \2143.69
- B. $\$1000(1.1)^7 = \2143.69
- C. $\$1000(1.1)^7 = \1948.72
- D. $\$1000(1.1)^8 = \1948.72

Question 17

Straight Line depreciation can best be described as:

- A. The value of an asset decreases by a specific amount at regular intervals.
- B. The value of an asset decreases by a specific amount at irregular intervals.
- C. The value of an asset decreases by a specific rate at regular intervals.
- D. The value of an asset decreases by a specific rate at irregular intervals.

Question 18

The table represents the monthly repayment schedule per \$1000 borrowed.

The monthly repayment on \$250000 loan over 20 years at 7.5% is given by

- A. $\$8.06 \times 250$
- B. $\$8.06 \times 250000$
- C. $\$7.75 \times 250$
- D. $\$7.75 \times 250000$

	Years				
Rate	10	15	20	25	30
6.50%	\$11.35	\$8.71	\$7.46	\$6.75	\$6.32
7.00%	\$11.61	\$8.99	\$7.75	\$7.07	\$6.65
7.50%	\$11.87	\$9.27	\$8.06	\$7.39	\$6.99
8.00%	\$12.13	\$9.56	\$8.36	\$7.72	\$7.34
8.50%	\$12.40	\$9.85	\$8.68	\$8.05	\$7.69
9.00%	\$12.67	\$10.14	\$9.00	\$8.39	\$8.05

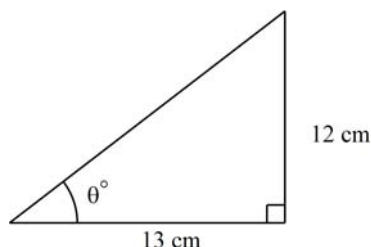
End of Section I

Section 2 Show all working required.

Answer all questions in the booklets provided and start each question in new booklet.

Question 19 Trigonometry (14 marks)**Marks**

- (a) Find the angle indicated to the nearest minute

1

- (b) An observer on top of a cliff spots a ship in danger, if the angle of depression is 10° and the cliff is 120 m above sea level how far out to sea is the ship?

2

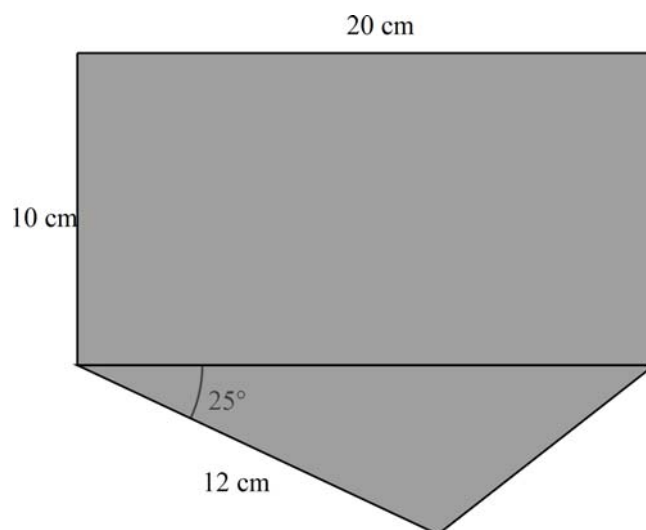
(Give answer to the nearest metre)

- (c) A walker sets out from his base A on a bearing of 125°T . He reaches his first waypoint, B , after walking 5 km on this bearing. He then changes direction to walk on a bearing of 035°T till he reaches the second waypoint C due East of A .

4

- (i) Draw a diagram of the journey, marking all angles and points.
(ii) Explain why $\angle ABC = 90^\circ$.
(iii) Find the distance AC .

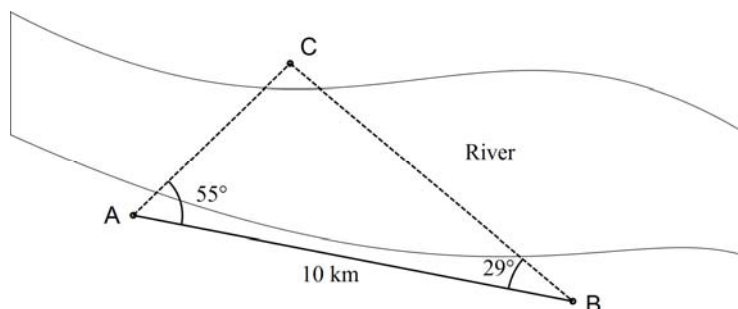
- (d) Find the area of the shaded region in the diagram below, give answer to the nearest cm.

