**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 7½%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 <u>0.5% per month</u>.

      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     37699.11cm$^3$
    D     18849.56 cm$^3$
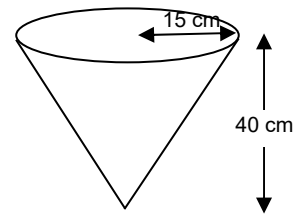


**7.** The length and width of a rectangle an measured to the nearest centimeter and found to be 12cm and 16cm. Between what upper and lower values must the actual area of the rectangle lie?

    A     $12 \times 16$ *cm²* (lower) and $13 \times 17$ *cm²* (upper)
    B     $12 \times 16$ *cm²* (lower) and $12.5 \times 15.5$ *cm²* (upper)
    C     $11.5 \times 15.5$ *cm²* (lower) and $11 \times 16$ *cm²* (upper)
    D     $11.5 \times 15.5$ *cm²* (lower) and $12.5 \times 16.5$ *cm²* (upper)

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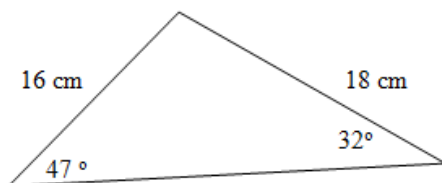


    A     140 cm$^2$
    B     76  cm$^2$
    C     280 cm$^2$
    D     110 cm$^2$

**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?
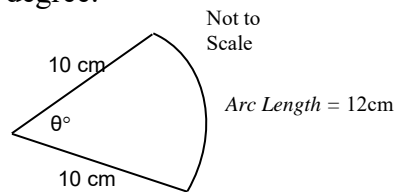
    A.   ±0.002%
    B.   ±0.004%
    C.   ±0.2%
    D.   ±0.4%

**10.**    A sphere has a volume of 360cm³. Its radius (to one decimal place) is closest to

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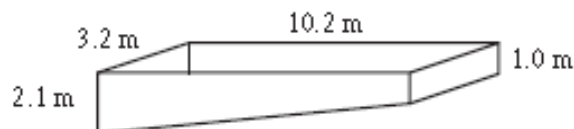    C       8.1 cm
    D       9.3  cm

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

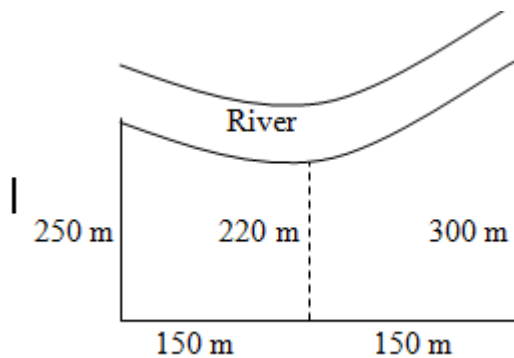    A       47°
    B       48°
    C       68°
    D       69°



Not to Scale
10 cm
θ°
10 cm
Arc Length = 12cm

**12.**    The owner of the pool below wants to know the capacity of the pool. What is the capacity in kilolitres? (1m³ = 1kL)



3.2 m     10.2 m
2.1 m          1.0 m

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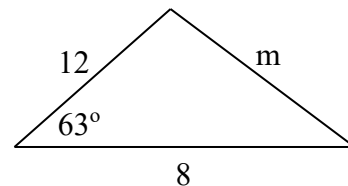
**15.**   Which equation should be used to obtain the value of *m* in the triangle below?

