

Section I
20 marks

Attempt Questions 1–20
Allow about 30 minutes for this section
Use the multiple choice answer sheet

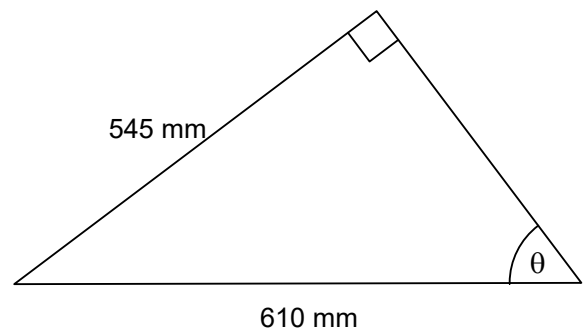
- 1** The position coordinates of a point 18° north of (12° S, 22° W) is;
- A (30° N, 22° W)
- B (12° S, 40° W)
- C (12° S, 4° W)
- D (6° N, 22° W)
- 2** In the formula $S = \frac{a}{1-r}$, find the value of S when $a = 20$ and $r = \frac{1}{6}$
- A $19\frac{5}{6}$
- B 24
- C 32
- D 48
- 3** Water is dripping from a tap at a rate of 70 drops per minute. Each drop is 0.4mL. How many litres drip from the tap in 5 hours?
- A 8.4 L
- B 0.875 L
- C 35 L
- D 52.5 L

- 4 The speed limit in the Eastern Distributor tunnel is 80km/h. This speed expressed in metres per second to one decimal place is;

A 22.0
B 2.2
C 0.2
D 22.2

- 5 Find, correct to the nearest degree, the size of angle θ .

A 27°
B 30°
C 60°
D 63°



- 6 Anne works at Big-Y Department Store and is paid \$11.20 per hour for a 38-hour week.

Calculate Anne's pay in a week where she works 5 hours at time-and-half in addition to her regular hours.

A \$425.60
B \$481.60
C \$509.60
D \$722.40

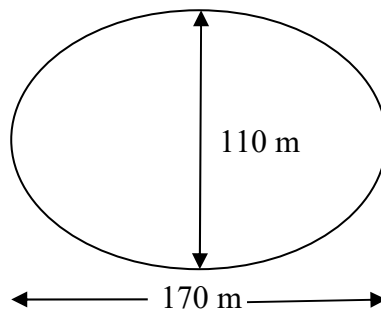
- 7 Simplify $12m^4n^3 \times 4mn^2$

A $3m^5n^5$
B $48m^4n^6$
C $48m^5n^5$
D $60m^8n^6$

8 The value of $\frac{4.6}{\sqrt{2.5+9.8}}$, correct to two significant figures is:

- A 0.76
- B 1.3
- C 1.31
- D 4.97

9 A Melbourne Council wishes to fertilize one of its AFL grounds which is in the shape of an ellipse, as shown in the diagram.



Fertilizer costs \$1.25 per square metre.

What will be the cost to fertilise the AFL ground to the nearest \$10?

- A \$73 430
- B \$18 360
- C \$36 720
- D \$36 710

- 10 The table below is used to calculate the compound value that \$1 will amount to under a certain investment condition.

	<i>Interest rate per period</i>				
Periods	1%	2%	3%	4%	5%
1	1.010	1.020	1.030	1.040	1.050
2	1.020	1.040	1.061	1.082	1.103
3	1.030	1.061	1.093	1.125	1.158
4	1.041	1.082	1.126	1.170	1.216
5	1.051	1.104	1.159	1.217	1.276
6	1.062	1.126	1.194	1.265	1.340

Mary-Rose plans to invest \$5 500 at 4% p.a. for 2 years, with interest compounded six-monthly.

What will her investment amount to?

- A \$5 500
- B \$5 624.45
- C \$5 951
- D \$6 200
- 11 The solution to the equation $2(4x - 3) - 7x = 19$ is
- A $x = 13$
- B $x = 16$
- C $x = 22$
- D $x = 25$
- 12 Bob the builder bought building supplies to the value of \$4 600 and then received a trade discount of 15%. If the account is paid within 30 days, a further 3% reduction of the discounted price applies. The account was paid within 30 days.

