

SECTION 1**QUESTIONS 1 – 20****(20 marks)**

Use the answer sheet provided to answer questions 1 to 20. Each question is worth 1 mark.

1. The simple interest for \$1500 invested at $7\frac{1}{2}\%$ p.a. for 2 years will be:

A	\$ 112.50
B	\$ 225.00
C	\$ 1725.00
D	\$ 22500.00

2. Find the value at the end of 7 years of an annuity of \$125 paid at the end of each month, interest compounded monthly at 0.5% per month.

A	\$29 600
B	\$6 348
C	\$11 018
D	\$13 009

3. A home loan for \$120 000 is taken out at an interest rate of 9.6% p.a. with a monthly repayment of \$1100. What will the balance of the loan be at the end of the first month?

A	\$119 860
B	\$130 420
C	\$120 951.20
D	\$131 414.40

4. A helicopter is purchased by a company for \$3.3 million. The salvage value of the helicopter depreciates in a straight line at a rate of \$240 000 per year. After how many years will the value of the helicopter first be less than \$1 million?

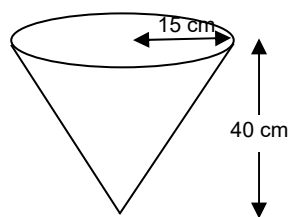
A	8
B	9
C	10
D	11

5. Cally has a credit card with an interest rate of 0.05% per day and no interest free period. Cally used the credit card to pay for car repairs costing \$480. She paid the credit card account 16 days later. What is the total amount (including interest) that she paid for the repairs?

A \$480.24
B \$483.84
C \$504.00
D \$864.00

6. The volume of the given cone (correct to 2 decimal places) is:

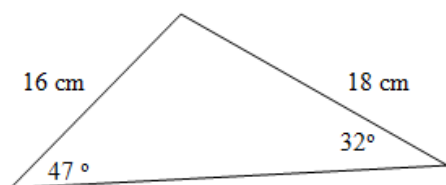
A 28274.33 cm^3
B 9424.78 cm^3
C 37699.11 cm^3
D 18849.56 cm^3



7. The length and width of a rectangle are measured to the nearest centimeter and found to be 12 cm and 16 cm. Between what upper and lower values must the actual area of the rectangle lie?

A $12 \times 16 \text{ cm}^2$ (lower) and $13 \times 17 \text{ cm}^2$ (upper)
B $12 \times 16 \text{ cm}^2$ (lower) and $12.5 \times 15.5 \text{ cm}^2$ (upper)
C $11.5 \times 15.5 \text{ cm}^2$ (lower) and $11 \times 16 \text{ cm}^2$ (upper)
D $11.5 \times 15.5 \text{ cm}^2$ (lower) and $12.5 \times 16.5 \text{ cm}^2$ (upper)

8. What is the area of the triangle shown? (correct to 2 significant figures)



A 140 cm^2
B 76 cm^2
C 280 cm^2
D 110 cm^2

9. Fred measures the length of a piece of wood as 250mm, correct to the nearest mm. What is the percentage error in his measurement?

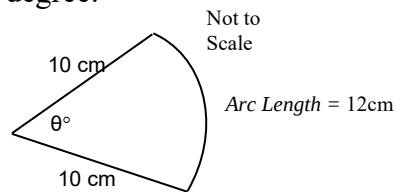
A. $\pm 0.002\%$
B. $\pm 0.004\%$
C. $\pm 0.2\%$
D. $\pm 0.4\%$