3

Question 19 continued**Marks**

- (e) A shown in the diagram, three towns A, B and C lie on the banks of a river.

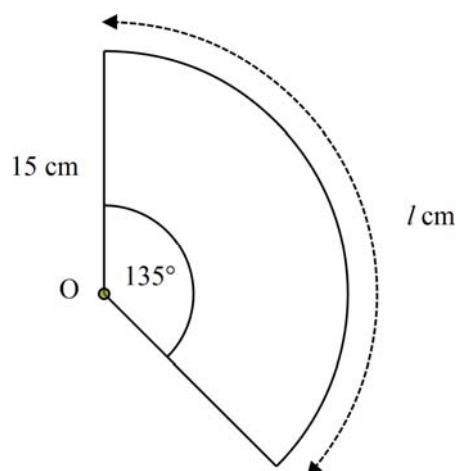
Recent flooding destroyed the bridge from A to C but a more modern bridge is to be built.



- (i) Using the information in the diagram, calculate the distance from A to C that the bridge must span, to the nearest metre. **3**
- (ii) At a cost of \$2750 per metre, calculate the cost of the bridge to nearest \$1000. **1**

Question 20 Spherical Geometry (14 marks)**(Start this Question in a new booklet)**

- (a) Find the arc length (l) of the sector below: **2**

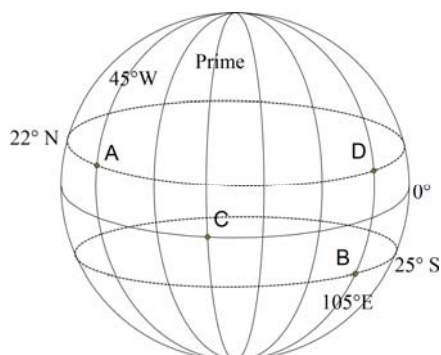


- (b) Describe the meaning of the phrase “a great circle” as it applies to the surface of the Earth. **2**
- (c) The co-ordinates of Adelaide are $35^\circ \text{ S } 139^\circ \text{ E}$ and Tokyo is $35^\circ \text{ N } 139^\circ \text{ E}$, find the distance between the two cities to the nearest 10 km. (Take the radius of the Earth to be equal to 6400 km.) **3**

Question 20 continued**Marks**

- (d) Berlin is 9 hours 12 mins behind Sydney in time, find the longitude of Berlin, given that Sydney has a longitude of 151° E. (2 marks) **2**

(e)



In the diagram, give the latitude and longitude of the points that lie on the same longitude.

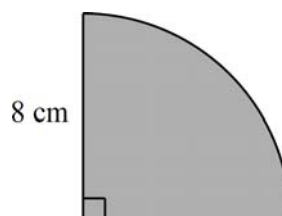
2

- (f) If I board a plane in Perth (32° S 116° E) at 8 am on a Friday 31st March and fly for 14 hours to Mumbai (19° N 73° E) via Singapore. What is the local time and date when I arrive in Mumbai. **3**

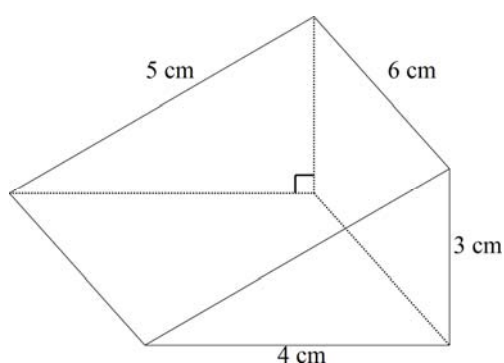
Question 21**Surface Area and Volume****(14 marks)****(Start this Question in a new booklet)**

- (a) Find the area of the sector shown

(Give answer correct to 2 decimal places)

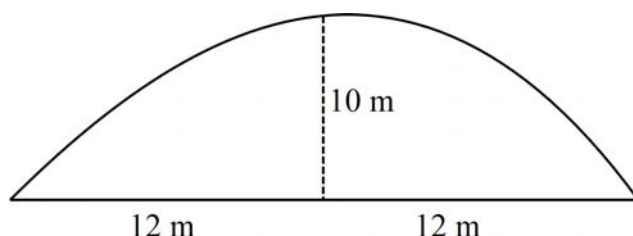
**2**

- (b) Find the surface area of the rectangular prism below:

**4**

Question 21 continued**Marks**

- (c) A circus apparatus is in the shape of an open cylinder. If the diameter is 2 m and the height is 1.5 m. Find the surface area of the outside of the apparatus. (Give answer to 2 decimal places)
(3 marks) **3**
- (d) The surface area of a sphere is found to be $36\pi \text{ cm}^2$. **3**
- (i) Find the radius of the sphere.
- (ii) Hence, find its volume, correct to 1 decimal place.
- (e) Use Simpson's Rule to find the approximate area of the figure below: **2**