How much did Bob pay?

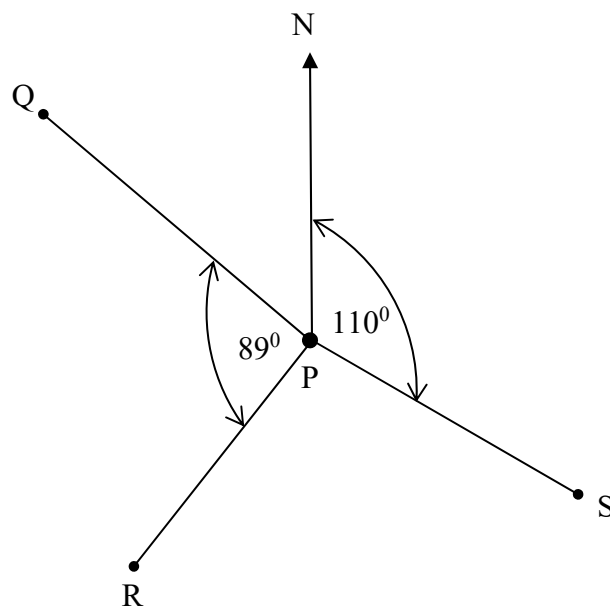
- A \$828
- B \$3 772
- C \$3 792.70
- D \$4 579.30

- 13** A rectangle has dimensions 18 cm by 12 cm correct to the nearest centimetre. The area of the rectangle will lie between;
- A 212.75 cm² and 231.25 cm²
 - B 201.25 cm² and 231.25 cm²
 - C 201.25 cm² and 218.75 cm²
 - D 212.75 cm² and 218.75 cm²
- 14** Brian invested \$6 000 for 5 years compounding annually. At the end of that time his investment had compounded to \$10 500. The interest rate correct to 1 decimal place was;
- A 15.0%
 - B 11.8%
 - C 35.0%
 - D 9.4%
- 15** When it is noon in Greenwich, the local time in Vancouver (49° N, 123°W) is;
- A 8:12 pm
 - B 3:48 am
 - C 3:16 pm
 - D 8:44 am
- 16** The radius of a sphere of volume 695 m³, correct to one decimal place is;
- A 11.8 cm
 - B 40.5 cm
 - C 51.5 cm
 - D 5.5cm

- 17 In triangle ABC, $AB = 32$ m, $AC = 50$ m and angle $A = 25^\circ$. The area of the triangle to the nearest square metre is;

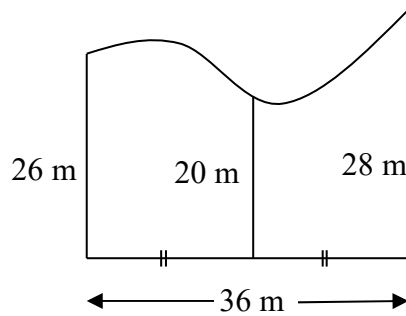
A 25 m^2
B 47 m^2
C 338 m^2
D 800 m^2

- 18 The bearing of S from P is 110° and Q is NW of P. The angle QPR is 89° . The bearing of R from P is;



A 134°
B 244°
C 155°
D 226°

- 19 Using Simpson's Rule, the nearest approximation to the area of the field drawn is;



- A 600 m²
 B 700 m²
 C 800 m²
 D 900 m²
- 20 Peter calculates the present value (N) of an annuity. The interest rate is 4% p.a compounded monthly. In 5 years the future value will be \$100 000.

Which of the calculations below will result in the correct answer?

- A $N = \frac{100\,000}{(1 + 0.04)^5}$
 B $N = \frac{100\,000}{(1 + 0.04 \div 12)^5}$
 C $N = \frac{100\,000}{(1 + 0.04)^{60}}$
 D $N = \frac{100\,000}{(1 + 0.04 \div 12)^{60}}$

End of Section I

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Section II

60 Marks

Attempt Questions 21–23

Allow about 1.5 hours for this section

Answer each question in a separate answer booklet, clearly labelled with your student number.

All necessary working should be shown in every question.