A   $\dfrac{m}{\sin 63} = \dfrac{8}{\sin 12}$



B   $m^2 = 12^2 + 8^2 - 2 \times 12 \times 8 \cos 63^0$

C   $\cos 63^0 = \dfrac{x^2 + 12^2 - 8^2}{2 \times 12 \times 8}$

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

**16.** If $w = \dfrac{15y}{y+12}$ 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 $s = ut + \dfrac{at^2}{2}$ is rearranged to make *a* the subject. The results is:

    A    $a = \dfrac{2s - ut}{t^2}$

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

    C    $a = \dfrac{2s + 2ut}{t^2}$

    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    $x = \dfrac{17}{3}$

    B    $x = 11$

    C    $x = 5$

    D    $x = \dfrac{5}{11}$

**20.** Evaluate $1.57 \times 10^{-5} \div 8.7 \times 10^3$ correct to 3 significant figures

    A    $1.80 \times 10^{-9}$
    B    0.0000000018045977
    C    $1.80 \times 10^{-1}$
    D    $1.37 \times 10^2$

**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)    $5a^4\left(4a^2 - 2\right) + a^3\left(a^3 + 7\right)$           **2**

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

(c)    If $D = \dfrac{yA}{(y+12)}$ , 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**



$x$ cm

$(x+2)$ cm

$2x$ cm

9 cm
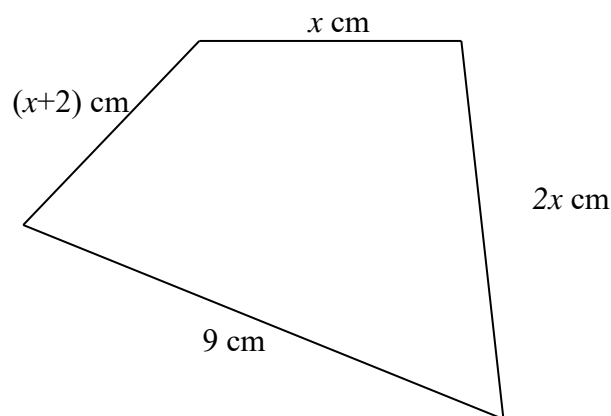
(e)     Solve for $k$: $\sqrt{5k + 4} = 7$           **2**

**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.
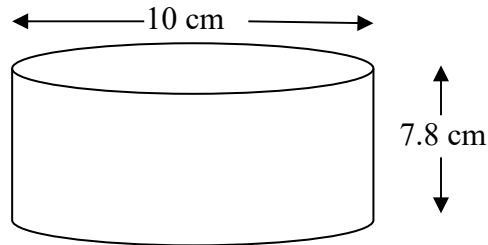


       i)    Calculate the volume of each cylinder , correct to the nearest cubic centimetre        **2**

       ii)   The capacity of the engine is the sum of all the capacities of the 8 cylinders. Does    **3**
             Subaru's engine meet the racing requirements that the capacity should be under
             5 litres? Justify your answer with a mathematical calculation. (Note: $1cm^3 = 1mL$ )

(b)    A couple are having an elliptical swimming pool built. They are having a concrete path
       around the pool 2 metres wide.
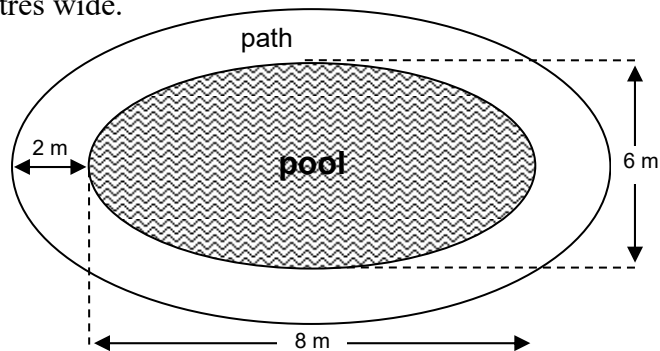


       i)     What is the area of the path around the pool? Answer to 2 decimal places              **2**

       ii)   The concrete will have a depth of 6 cm. What is the volume of concrete needed          **2**
             for the path? Answer to nearest cubic metre.