10. A sphere has a volume of 360cm^3 . Its radius (to one decimal place) is closest to

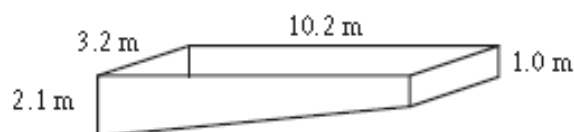
A. 1.7 cm
B. 4.4 cm
C. 8.1 cm
D. 9.3 cm

11. This is the sketch of a sector of a circle,
Find the value of θ to the nearest degree:

A. 47°
B. 48°
C. 68°
D. 69°

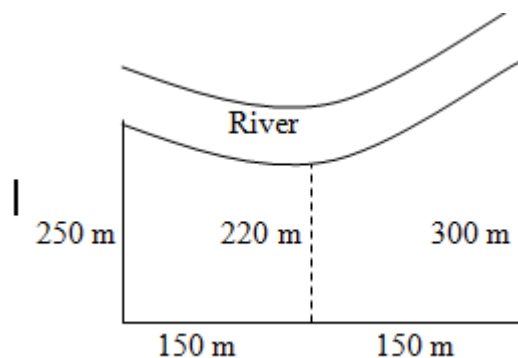


12. The owner of the pool below wants to know the capacity of the pool. What is the capacity in kilolitres? ($1\text{m}^3 = 1\text{kL}$)



A. 68.5kL
B. 15.8kL
C. 50.6kL
D. 101.2kL

13. A paddock is bordered by a river as shown below. Use Simpsons Rule to find the area of the paddock. Note the diagram is not drawn to scale.



- A 115 550 m²
 B 38 500 m²
 C 143 000 m²
 D 71 500 m²
14. The coordinates of Hellsville are 25°N 45°W, Heavenville is 2 hours ahead of Hellsville. The coordinates of Hellsville could be:

- A (10°N, 15°W)
 B (55°N, 45°W)
 C (5°S, 75°W)
 D (5°S, 45°W)

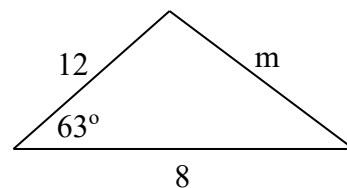
15. Which equation should be used to obtain the value of m in the triangle below?

A $\frac{m}{\sin 63^\circ} = \frac{8}{\sin 12^\circ}$

B $m^2 = 12^2 + 8^2 - 2 \times 12 \times 8 \cos 63^\circ$

C $\cos 63^\circ = \frac{x^2 + 12^2 - 8^2}{2 \times 12 \times 8}$

D $m^2 = 12^2 - 8^2$



16. If $w = \frac{15y}{y+12}$ and $y = 7$, find the value of w (correct to two decimal places)
- A 5.53
B 8.26
C 15.75
D 27.00
17. The formula $s = ut + \frac{at^2}{2}$ is rearranged to make a the subject. The results is:
- A $a = \frac{2s - ut}{t^2}$
B $a = \frac{2(s - ut)}{t^2}$
C $a = \frac{2s + 2ut}{t^2}$
D $a = t^2(2s - 2ut)$
18. If a garden hose can fill a 5 litre bucket in 10 seconds:
When expressed as a rate of flow in litres per hour this is that's same as :
- A 180 L/hr
B 1800 L/hr
C 30 L/hr
D 200 L/hr
19. The solution to the equation $4 - 6(x - 3) = -12$
- A $x = \frac{17}{3}$
B $x = 11$
C $x = 5$
D $x = \frac{5}{11}$
20. Evaluate $1.57 \times 10^{-5} \div 8.7 \times 10^3$ correct to 3 significant figures
- A 1.80×10^{-9}
B 0.0000000018045977
C 1.80×10^{-1}
D 1.37×10^2

QUESTION 21 (15 marks)

Start a new page

Marks

- (a) Solve for x :

$$\frac{2x-3}{4} + 5 = 9$$

3

- (b) Simplify the following expressions:

(i) $(-2rt)^2$

1

(ii) $5a^4(4a^2-2) + a^3(a^3+7)$

2

(iii) $\frac{6d^3}{9c} \times \frac{c}{2} \times \frac{18c^2}{12d}$

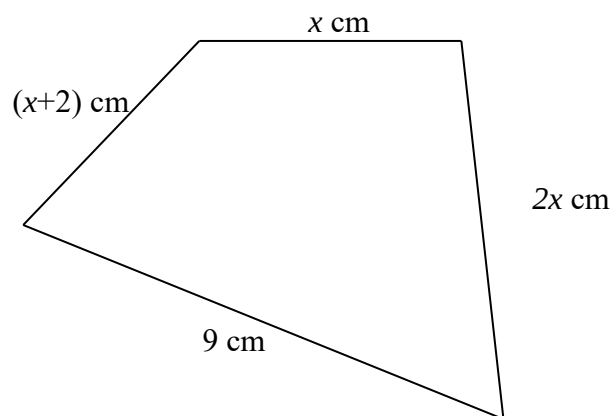
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- (c) If $D = \frac{yA}{(y+12)}$, find A if $y = 9$ and $D = 11$ correct to 2 significant figures.