**Question 22****Financial Mathematics****(20 marks)****(Start this Question in a new booklet)**

- (a) Calculate the simple interest gained on an investment of \$2500 over 4 years at 6.5% p.a. **2**
- (b) \$100 was invested at a rate of 6% p.a. compounded annually. If this amount was left for 300 years calculate the value of the investment at the end of the period. **2**

Question 22 continued

Marks

- (c) Use the credit card summary below to answer the following questions:

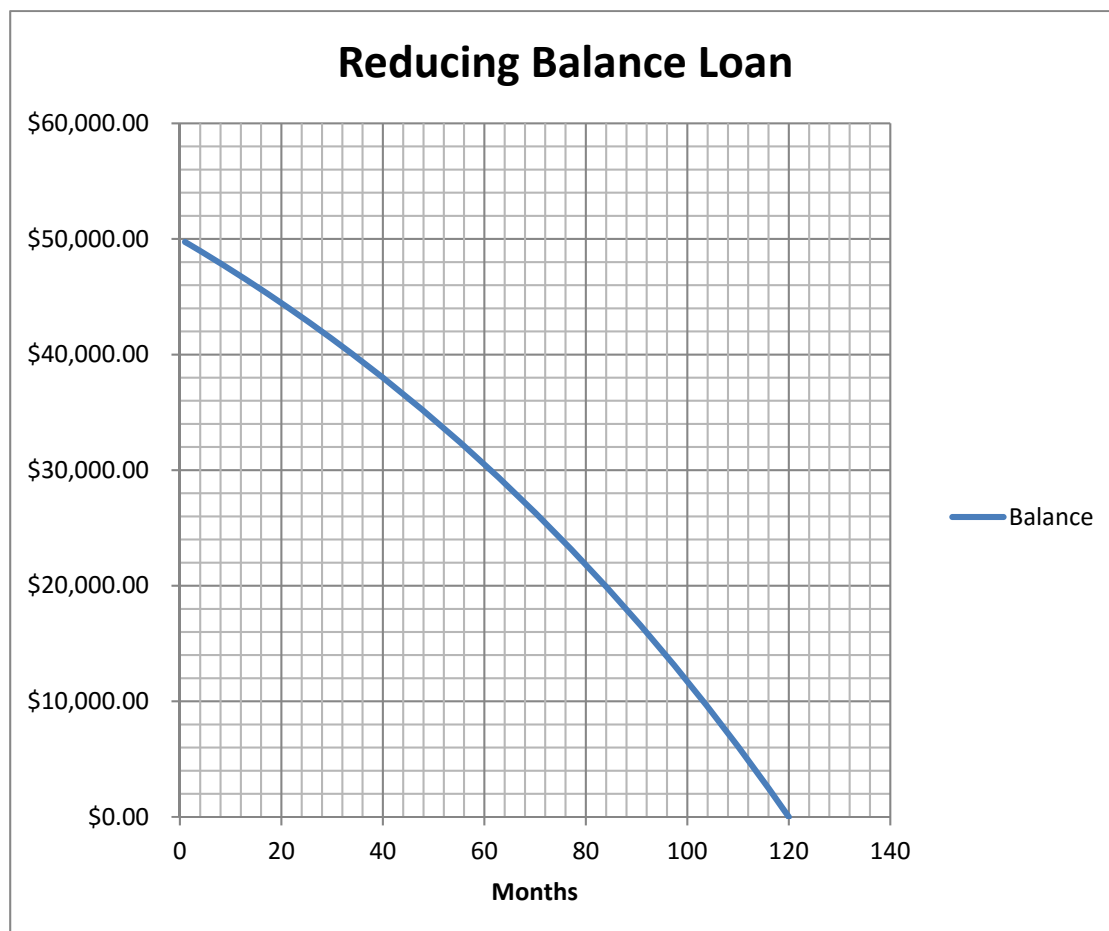
4

PIGGY BANK USA 					
PLATINUM PIGGY CARD STATEMENT		PAGE 1 of 1			
ACCOUNT SUMMARY Account Number 9999 9999 9999 9999 Total Credit Limit \$5,000.00 Total Credit Limit Available \$2,465.80 Statement Date 04/27/08		PAYMENT SUMMARY Minimum Payment \$50.00* Payment Due Date 05/21/08 Current Payment Due \$50.00			
		BALANCE SUMMARY Previous Balance \$2,250.00 Payment/Credits - \$50.00 Purchases/Debits + \$300.00 Finance Charge + \$34.20 New Balance \$2,534.20			
FLYING PIG REWARDS SUMMARY Previous Pig Points 2,500 Earned Points 300 Total Points 2,800					
TRANSACTION SUMMARY					
Trans Date	Post Date	Transaction Description	Reference Number	Amount Charges Credits	
04/02	04/03	Grocery Store	XX999XXXX9	\$75.00	