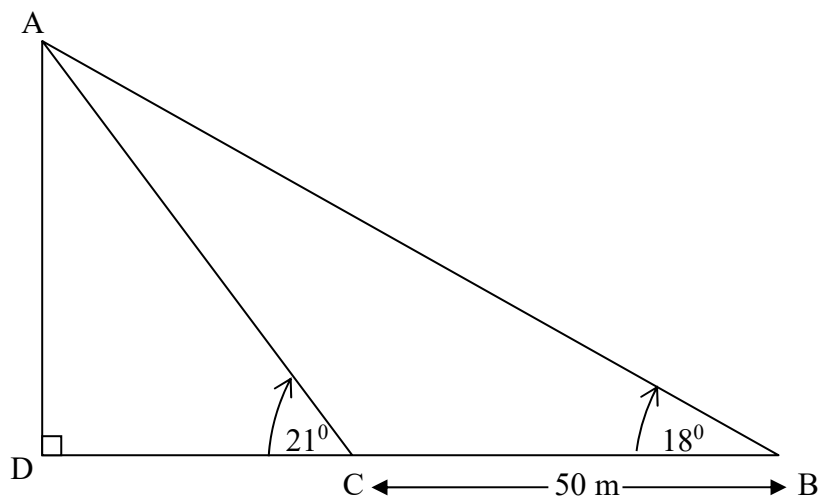
Marks

Question 21 (20marks) Use a SEPARATE answer booklet.

- | | |
|--|----------|
| (a) Evaluate $\frac{4.8 \times 10^5}{6.4 \times 10^{-2}}$, giving your answer in scientific notation. | 1 |
| (b) Solve the equation $4(2y - 2) = 5y + 19$ | 2 |
| (c) A computer system is purchased for \$ 5 800. Its depreciation can be calculated using a straight line depreciation of \$1 200 p.a. or by using a declining balance rate of 30% p.a. | |
| (i) Find the value of the system after 3 years using the declining balance method. | 2 |
| (ii) Which method will give the system the greater value after 3 years?

Justify your answer with calculations | 2 |

- (d) A radio transmission tower stands on level ground. A surveyor, at B, sights the top of the tower (A) and notes its angle of elevation is 18° . He then walks 50 m towards the tower to C and notes its angle of elevation is 21° as illustrated in the diagram.



- | | | |
|-------|--|---|
| (i) | Determine the size of $\angle BAC$. | 1 |
| (ii) | Use the Sine rule to find the length of AC correct to the nearest metre. | 3 |
| (iii) | Hence find the height AD of the radio transmission tower correct to the nearest metre. | 2 |

Question 21 continued.**Marks**

- (e) Allan is a surveyor for Valley Heights Council and his scale survey drawing is shown below.

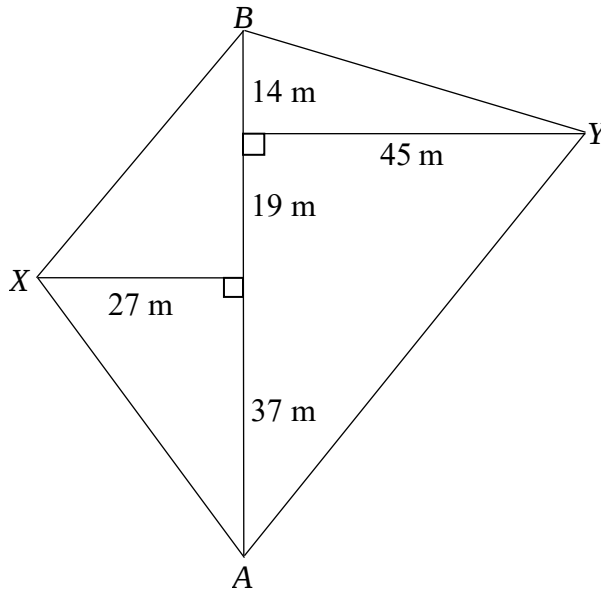


Fig 1

Scale: 1 mm = 1 m

- (i) The park, AXBY, is to have a 1.8 m high fence placed around its perimeter.
By accurate measurement determine how much fencing is required, to the nearest metre? **2**
- (ii) As part of a government grant the park is to be planted with native trees. If a tree can be planted for every 12 m^2 of space, how many trees can be planted in the park?
(Note: we must assume there are NO trees in the park at present) **3**
- (f) A plane leaves Chicago (42°N , 88°W) at 8 am and flies to Rome (42°N , 12°E) **2**
If the flying time is 5 hours 30 minutes at what local time did the plane arrive in Rome.