**Question 22 continued**        **Marks**

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

23 cm

11 cm

8 cm
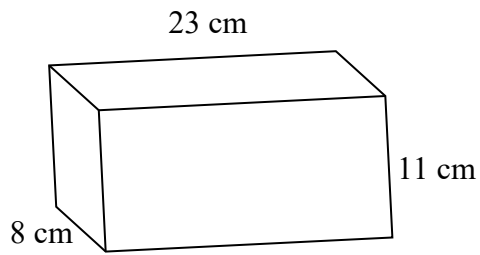
(i)    What is the surface area of one brick?    **1**

(ii)    The surface area for a stack of these bricks is less than the total surface area    **3**
of the individual bricks in the stack. Find the formula for the surface area
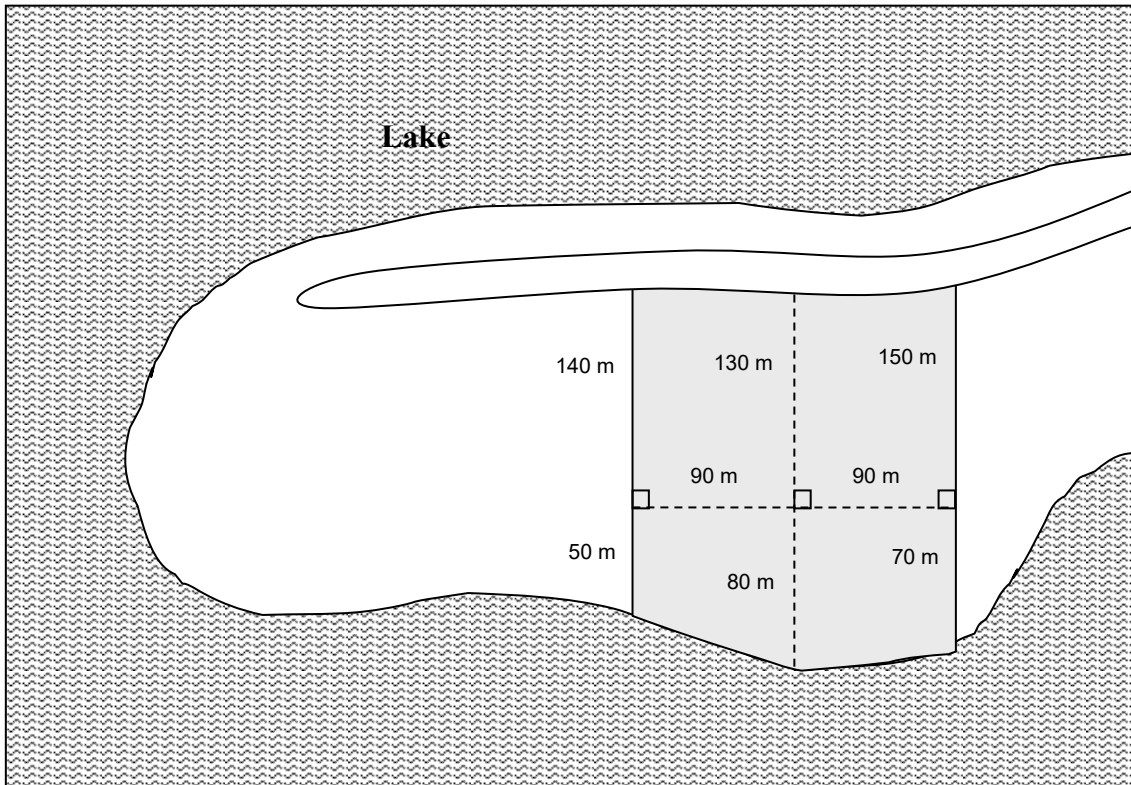of a stack of N bricks.