04/05	04/06	Book Store	XX999XXXX9	\$25.00	
04/10	04/12	Movie Theater	XX999XXXX9	\$25.00	
04/11	04/12	Restaurant	XX999XXXX9	\$50.00	
04/15	04/15	Gas/Electricity	XX999XXXX9	\$50.00	
04/21	04/21	Payment	XX999XXXX9	+ \$50.00	
04/22	04/23	Concert Tickets	XX999XXXX9	\$60.00	
04/22	04/23	Movie Rental	XX999XXXX9	\$15.00	
FINANCE CHARGE CALCULATION This is a grace account. Grace period information on back.					
	Average Daily Balance	Daily Periodic Rate	Days in Billing Cycle	FINANCE CHARGE Cash Advance / Transaction Fees	Annual Percentage Rate
Balance Transfer	\$0.00	0.00000%	29	\$0.00	0.000%
Purchases	\$2,409.48	0.04381%	29	\$30.61	15.990%
Cash Advances	\$205.24	0.06025%	29	\$3.59	21.990%

- What is the due date for payment?
- What is the available credit on this card?
- What is the annual rate of interest charged on purchases made with this card?
- How much did this person withdraw as cash advances?

Question 22 continued**Marks**

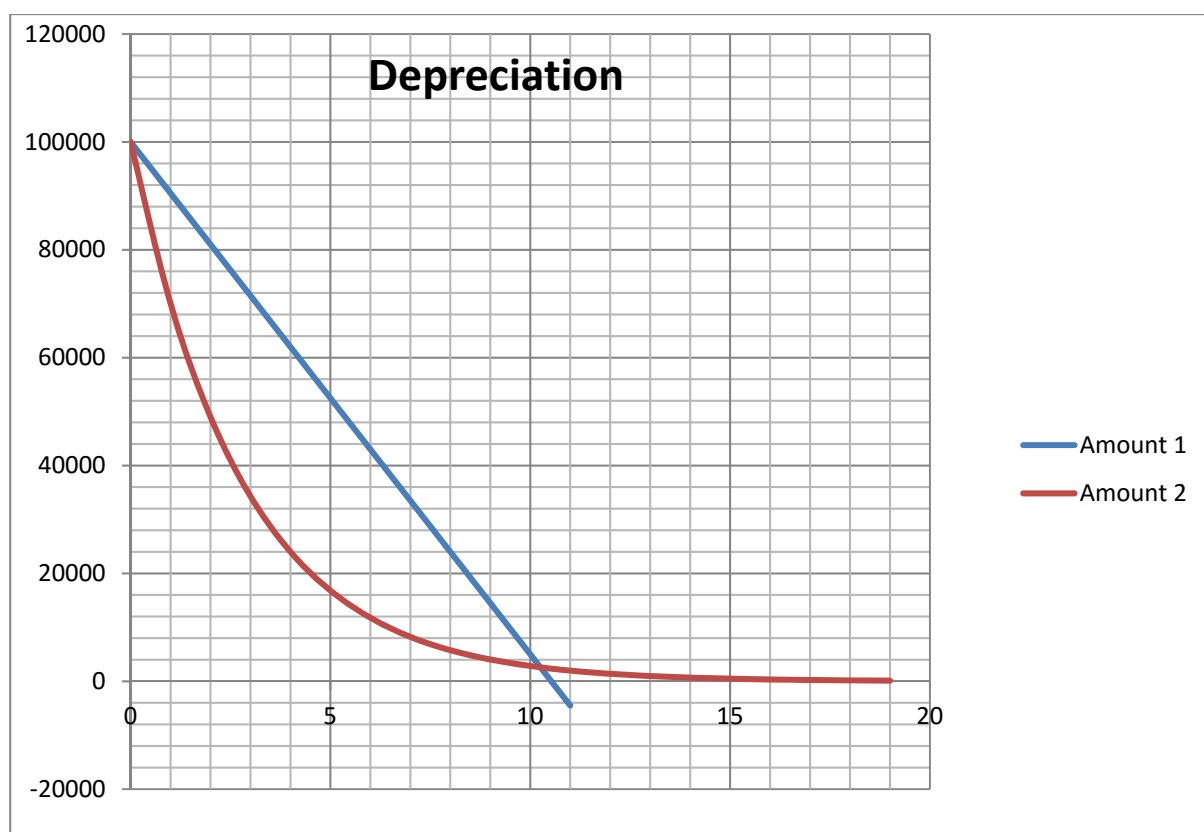
- (d) James borrows \$50000 at a rate of 9% p.a. compounded monthly over 10 years. **4**
The repayments are calculated to be \$633.38 a month. The balance over the course of the loan can be seen in the chart below:



- (i) Approximately how many months have elapsed before half the loan has been repaid?
- (ii) How much of the loan still needs to be repaid after 2 years of payments?
- (iii) How much interest is paid over the 10 years of the loan?
- (e) Janine deposits \$700 at the end of every year into a special account that earns **2**
8% p.a. compounding annually. If Janine continues this habit for next 15 years
how much will she have to withdraw at that time?

Question 22 continued**Marks**

- (f) Martha and Edmond need \$1200 per month over 20 years to maintain their lifestyle after retirement. 4
- (i) Calculate the lump sum required at 6% p.a. for this annuity to be achieved.
- (ii) If they're combined contributions are \$650 a month over 35 years at 6% p.a. will they have the lump sum required? Justify your answer.
- (g) The graphs below show the two types of depreciation. 2
- (i) From the graph, when is the salvage cost of the item the same for both methods? (Give answer to nearest year)
- (ii) What is the approximate value at this time?

**END OF PAPER**

Solutions**Section 1**

Question 1 D

Question 2 A

Question 3 C

Question 4 B

Question 5 B

Question 6 D

Question 7 D

Question 8 D

Question 9 D

Question 10 A

Question 11 A

Question 12 D

Question 13 B

Question 14 B

Question 15 B

Question 16 C

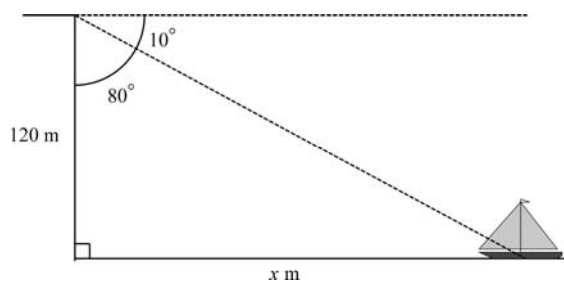
Question 17 A

Question 18 B

Section 2**Question 19 Trigonometry (14 marks)**

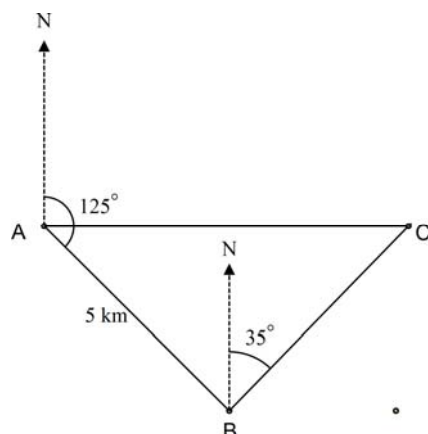
(a) $\tan \theta = \frac{12}{13}$ 1 mark
 $\theta = 42^\circ 43'$

(b) $\tan 80^\circ = \frac{x}{120}$ 1 mark
 $x = 120 \tan 80^\circ$
 $x = 681 \text{ m}$



1 mark

(c) (i)



1 mark

(ii) $\angle ABN = 180^\circ - 125^\circ = 55^\circ$ 1 mark

$\angle ABC = 55^\circ + 35^\circ = 90^\circ$

(iii) $\angle CAB = 125^\circ - 90^\circ = 35^\circ$ 2 marks

$$\cos 35^\circ = \frac{5}{AC}$$

$$AC = \frac{5}{\cos 35^\circ}$$

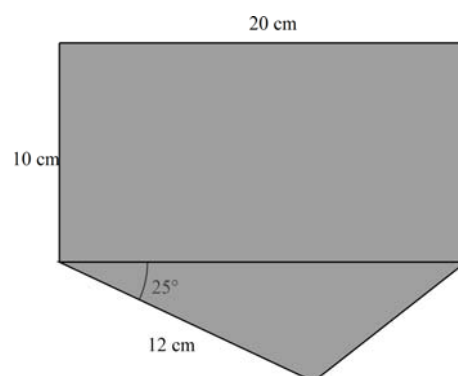
$$= 7.1 \text{ km (correct to 1 dp)}$$

(d) $Area_{\square} = 20 \times 10$
 $= 200 \text{ cm}^2$ 1 mark

$$Area_{\triangle} = \frac{1}{2} \times 20 \times 12 \times \sin 25^\circ$$

$$= 50.7 \text{ cm}^2$$
 1 mark

Total = 250.7 cm^2 1 mark



(e)