3

- (d) Using the diagram below, if the perimeter is 91 cm, calculate the value of x .

2

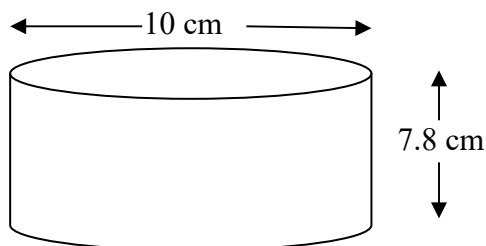


- (e) Solve for k : $\sqrt{5k+4} = 7$

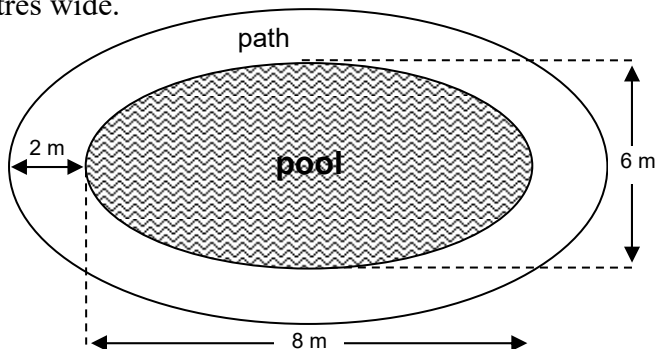
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QUESTION 22 (13 marks)**Start a new page****Marks**

- (a) Subaru is designing an eight cylinder racing engine. Each cylinder has a bore (diameter) of 10.0cm and a stroke (height) of 7.8 cm as shown below.



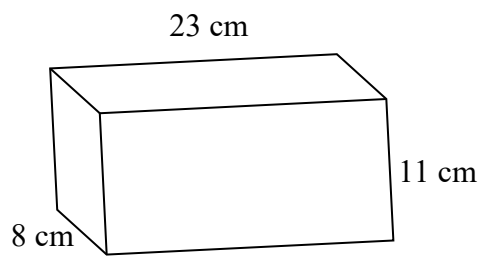
- i) Calculate the volume of each cylinder, correct to the nearest cubic centimetre 2
- ii) The capacity of the engine is the sum of all the capacities of the 8 cylinders. Does Subaru's engine meet the racing requirements that the capacity should be under 5 litres? Justify your answer with a mathematical calculation. (Note: $1\text{cm}^3 = 1\text{mL}$) 3
- (b) A couple are having an elliptical swimming pool built. They are having a concrete path around the pool 2 metres wide.



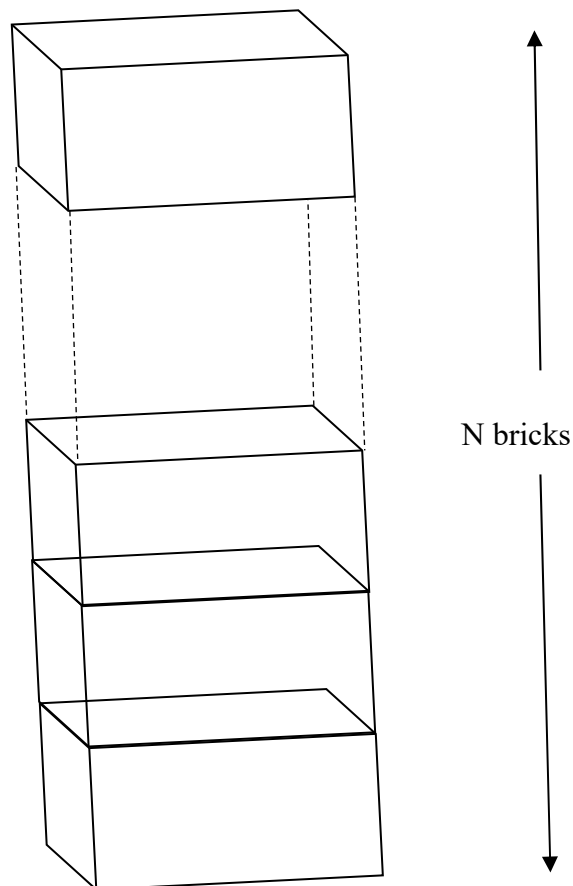
- i) What is the area of the path around the pool? Answer to 2 decimal places 2
- ii) The concrete will have a depth of 6 cm. What is the volume of concrete needed for the path? Answer to nearest cubic metre. 2