N bricks
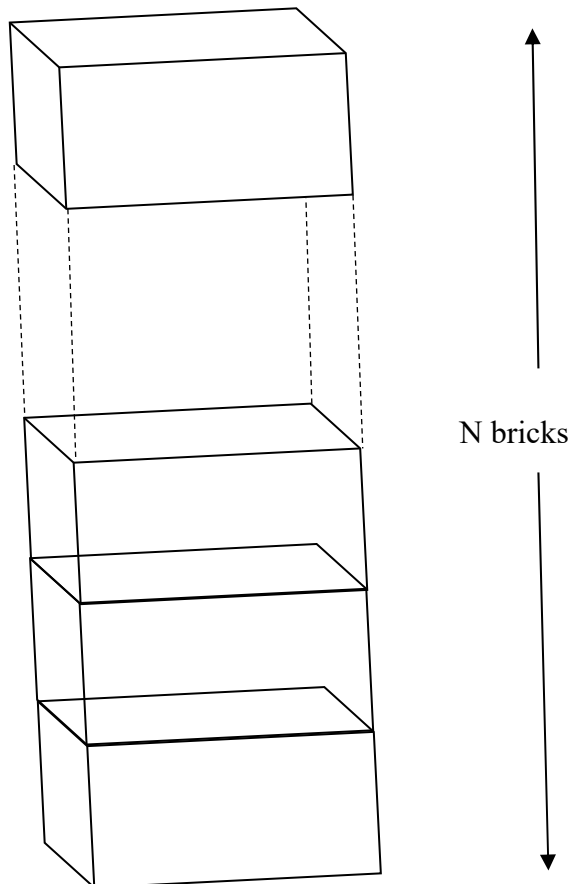
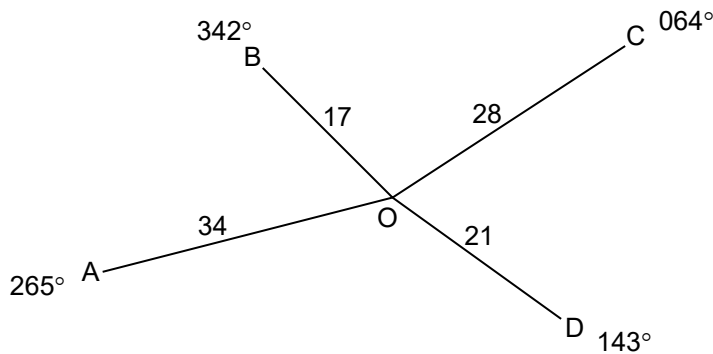**QUESTION 23 (19 marks)**        **Start a new page**        **Marks**

(a)     Use Simpsons Rule to find the approximate area of the shaded block of waterfront land.    **3**



(b)     A radial survey of a small community is drawn.  All measurements are in kilometres.
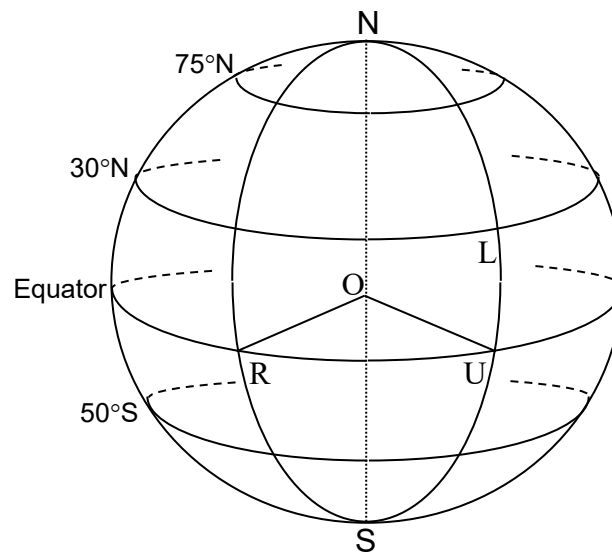


    (i)      Find the size of $\angle$BOC.    **1**

    (ii)     Find the length of DC to the nearest kilometre.    **2**

    (iii)    Find the area of $\triangle$AOD $[\angle AOD = 122°]$. 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                      **2**
         Nautical Miles.