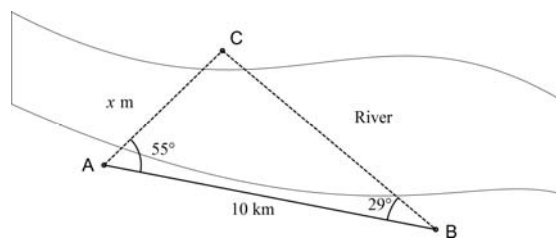
$$(i) \quad \angle ACB = 180 - (55 + 29) = 96 \quad 1 \text{ mark}$$

$$\frac{x}{\sin 29^\circ} = \frac{10}{\sin 96^\circ}$$

$$x = \frac{10 \sin 29^\circ}{\sin 96^\circ}$$

$$x = 4.875 \text{ km}$$

2 marks



$$(ii) \quad \text{Cost} = \$2750 \times 4875 = \$13\,407\,000 \text{ (nearest \$1000)} \quad 1 \text{ mark}$$

Question 20 Spherical Geometry (14 marks)

(Start this Question in a new booklet)

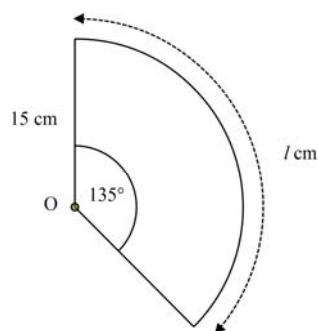
(a)

$$l = \frac{\pi r \theta}{180}$$

$$= \frac{\pi \times 15 \times 135}{180}$$

$$= 35.3 \text{ cm (nearest mm)}$$

2 marks



(b) Must mention any 2 of the following

- radius equal to radius of Earth
- circle passing through any two points on same longitude
- circle passing through any two points on equator

$$(c) \quad \text{Angle at the centre} = 35 + 35 = 70 \quad 1 \text{ mark}$$

$$\text{Arc length} = \frac{\pi \times 6400 \times 70}{180}$$

$$= 18990 \text{ km (nearest 10 km)} \quad 2 \text{ marks}$$

$$(d) \quad 1 \text{ hour} = 15^\circ \quad 9 \text{ hours} = 135^\circ$$

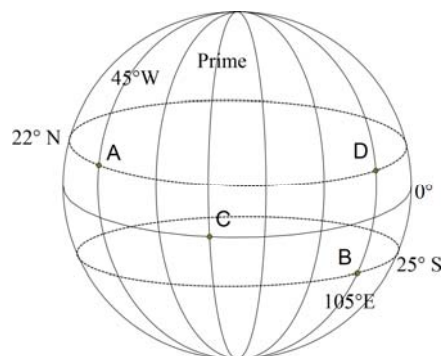
$$4 \text{ mins} = 1^\circ \quad 12 \text{ mins} = 3^\circ$$

$$151^\circ - 138^\circ = 13^\circ \text{ E i.e. Berlin has a longitude of } 13^\circ \text{ E} \quad 2 \text{ marks}$$

- (e) D and B lie on the same longitude.

D is at $22^\circ\text{N } 105^\circ\text{E}$ 1 mark

B is at $25^\circ\text{S } 105^\circ\text{E}$ 1 mark



- (f) Difference in longitude is $116^\circ - 73^\circ = 43^\circ$ 1 mark

Time difference = $4 \times 43 \text{ mins} = 2 \text{ hr } 52 \text{ mins}$ 1 mark

Time in Mumbai when plane leaves Perth = 0500 on Friday (local time, ignore 8 mins)

Plus Flying time = 1900 hrs = 7 pm on Friday 31st March. 1 mark

Question 21

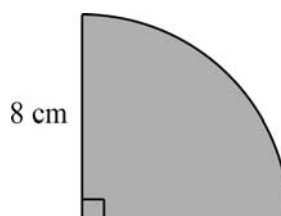
Surface Area and Volume

(14 marks)

(Start this Question in a new booklet)

- (a)
$$\text{Area} = \frac{1}{4} \times \pi \times 8^2$$

$$= 50.27 \text{ cm}^2$$
 2 marks



- (b) Area = 2 Triangles + 3 Rectangles

$$\text{Area}_{2\times\square} = 2 \times \frac{1}{2} \times 3 \times 4$$

$$= 12 \text{ cm}^2$$

1 mark

$$\text{Area}_{\square 1} = 4 \times 6 = 24 \text{ cm}^2$$

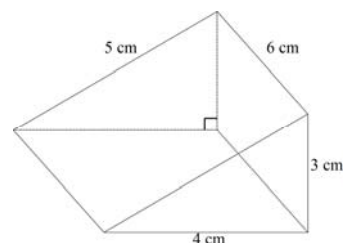
$$\text{Area}_{\square 2} = 3 \times 6 = 18 \text{ cm}^2$$