End of Question 21

Question 22 (20 marks) Use a SEPARATE answer booklet.

Marks

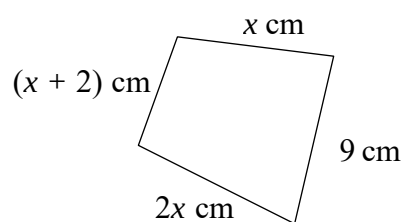
- (a) A cylindrical can has a diameter of 6.5 cm and a height of 11 cm.
The curved surface area of the can is covered completely with a label,
without any overlapping.

Find, to one decimal place, the

- | | | |
|-------|---------------------------------------|---|
| (i) | circumference of the base of the can. | 2 |
| (ii) | area of the label. | 1 |
| (iii) | volume of the can. | 1 |
- (b) If $V = \frac{h}{2(r+h)}$, find h if $r = 8$ and $V = 0.1$ 2

- (c) Given that $A = \frac{Y}{B}$, find A when $Y = 300$ and $B = 3.81 \times 10^{-4}$.
Express your answer in scientific notation correct to 2 significant figures. 2

(d)



- (i) Show that the perimeter $P \text{ cm}$ of this quadrilateral is given by 1

$$P = 4x + 11$$

- (ii) If the perimeter is 91 cm, determine the longest side length. 2

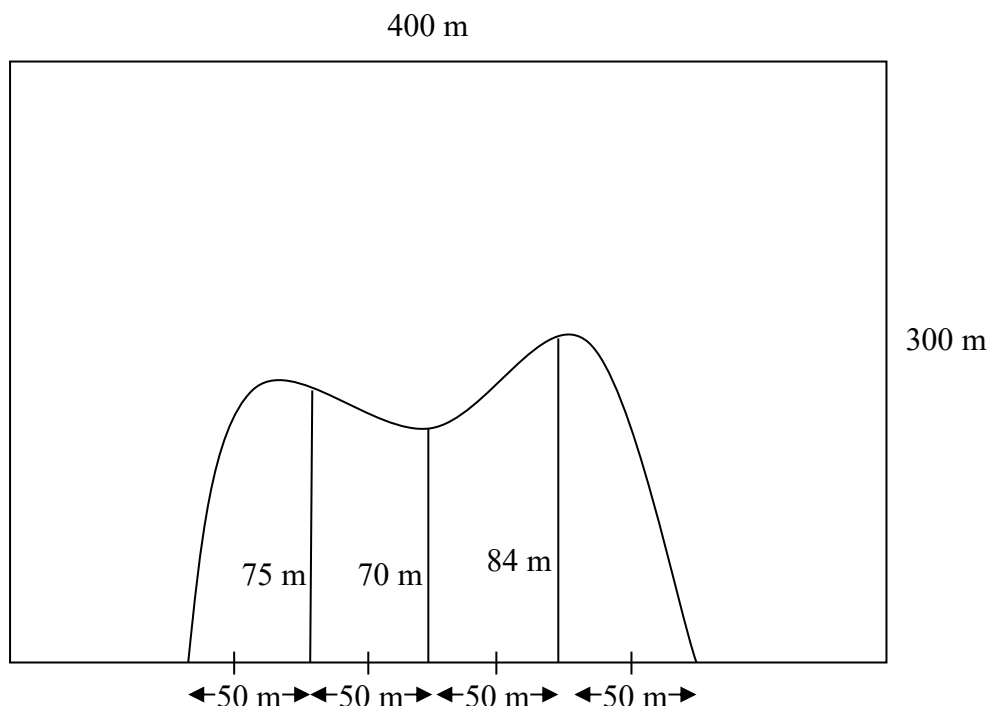
Question 22 continued.**Marks**

- (e) Given the radius of the Earth is approximately 6400 km, find the distance between the two points on the equator, $(0^{\circ}, 20^{\circ}\text{W})$ and $(0^{\circ}, 8^{\circ}\text{E})$. (Give your answer to the nearest kilometre.) **2**
- (f) Calculate the distance, in nautical miles, between $(20^{\circ}\text{N}, 85^{\circ}\text{W})$ and $(35^{\circ}\text{N}, 85^{\circ}\text{W})$. **2**
- (g) Given $1 \text{ M} = 1.852 \text{ km}$, calculate the average speed, in knots for a journey of 865 km in 6 hours and 54 minutes. (Give your answer to the nearest knot.) **2**
- (h) Ruby needs to have a sum of \$5 000 in 3 years. She invests in an annuity that earns 5.4% p.a compounding quarterly. How much should she deposit each quarter to achieve her required sum? **3**

End of Question 22

Question 23 (20 marks) Use a SEPARATE answer booklet.

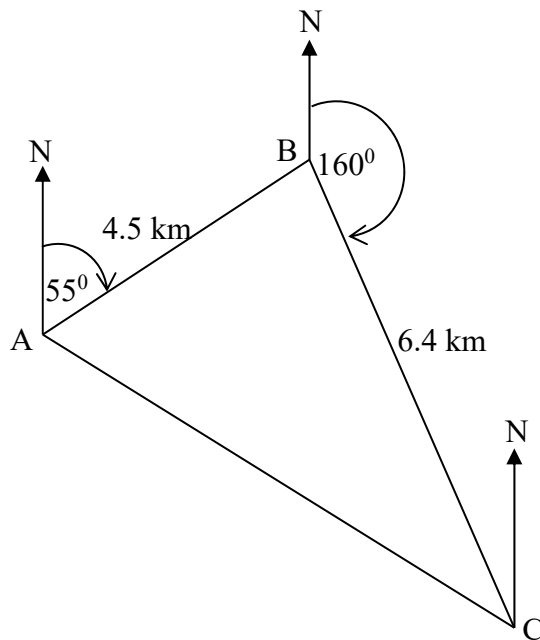