(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 1st August, at what local time and date              **2**
         does  the ship arrive at U?

(d)      The position of Brennanville is given by the co-ordinates $(34^0S, 135^0E)$ and the      **2**
         position of Wilsontown is given as $(34^0N, 135^0E)$.
         Find the distance to the nearest kilometre between the two towns to the nearest kilometre.

         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    **4**
guide.

**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.

                $\propto$)      What values should Gwen put in for $n$ and $r$?       **2**

                $\beta$)      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       **2**

                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.

**End of paper**

Section 1

1.  $I = Prn$

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

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

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

4.  $S = 3,300,000 - 240,000\,n$
    $1,000,000 = 3,300,000 - 240000\,n$
    $240000\,n = 2,300,000$
    $n = 9.58$
    $n = 10$ nearest year     C.

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

6.  $V = \frac{1}{3}\pi r^2 h$
    $= \frac{1}{3}\pi \times 15^2 \times 40$
    $= 37699.11$     B

7.  $11.5 \times 15.5$ and $12.5 \times 16.5$     D

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

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

10. $360 = \frac{4}{3}\pi r^3$
    $r^3 = 85.94\ldots$
    $r = 4.4\ldots$     B

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

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

$= 68.75\ldots$

$= 69°$ (nearest degree)   D

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

$= 50.592 \, M^3$

$= 50.6 KL$   C

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

$= 71500 \, M^2$   D

14. 2 hours equates to $30°$ longitude

∴ ahead so further East

∴ must be $15°W$   A

15. $M^2 = 12^2 + 8^2 - 2 \times 12 \times 8 \cos 63$

(cosine rule)   B

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

$= 5.526\ldots$

$= 5.53$ (2dp)   A

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

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

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

18. $5\ell/10 \, sec$.

$30\ell/min$

$1800\ell/h$.   B

19. $4 - 6(x-3) = -12$
$-6(x-3) = -16$
$6(x-3) = 16$
$x - 3 = \dfrac{16}{6}$
$x = 2\frac{2}{3} + 3$
$= 5\frac{2}{3}$
$= 17/3$

A

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

A.

<u>Question 21</u>. — —

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

   $\dfrac{2x-3}{4} = 4$ ✓

   $2x - 3 = 16$ ✓

   $2x = 19$

   $x = \dfrac{19}{2}$ $\left(9\frac{1}{2}\right)$ ✓   (3 marks if answer correct — can be done AC)

(b)(i) $\left(-2rt^2\right)^2 = 4r^2t^4$ ✓

(ii) $5a^4\left(4a^2-2\right) + a^3\left(a^3+7\right)$
   $= 20a^6 - 10a^4 + a^6 + 7a^3$ ✓
   $= 21a^6 - 10a^4 + 7a^3$ ✓

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

(iii) $\dfrac{6d^3}{9q} \times \dfrac{q}{1} \times \dfrac{18c^2}{12d} = \dfrac{dc^2}{2}$ ✓✓

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

   $11 = \dfrac{9 \times A}{(9+12)}$ ✓

   $9A = 231$ ✓

   $A = 25 \cdot 666 \ldots$ ✓

   $A = 26$ $(2\ \text{sg figs})$ ✓

(d). $x + 2x + 9 + x + 2 = 91$ ✓
   $4x + 11 = 91$
   $4x = 80$
   $x = 20$. ✓

(e) $\sqrt{5k+4} = 7$.
   $5k + 4 = 49$ ✓
   $5k = 45$
   $k = 9$. ✓

# Question 22.

(a) (i) $V = \pi r^2 h$

$V = \pi \times 5^2 \times 7.8$ ✓

$= 612.61...$ ✓

$V = 613 \text{ cm}^3$. ✓

(ii) $8 \times 613 = 4904 \text{ cm}^3$ ✓     $1 \text{ cm}^3 = 1 \text{ mL}$.