Question 22 continued**Marks**

- (c) A house brick in the shape of a rectangular prism has dimensions as shown below,

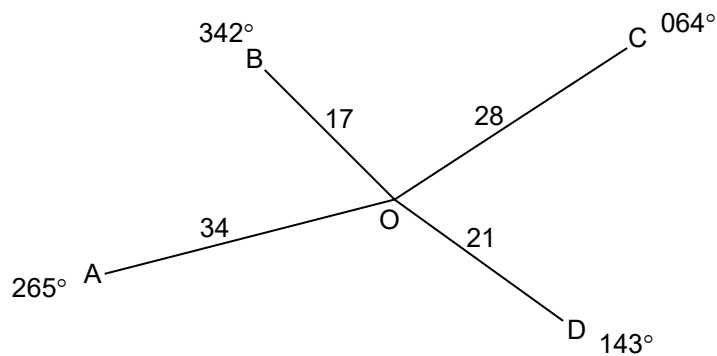
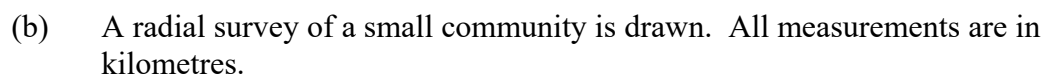


- (i) What is the surface area of one brick? **1**
- (ii) The surface area for a stack of these bricks is less than the total surface area of the individual bricks in the stack. Find the formula for the surface area of a stack of N bricks. **3**



Marks

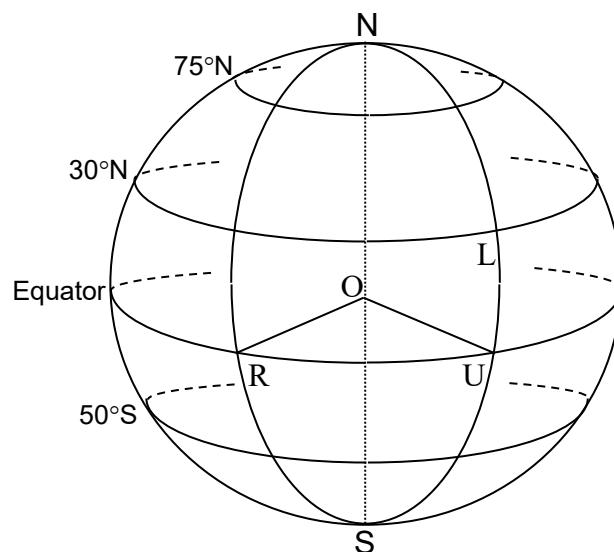
- 3



- | | | |
|-------|--|----------|
| (i) | Find the size of $\angle BOC$. | 1 |
| (ii) | Find the length of DC to the nearest kilometre. | 2 |
| (iii) | Find the area of $\triangle AOD$ [$\angle AOD = 122^\circ$]. Answer to one decimal place | 2 |

Question 23 continued**Marks**

(c)



In the diagram above, R and U represent points on the equator with longitudes 55° W and 35° E respectively. L is located on latitude 30° N .