- (a) A rectangular shaped park with dimensions 400 m by 300 m has a lake within its boundaries with dimensions as illustrated in the diagram. (Diagram not to scale.)



- (i) Using Simpsons rule twice calculate the area of the lake to the nearest 10 square metres. 2
- (ii) If the lake has an average depth of 1.5 m, calculate the amount of water in the lake in Kilolitres 2
- (iii) What percentage of the park is occupied by the lake. Answer to 1 decimal place. 2

Question 23 Continued.**Marks**

(b) The diagram below represents a sailing course.

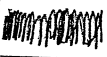


- | | | |
|-------|--|----------|
| (i) | Show that $\angle ABC = 75^\circ$. | 1 |
| (ii) | Find the distance AC to one decimal place. | 3 |
| (iii) | Find $\angle BAC$ to the nearest degree. | 2 |
| (iv) | Find the bearing of A from C. | 1 |
- (c) A home loan of \$350 000 is taken out and repaid monthly over 25 years.
- | | | |
|-------|---|----------|
| (i) | Determine the monthly repayment if interest is calculated at 8.4% p.a. | 3 |
| (ii) | Determine the total amount repaid. | 1 |
| (iii) | Determine the amount saved on the loan if repayments are made fortnightly at a rate of 7.8% p.a. over 25 years. | 3 |

END OF PAPER

Section I – Multiple Choice

Answer sheet

	A	B	C	D
1				
2				
3				
4				
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7				
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9				
10				
11				
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18				
19				
20				

Q21

(19)

$$\frac{4.8 \times 10^5}{6.4 \times 10^{-2}}$$

$$M = 7500000 \\ = 7.5 \times 10^6 \quad \checkmark$$

$$b) 4(2y-2) = 5y+19$$

$$8y-8 = 5y+19 \quad \checkmark$$

$$a) 3y = 27$$

$$y = 9 \quad \checkmark$$

$$c) i) A = P(1-r)^n \\ \text{Value} = 5800(1-0.3)^3 \quad \checkmark \\ = \$1989.40 \quad \checkmark$$

$$ii) \text{Straight Line Value} = 5800 - 1200 \times 3 \\ = \$2200 \quad \checkmark$$

