TANJONG KATONG GIRLS' SCHOOL
PRELIMINARY EXAMINATION
SECONDARY FOUR EXPRESS

CANDIDATE NAME

CLASS | | E | |

INDEX NUMBER | | |

MATHEMATICS

4052/01

Paper 1

18 August 2023

2 hours 15 minutes

Candidates answer on the Question Paper

READ THESE INSTRUCTIONS FIRST

Write your index number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE ON ANY BARCODES.

Answer **all** the questions.
The number of marks is given in brackets [ ] at the end of each question or part question.

If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
The total of the marks for this paper is 90.

The use of an approved scientific calculator is expected, where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

For Examiner's use

This document consists of **18** printed pages and **1** blank page.

Mathematical Formulae

Compound interest

$$\text{Total amount} = P\left(1+\frac{r}{100}\right)^n$$

Mensuration

Curved surface area of a cone $= \pi rl$

Surface area of a sphere $= 4\pi r^2$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2}ab\sin C$$

Arc length $= r\theta$, where θ is in radians

$$\text{Sector area} = \frac{1}{2}r^2\theta \text{ , where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

Statistics

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$\text{Standard deviation} = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \left(\frac{\Sigma fx}{\Sigma f}\right)^2}$$

Answer **all** the questions.

1 **(a)** Calculate $\sqrt[3]{\frac{-21.3^2}{10^0}-7\frac{1}{4}}$.

Answer ..... [1]

(b) Write 0.000012345 in standard form.

Answer ..... [1]

---

2 y is directly proportional to x^n.

(a) Write down the value of n when y m^2 is the area of a circle with radius x m.

Answer ..... [1]

(b) Write down the value of n when y m^3 is the volume of a cylinder with height x m and a constant base area.

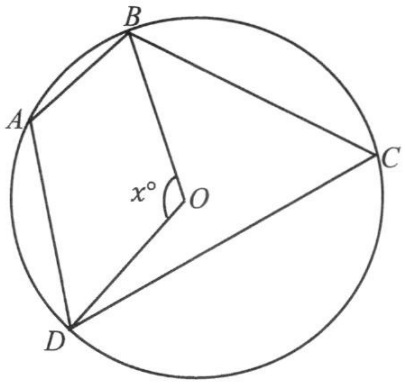
Answer ..... [1]

---

3 Solve the equation $\frac{y}{6}-\frac{2y+3}{7}=1$

Answer ..... [3]

4



A, B, C and D are points on a circle with centre O.
Angle $BOD = x°$.
Stating your reasons clearly, find in terms of x,

(a) reflex angle BOD,

Answer .....reason ..... [1]

(b) angle BAD,

Answer .....reason ..... [1]

(c) If angle BCD is $(x-55)^{\circ}$, solve for x.

Answer ..... [1]

---

5 Every morning, Fanny either eats oats or two eggs for breakfast.
The probability that she eats oats is 0.8. If she eats two eggs, the probability that she will exercise is $\frac{1}{4}$. If she eats oats, the probability that she will not exercise is 60%.
Find the probability that

(a) if she eats oats, she will exercise.

Answer ..... [1]

(b) she will not exercise for any given morning.

Answer ..... [2]

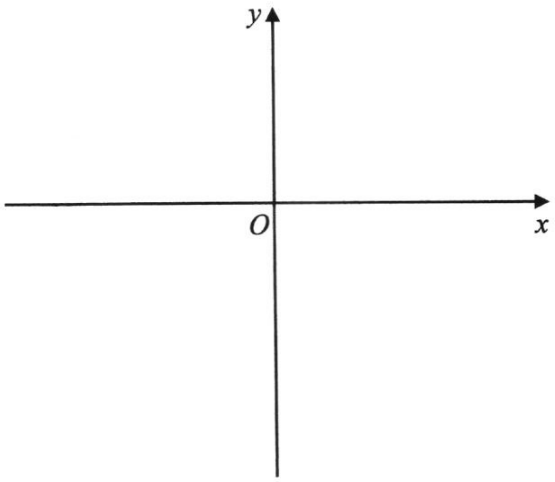
6 **(a)** Express $5x-2-x^2$ in the form $b-(x+a)^2$.

Answer ..... [2]

(b) Hence, write down the coordinates of the turning point of the graph $y=5x-2-x^2$.

Answer ..... [1]

(c) Given $5x-7-x^2=c-(x+a)^2$, deduce the value of c, hence or otherwise, in the axes provided, sketch the graph $y=5x-7-x^2$.
Label the turning point and y-intercept clearly.



Answer c = ... [3]

7 The n^{th} term of a sequence 0, 3, 8, 15.... is given by $n^2 - 1$.

(a) One term in the sequence is 288. Find the value of n for this term.

Answer ..... [2]

(b) Find an expression, in terms of n, for the nth term of another sequence if the first four terms are $-5, -2, 3, 10$.