- | | | |
|-------|--|----------|
| (i) | What is the longitude of L? | 1 |
| (ii) | If it is 11 pm at L what is the time at U? | 1 |
| (iii) | What is $\angle ROU$? | 1 |
| (iv) | What is the time difference between R and U? | 1 |
| (v) | Find the distance between R and U along the Earth's surface in Nautical Miles. | 2 |
| (vi) | How long does it take a ship travelling at 25 knots to travel from R to U. | 1 |
| (vii) | If the ship leaves R at 6am on 1 st August, at what local time and date does the ship arrive at U? | 2 |
| (d) | The position of Brennanville is given by the co-ordinates $(34^\circ\text{S}, 135^\circ\text{E})$ and the position of Wilsontown is given as $(34^\circ\text{N}, 135^\circ\text{E})$.
Find the distance to the nearest kilometre between the two towns to the nearest kilometre. | 2 |

Use may use any or all of the following facts:

radius of the earth = 6400 km and/or 1 nautical mile = 1.852 km.

QUESTION 24 (13 marks)**Start a new page****Marks**

- (a) A loan of \$290 000 at 6% p.a. compounded monthly is paid off in equal monthly instalments over a 20 year term.

Calculate: (i) the monthly repayment to the nearest cent

2

(ii) the total amount repaid.

1

- (b) Jack plans to borrow money to buy a motorbike and considers the following repayment guide.

4**Fortnightly Car Loan Repayment Guide**

Amount Borrowed (\$)	Length of Loan		
	1 year (\$)	2 years (\$)	3 years (\$)
10500	430	228	161
11000	451	239	168
11500	471	249	176
12000	492	260	183
12500	512	271	191
13000	532	282	199

He decides to borrow \$11000 and pay the loan back in fortnightly instalments over 3 years. What is the flat rate of interest per annum on this loan? (answer to one decimal place)

- (c) Gwen borrows \$53 000 to begin a new business. She has secured a 9% pa interest loan. She makes monthly repayments and intends to complete the loan in 5 years.

- (i) She looks up her HSC General Mathematics Formula Sheet and finds the Present Value Formula and hopes to confirm what the Credit Union told her.

α) What values should Gwen put in for n and r ?

2

β) Gwen is told that her monthly repayment is \$1100? Is this correct?

2

Use calculations to support your answer.

- (ii) Her financial advisor tells Gwen that the repayments must be less than 40% of her net income. Using the Credit Union's figure of \$1100/month calculate the net income she needs to earn each month to follow the recommendation of the advisor.

2**End of paper**

2012 - Gen Maths
Yr 12 Mini

Section 1

1. $I = Prn$

$I = 1500 \times 0.075 \times 2$
 $= 225$

B.

2. $A = 125 \left\{ \frac{(1 + 0.005)^{84} - 1}{0.005} \right\}$
 $= 13009$

D.

3. $120000 + 0.008 \times 120000 - 1100.$
 $= 119860$

A.

4. $S = 3,300,000 - 240,000n$
 $1,000,000 = 3,300,000 - 240,000n$
 $240,000n = 2,300,000$
 $n = 9.58$
 $n = 10$ nearest year.

C.

5. $4.80 + 0.05\% \times 480 \times 16.$
 $= 483.84$

B.

6. $V = \frac{1}{3} \pi r^2 h$
 $= \frac{1}{3} \pi \times 15^2 \times 40.$

$= 37699.11$

~~A~~ B

7. 11.5×15.5 and $12.5 \times 16.5.$

D.

8. $A = \frac{1}{2} \times 16 \times 18 \times \sin 101.$
 $= 141.35$
 $= 140 \text{ cm}^2$ 25.f.

A.

9. $\frac{0.5}{250} \times 100 = 0.2$

C.

10. $360 = \frac{4}{3} \pi r^3$

$r^3 = 85.94$

$r = 4.42$

B.

$$11. \quad 12 = \frac{\theta}{360} \times 2\pi \times 10.$$

$$\theta = \frac{12 \times 360}{20\pi}$$

$$= 68.75 \dots$$

$$= 69^\circ \text{ (nearest degree)}$$

D.

$$12. \quad \text{Vol} = \frac{1}{2} (2.1 + 1.0) \times 10.2 \times 3.2.$$

$$= 50.592 \text{ m}^3$$

$$= 50.6 \text{ kL}$$

C.

$$13. \quad A = \frac{150}{3} (250 + 4 \times 220 + 300).$$

$$= 71500 \text{ m}^2$$

D.