∴ Straight line method gives greater value

$$d) i) \angle BAC = 30^\circ \quad \checkmark$$

$$ii) \frac{a}{\sin A} = \frac{b}{\sin B} \\ \frac{AC}{\sin 18} = \frac{50}{\sin 3} \quad \checkmark$$

$$AC = \frac{50}{\sin 3} \times \sin 18$$

$$AC = 295.22 \dots (\text{Calc})$$

$$\therefore AC = 295 \text{ m} \quad \checkmark$$

$$iii) \sin \theta = \frac{O}{H}$$

$$\sin 21^\circ = \frac{AD}{295} \quad \checkmark$$

$$M) AD = 295 \times \sin 21 \\ = 105.71 \dots (\text{Calc}) \\ = 106 \text{ m} \quad \checkmark$$

$$e) i) \text{Fencing required} (207.4095 \text{ m}) \\ 204 - 212 \quad \checkmark$$

$$M) 72+47+43+46 = 208 \text{ m}$$

One mark for adding 4 sides $\checkmark$

$$ii) \text{Area} = \frac{1}{2} \times 70.27 \times 70 \times 95$$

$$= 2520 \text{ m}^2 \quad \checkmark$$

$$2520$$

$$\therefore \text{No of Trees} = 2520 \div 12 \\ = 210 \text{ Trees} \quad \checkmark$$

$$F) \text{Time Difference} = 100 \times 4$$

$$M) = 400 \text{ mins} \quad \checkmark \\ = 6 \text{ h } 40 \text{ mins}$$

$$\text{Time in Rome} = 6 \text{ h } 40 + 5 \text{ h } 30 + 8 \text{ a.m.} \\ = 8.10 \text{ p.m. (same day)} \quad \checkmark$$

Q 22

a) i) $C = \pi d$

$= \pi \times 6.5 \text{ cm}$

$= 20.42035225$

$= 20.4 \text{ cm}$

ii) $A = 2\pi rh$

$= 20.4 \times 11$

$= 224.4 \text{ cm}^2$

OR 224.6 cm^2

iii) $V = \pi r^2 h$

$= \pi \times (3.25)^2 \times 11$

$= 365.0137964$

$= 365.0 \text{ cm}^3$

b) $V = \frac{h}{2(r+h)}$

$\therefore 0.1 = \frac{h}{2(8+h)}$

$0.2(8+h) = h$

$1.6 + 0.2h = h$

$0.8h = 1.6$

$h = 2$

c) $A = \frac{Y}{B}$

$A = 300 \div (3.81 \times 10^{-4})$

$A = 787401.5748$

$A = 790000 \text{ (2 sig figs)}$

$A = 7.9 \times 10^5$

d) i) $P = x + 9 + 2x + (x + 2)$

$= 4x + 11$

ii) $91 = 4x + 11$

$4x = 80$

$x = 20$

$\therefore \text{Longest side} = 2(20) = 40 \text{ cm}$

e) Angular Diff = $20^\circ + 8^\circ$
 $= 28^\circ$

$\therefore \text{Distance} = \frac{28^\circ}{360^\circ} \times 2 \times \pi \times 6400$

$= 3127.63002$

$= 3127.63 \text{ km}$

f) Angular Diff = $35^\circ - 20^\circ$
 $= 15^\circ$

$\therefore \text{Distance} = 15 \times 60$

$= 900 \text{ nautical miles}$

g) $865 \text{ km} = 865 \div 1.852$

$= 467.062635 \text{ naut. miles}$

$\therefore \text{Average Speed} = 467.062635 \div 6 \text{ hours } 54 \text{ min}$