$= 4.904 \text{ litres}$ ✓

yes it does meet the requirements. ✓

(b)(i) Area of path $= \pi \times 6 \times 5 - \pi \times 4 \times 3$. ✓

$= 18\pi$

$= 56.55 \text{ m}^2$. ✓

(ii) $Vol = 56.55 \times 6$. ✓

$= 339$

(c) (i) $SA = 2 \times (8 \times 11 + 8 \times 23 + 11 \times 23)$

$= 2 \times 525$

$= 1050 \text{ cm}^2$. ✓

(ii) $A = n \times 4 \text{ sides} + \text{top} + \text{bottom}$

$SA = n \times 2 \times (8 \times 11 + 11 \times 23) + 2 \times 23 \times 8$.

$SA = 682n + 368$. ✓

Question 23

a) $A = \frac{70}{3}\{50 + 4 \times 80 + 70\} + \frac{90}{3}\{140 + 4 \times 130 + 150\}$

$= 13200 + 24300$

$= 37500 \text{ m}^2$

(if incorrect formula used give 1 mark for adding two areas)

(b) (i) $B\hat{O}C = 18 + 64$

$= 82$

(ii) $DC^2 = 28^2 + 21^2 - 2 \times 28 \times 21 \cos 79$

$DC^2 = 1000 \cdot 608$

$DC = \sqrt{1000 \cdot 608}$

$= 31 \cdot 63$

$= 32$ (nearest km)    (no rounding penalised)

(iii) $A = \frac{1}{2} ab \sin C$

$= \frac{1}{2} \times 34 \times 21 \times \sin 122$

$= 302 \cdot 75 \text{ km}^2$    (no rounding penalised)

c) (i) $35°E$

(ii) 11pm (same time)

(iii) $55 + 35 = 90°$

(iv) time difference $= \frac{90}{15}$

$= 6$ hours

(v) $1° \Rightarrow 60$ nautical miles on surface

$90° \Rightarrow 5400$ NM

(vi) $S = \frac{d}{t}$

$t = \frac{d}{S}$

$t = \frac{5400}{25}$

$= 216$ hours

(vii) At 6am 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 68×60 = 4080 NM
= 4080×(1.852) km
= 7556.16
= 7556 km (nearest km) ✓

Question 24.

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

$290\,000 = M \times 90.073\ldots$ ✓

$M = 3219.59$ per month ✓

(ii) Total $\$386\,350.8$ ✓ $\quad (3219.59 \times 120)$

(b) repayment per fortnight $= 168$ ✓

Total repaid $= 168 \times 3 \times 26$ ✓

$= \$13104$ ✓

Total interest $= 13104 - 11000$

$= \$2104$.

Interest per annum $= 2104 \div 3$ ✓

$= \$701.33$

Flat interest rate $= \dfrac{701.33}{11000}$

$= 6.3757\ldots \%$ ✓

$= 6.4\%$ ✓ (no rounding required)

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

$= 8640$.

Interest $= 8640 - 5000$

$= 3640$.

Interest per annum $= 3640 \div 3$

$= \$1213.33\ldots$

Simple rate $= \dfrac{1213.33}{5000}$

$= 24.26\ldots \%$

$= 24.3\%$.

(d)(i) (ꭓ) $n = 5 \times 12$ ✓
$= 60.$ ✓
$r = \dfrac{9}{12} \%$
$= 0.0075.$ ✓

(β) $N = 1100 \left\{ \dfrac{(1+0.0075)^{60} - 1}{0.0075(1+0.0075)^{60}} \right\}$ ✓

$= 52990.$ ✓
yes it is correct. ✓

(ii) let Income be $I$

$0.4 \times I = 1100.$ ✓

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

$= \$2750$ ✓

she must earn at least $2750 per month.