2 marks

$$\text{Area}_{\square 3} = 5 \times 6 = 30 \text{ cm}^2$$

$$\text{Total Area} = 30 + 18 + 24 + 12 = 84 \text{ cm}^2$$

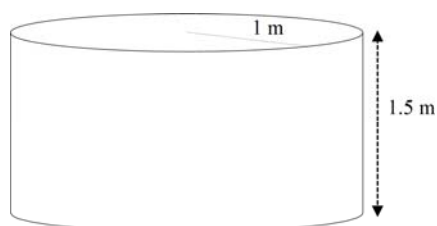
1 mark



- (c) Radius = 1 m 1 mark

$$S.A. = 2 \times \pi \times 1 \times 1.5 + \pi \times 1^2$$

$$= 12.57 \text{ m}^2 \quad 2 \text{ marks}$$



- (d) (i) $S.A. = 4\pi r^2$
 $36\pi = 4\pi r^2$
 $r^2 = 9$
 $r = 3 \text{ cm}$ 2 marks

- (ii) Volume = $\frac{4}{3}\pi r^3$
 $= \frac{4}{3} \times \pi \times 3^3$
 $= 36\pi$
 $= 113.1 \text{ cm}^2$ 1 mark

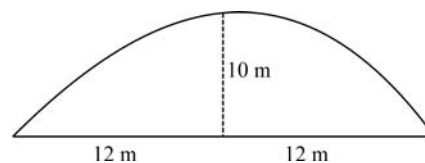
- (e)

x	a	$a + h$	b
Height	0	10	0
Factor	1	4	1
Totals	0	40	0

$$\text{Area} = \frac{12}{3} [0 + 40 + 0]$$

$$= 160 \text{ m}^2$$

2 marks



Question 22

Financial Mathematics

(20 marks)

(Start this Question in a new booklet)

- (a) Interest = $2500 \times \frac{6.5}{100} \times 4$
 $= \$650$ 2 marks

(b) $A = 100(1 + 0.06)^{300}$
 $= \$3,906,245,905.00$ 2 marks

(c)

PIGGY BANK USA 					
PLATINUM PIGGY CARD STATEMENT		PAGE 1 of 1			
ACCOUNT SUMMARY Account Number 9999 9999 9999 9999 Total Credit Limit \$5,000.00 Total Credit Limit Available \$2,465.80 Statement Date 04/27/08		PAYMENT SUMMARY Minimum Payment \$50.00* Payment Due Date 05/21/08 Current Payment Due \$50.00			
		BALANCE SUMMARY Previous Balance \$2,250.00 Payment/Credits - \$50.00 Purchases/Debits + \$300.00 Finance Charge + \$34.20 New Balance \$2,534.20			
FLYING PIG REWARDS SUMMARY					
Previous Pig Points 2,500		Earned Points 300			
Total Points 2,800					
TRANSACTION SUMMARY					
Trans Date	Post Date	Transaction Description	Reference Number	Amount Charges	Credits
04/02	04/03	Grocery Store	XX999XXXX9	\$75.00	
04/05	04/06	Book Store	XX999XXXX9	\$25.00	
04/10	04/12	Movie Theater	XX999XXXX9	\$25.00	
04/11	04/12	Restaurant	XX999XXXX9	\$50.00	
04/15	04/15	Gas/Electricity	XX999XXXX9	\$50.00	
04/21	04/21	Payment	XX999XXXX9		+ \$50.00
04/22	04/23	Concert Tickets	XX999XXXX9	\$60.00	
04/22	04/23	Movie Rental	XX999XXXX9	\$15.00	
FINANCE CHARGE CALCULATION					
This is a grace account. Grace period information on back.					
	Average Daily Balance	Daily Periodic Rate	Days in Billing Cycle	FINANCE CHARGE Cash Advance /Transaction Fees	Annual Percentage Rate
Balance Transfer	\$0.00	0.00000%	29	\$0.00	0.000%
Purchases	\$2,409.48	0.04381%	29	\$30.61	15.990%
Cash Advances	\$205.24	0.06025%	29	\$3.59	21.990%