14. 2 hours equates to 30° longitude

$\therefore$ ahead so further East

$\therefore$ must be 15°W

A.

$$15. \quad m^2 = 12^2 + 8^2 - 2 \times 12 \times 8 \cos 63^\circ$$

(cosine rule)

B.

$$16. \quad W = \frac{15 \times 7}{7 + 12}$$

$$= 5.526 \dots$$

$$= 5.53 \text{ (2dp)}$$

A.

$$17. \quad s = ut + \frac{at^2}{2}$$

$$\frac{at^2}{2} = s - ut.$$

$$a = \frac{2(s - ut)}{t^2}$$

B.

$$18. \quad 5 \text{ L} / 10 \text{ sec.}$$

$$30 \text{ L} / \text{min}$$

$$1800 \text{ L} / \text{h.}$$

B.

$$\begin{aligned}
 19. \quad 4 - 6(x-3) &= -12 \\
 -6(x-3) &= -16 \\
 6(x-3) &= 16 \\
 x-3 &= \frac{16}{6}
 \end{aligned}$$

$$\begin{aligned}
 x &= 2\frac{2}{3} + 3 \\
 &= 5\frac{2}{3} \\
 &= 17/3
 \end{aligned}$$

A

$$\begin{aligned}
 20. \quad 1.57 \times 10^{-5} \div 8.7 \times 10^3 \\
 = 1.80 \times 10^{-9}
 \end{aligned}$$

A.

Question 2

(a) $\frac{2x-3}{4} + 5 = 9$

$$\frac{2x-3}{4} = 4 \quad \checkmark$$

$$2x-3 = 16 \quad \checkmark$$

$$2x = 19$$

$$x = \frac{19}{2} \left(9\frac{1}{2}\right) \quad \checkmark$$

(3 marks if answer correct - can be done AC)

(b)(i) $(2rt)^2 = 4r^2t^2 \quad \checkmark$

(ii) $5a^4(4a^2-2) + a^3(a^3+7)$
 $= 20a^6 - 10a^4 + a^6 + 7a^3 \quad \checkmark$
 $= 21a^6 - 10a^4 + 7a^3 \quad \checkmark$

(if expansion incorrect still give collection of like terms mark)

(iii) $\frac{6d^3}{9d} \times \frac{d}{2} \times \frac{18d^2}{12d} = \frac{d^2c^2}{2} \quad \checkmark$

(c) $D = \frac{yA}{(y+12)}$

$$11 = \frac{9 \times A}{(9+12)} \quad \checkmark$$

$$9A = 231 \quad \checkmark$$

$$A = 25.666 \quad \checkmark$$

$$A = 26 \quad (2 \text{ sig figs}) \quad \checkmark$$

(d) $x + 2x + 9 + x + 2 = 91 \quad \checkmark$

$$4x + 11 = 91$$

$$4x = 80 \quad \checkmark$$

$$x = 20$$

(e) $\sqrt{5k+4} = 7$

$$5k+4 = 49 \quad \checkmark$$

$$5k = 45$$

$$k = 9 \quad \checkmark$$

Question 22.

$$(a)(i) V = \pi r^2 h$$
$$V = \pi \times 5^2 \times 7.8 \quad \checkmark$$

$$= 612.61 \quad \checkmark$$
$$\checkmark = 613 \text{ cm}^3 \quad \checkmark$$

$$(ii) 8 \times 613 = 4904 \text{ cm}^3 \quad \checkmark$$
$$= 4.904 \text{ litres} \quad \checkmark$$

yes it does meet the requirements. $\checkmark$

$$(b)(i) \text{Area of path} = \pi \times 6 \times 5 - \pi \times 4 \times 3. \quad \checkmark$$
$$= 18\pi$$
$$= 56.55 \text{ m}^2 \quad \checkmark$$

$$(ii) \text{Vol} = 56.55 \times 6. \quad \checkmark$$
$$= 339.3 \quad \checkmark$$

$$(c)(i) SA = 2 \times (8 \times 11 + 8 \times 23 + 11 \times 23) \quad \checkmark$$
$$= 2 \times 525$$
$$= 1050 \text{ cm}^2 \quad \checkmark$$

$$(ii) A = n \times 4 \text{ sides} + \text{top} + \text{bottom} \quad \checkmark$$
$$SA = n \times 2 \times (8 \times 11 + 11 \times 23) + 2 \times 23 \times 8.$$
$$SA = 682n + 368 \quad \checkmark$$