$= 67.69023695$

$= 68 \text{ knots}$

h) $n = 12$

$I = 1.35$

$\therefore \text{PMT} = \386.63

$PV = 0$

$\text{PMT} = 0$

$FV = 5000$

$P/Y = 1$

$C/Y = 1$

$A = \frac{M[(1+r)^n - 1]}{r}$

$5000 = \frac{M[(1+0.0135)^{12} - 1]}{0.0135}$

$M = \frac{5000 \times 0.0135}{(1+0.0135)^{12} - 1}$

$\therefore \text{Payment} = \386.63

Q23

$$\begin{aligned}
 \text{a)} \quad \text{Area} &= \frac{h}{3} \{d_f + 4d_m + d_b\} \\
 &= \frac{50}{3} \{0 + 4 \times 75 + 70 + 70 + 4 \times 84 + 0\} \\
 &\quad \text{OR 2 Sep. Areas} \\
 &= \frac{50}{3} \times 776 \quad \text{OR } \frac{50}{3} \times 370 + \frac{50}{3} \times 406 \\
 &= 12933.33 \text{ (Calc)} \\
 &= \underline{\underline{12930 \text{ m}^2}}
 \end{aligned}$$

$$\begin{aligned}
 \text{ii)} \quad \text{Volume} &= A \times h \\
 &= 12930 \times 1.5 \\
 &= 19395 \text{ m}^3 \\
 &= \underline{\underline{19395 \text{ KL}}}
 \end{aligned}$$

$$\begin{aligned}
 \text{iii)} \quad \% \text{ Lake Occupies} &= \frac{12930}{(400 \times 300)} \times 100 \\
 &= \frac{12930}{120000} \times 100 \\
 &= 10.775 \\
 &= \underline{\underline{10.8\%}}
 \end{aligned}$$

$$\begin{aligned}
 \text{bi)} \quad \angle ABC + 160 + (180 - 55) &= 360 \\
 \angle ABC + 160 + 125 &= 360 \\
 \therefore \underline{\underline{\angle ABC = 75^\circ}}
 \end{aligned}$$

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$$ii) a^2 = b^2 + c^2 - 2bc \cos A$$

$$AC^2 = 4.5^2 + 6.4^2 - 2 \times 4.5 \times 6.4 \cos 75^\circ$$

$$= 46.302 \dots (\text{Calc})$$

$$\therefore AC = 6.804 \dots (\text{Calc})$$

$$= \underline{\underline{6.8 \text{ cm}}}$$

$$iii) \frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\frac{\sin A}{6.4} = \frac{\sin 75}{6.8}$$

$$\sin A = \frac{\sin 75 \times 6.4}{6.8}$$

$$= 0.9091 \dots (\text{Calc})$$

$$\angle BAC = \sin^{-1}(0.9091 \dots)$$

$$= 65.38 \dots$$

$$= \underline{\underline{65^\circ}}$$

$$iii) \text{ Bearing of A from C} = 360 - 40 - 20$$

$$= \underline{\underline{300^\circ T}}$$

$$c) N = M \frac{[(1+r)^n - 1]}{r(1+r)^n}$$

$$350000 = M \frac{[(1+0.007)^{300} - 1]}{0.007(1+0.007)^{300}}$$

$$350000 = M \frac{[1.007^{300} - 1]}{0.007 \times 1.007^{300}}$$

$$\therefore M = 350000 \times 0.007 \times 1.007^{300} \div [1.007^{300} - 1]$$

$$= 2794.747 \dots (\text{Calc})$$

$$\therefore \text{Monthly Payment} = \underline{\underline{\$2794.75}}$$

$$cii) \text{ Total Repaid} = 2794.75 \times 300$$

$$= \underline{\underline{\$838425}}$$

$$ciii) \text{ Using } r = 7.8 \div 26 \div 100$$

$$= 0.003$$

$$\text{and } n = 26 \times 25$$

$$= 650$$

$$M = 350000 \times 0.003 \times 1.003^{650} \div [1.003^{650} - 1]$$

$$= 1224.761 \dots (\text{Calc})$$

$$\text{Fortnightly Payments} = \underline{\underline{\$1224.76}}$$

$$\text{Amount Saved} = [2794.75 \times 12] - [1224.76 \times 26] \times 25$$

$$= [33537 - 31843.76] \times 25$$

$$= 1693.24 \times 25$$

$$= \underline{\underline{\$42331}}$$

By Graphics

$$n = 300$$

$$I = 8.4$$

$$PV = 350000$$

$$FV = 0$$

$$P/Y = 12$$

$$C/Y = 12$$

$$PMT = 2794.74$$

$$n = 650$$

$$I = 7.8$$

$$PV = 350000$$

$$FV = 0$$

$$P/Y = 26$$

$$C/Y = 26$$