(i) 21 May, 2008

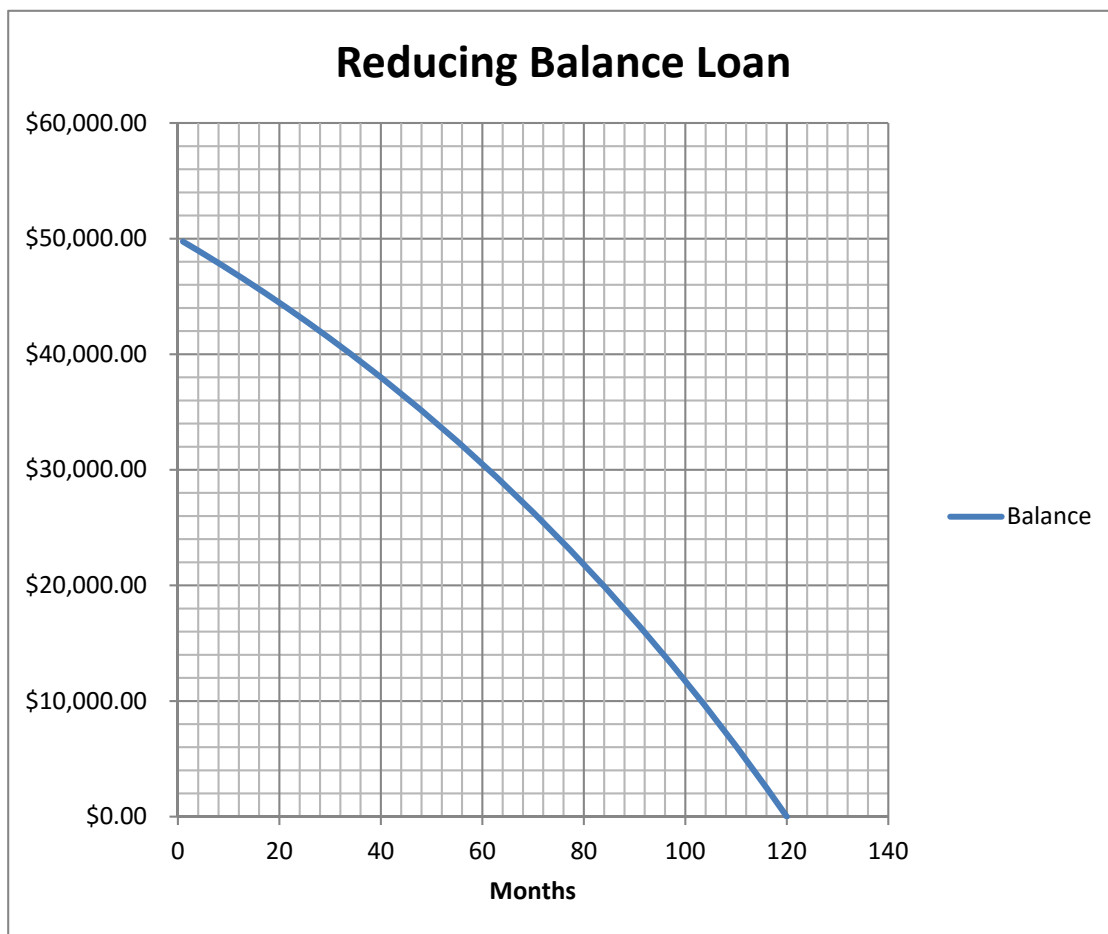
(ii) \$2465.80

(iii) 15.99% p.a.

(iv) \$205.24

4 marks, 1 mark each

(d)



- (i) 72 months 1 mark
- (ii) \$42 000 1 mark
- (iii) $120 \times \$633.38 - \$50000 = \$26\,005.60$ 2 marks

(e) Future Value:

$$\begin{aligned}
 FV &= \frac{M[(1+r)^n - 1]}{r} \\
 &= \frac{700[(1.08)^{15} - 1]}{0.08} \\
 &= \$19008.48
 \end{aligned}$$

2 marks

(f) (i) Present Value:

$$\begin{aligned}
 N &= \frac{M \left[(1+r)^n - 1 \right]}{r(1+r)^n} \\
 &= \frac{1200 \left[(1.005)^{240} - 1 \right]}{.005(1.005)^{240}} \\
 &= \$167496.93
 \end{aligned}$$

2 marks

$$\begin{aligned}
 \text{(ii)} \quad FV &= \frac{M \left[(1+r)^n - 1 \right]}{r} \\
 &= \frac{\$650 \left[(1.005)^{420} - 1 \right]}{0.005} \\
 &= \$926061.69
 \end{aligned}$$

2 marks

(g) (i) 10 years

(ii) \$3000

2 marks, 1 mark each