Question 23

a) $A = \frac{90}{3} \{50 + 4 \times 80 + 70\} + \frac{90}{3} \{140 + 4 \times 130 + 150\}$
 $= 13200 + 24300$
 $= 37500 \text{ m}^2$ ✓

(if incorrect formula used give mark for adding two areas)

(b) (i) $\angle BOC = 18 + 64$
 $= 82$ ✓

(ii) $DC^2 = 28^2 + 21^2 - 2 \times 28 \times 21 \cos 79$ ✓
 $DC^2 = 1000.608$
 $DC = \sqrt{1000.608}$
 $= 31.63$
 $= 32 \text{ (nearest km)}$ ✓ (no rounding penalised)

(iii) $A = \frac{1}{2} ab \sin C$
 $= \frac{1}{2} \times 34 \times 21 \times \sin 122$ ✓
 $= 302.75 \text{ km}^2$ ✓ (no rounding penalised)

(c) (i) 35° E ✓
(ii) 11 pm (same time) ✓
(iii) $55 + 35 = 90^\circ$ ✓
(iv) time difference = $\frac{90}{15}$
 $= 6 \text{ hours}$ ✓

(v) $1^\circ \Rightarrow 60 \text{ nautical miles on surface}$ ✓
 $90^\circ \Rightarrow 5400 \text{ NM}$ ✓

(vi) $S = \frac{d}{t}$
 $t = \frac{d}{S}$
 $t = \frac{5400}{25}$
 $= 216 \text{ hours}$ ✓

(vii) At 6 am on Mon 1st August at R
it is $6+6=12$ midday at U. ✓

travel time is 216 hours or 9 days.

Would arrive on 10th August at midday. ✓

(d) 68° ✓

distance is $68 \times 60 = 4080$ NM

$$= 4080 \times 1.852 \text{ km}$$

$$= 7556.16$$

$$\approx 7556 \text{ km (nearest km)} \quad \checkmark$$

Question 24.

$$(a) (i) 290\,000 = M \left\{ \frac{(1 + 0.005)^{120} - 1}{0.005(1 + 0.005)^{120}} \right\} \quad \checkmark$$

$$290\,000 = M \times 90.073 \dots$$

$$M = 3219.59 \text{ per month} \quad \checkmark$$

$$(ii) \text{ Total } \$386\,350.8 \quad \checkmark \quad (3219.59 \times 120)$$

$$(b) \text{ repayment per fortnight} = 168 \quad \checkmark$$

$$\text{Total repaid} = 168 \times 3 \times 26 \\ = \$13\,104 \quad \checkmark$$

$$\text{Total interest} = 13\,104 - 11\,000 \\ = \$2\,104$$

$$\text{Interest per annum} = \frac{2\,104}{3} \\ = \$701.33 \quad \checkmark$$

$$\text{Flat interest rate} = \frac{701.33}{11\,000}$$

$$= 6.3757\% \\ = 6.4\% \quad \checkmark$$

(no rounding required)

$$(c) T = 240 \times 3 \times 12 \\ = 8640$$

$$\text{Interest} = 8640 - 5000 \\ = 3640$$

$$\text{Interest per annum} = \frac{3640}{3} \\ = 1213.33 \dots$$

$$\text{Simple rate} = \frac{1213.33}{5000}$$

$$= 24.26\% \\ = 24.3\%$$

$$(i) (x) \quad n = 5 \times 12$$

$$= 60. \quad \checkmark$$

$$r = \frac{9}{12} \%$$

$$= 0.0075. \quad \checkmark$$

$$(B) \quad N = 1100 \left\{ \frac{(1 + 0.0075)^{60} - 1}{0.0075(1 + 0.0075)^{60}} \right\} \quad \checkmark$$

$$= 52990.$$

yes it is correct. $\checkmark$

(ii) let income be I .

$$0.4 \times I = 1100. \quad \checkmark$$

$$I = \frac{1100}{0.4}$$

$$= \$2750. \quad \checkmark$$

she must earn at least \$2750 per month.