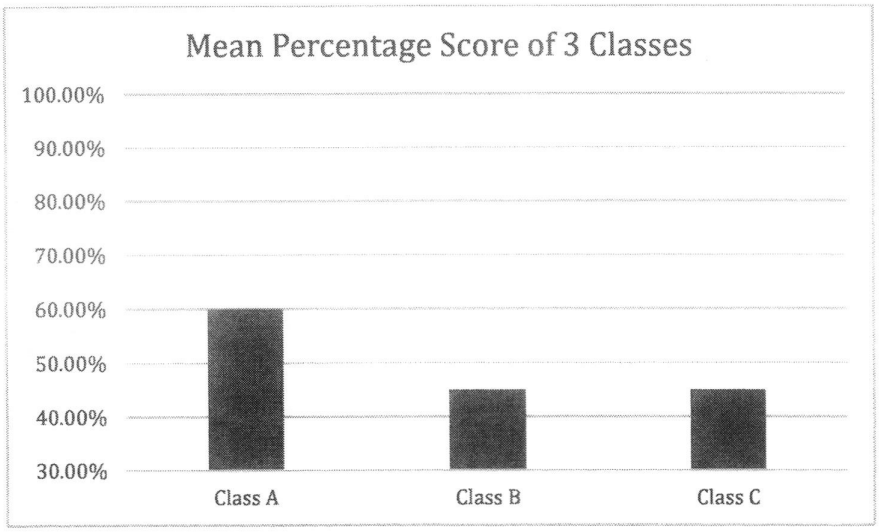
Answer ..... [1]

---

8 The number of sneakers, sandals and boots in a shoe shop are in the ratio 1.5 : 1 : 0.5.
After 20 sneakers were sold, the ratio become 7 : 6 : 3.
Find the number of sneakers in the shop at first.

Answer ..... [3]

9 The graph shows the average score of each class in an education centre after a test.



Explain why this chart is misleading.

Answer .....

.....

..... [2]

---

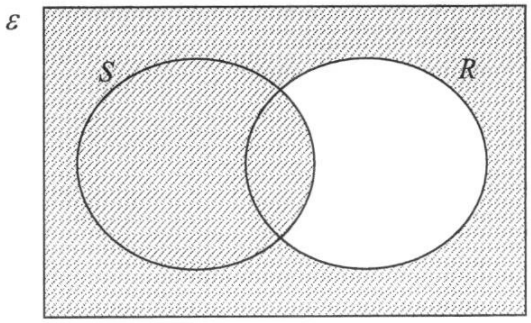
10 **(a)** Simplify $\frac{3}{ab^2} \div 12b^{-1}$

Answer ..... [2]

(b) Solve the equation $-2^{x-1} = -1024$

Answer ..... [2]

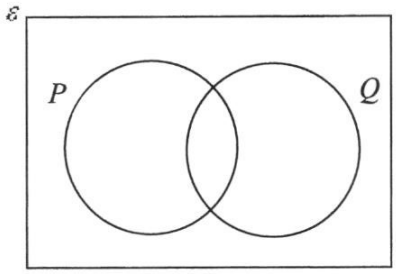
11



(a) Use set notation to describe the shaded region.

Answer ..... [1]

(b) On the Venn Diagram, shade the region which represents $(P \cap Q) \cup (P \cup Q)'$.



[1]

(c) ε = {non-negative integers: $x \leq 10$}.
A is the set of composite numbers.
C is the set of prime numbers.
0 and 1 are neither composite nor prime.

Underline the correct statement(s), cross out the wrong ones.

$n(C) = 4$ $\quad 1 \in (A \cup C')$ $\quad 4 \not\subset A$ $\quad A \cap C = \{\varnothing\}$ [2]

12 The price of a sofa bed is $\$x$. Toby buys it on hire purchase. He pays a downpayment of 25% and arranges to pay the remaining amount in monthly instalments over 26 months, at a simple interest rate of 8% p.a.
Given that his monthly instalment is \$88, find x.

Answer x = ... [4]

---

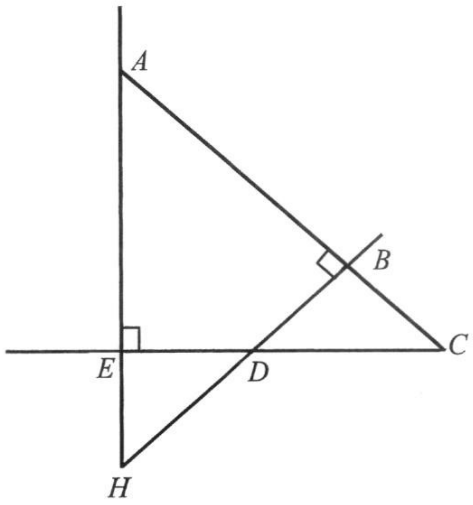
13 Factorise completely $5h-15h^2-2y+6hy$.

Answer ..... [2]

14 A is inversely proportional to $\sqrt{B}$. When the value of A is increased to 25, B decreased by 84%. calculate the original value of A.

Answer ..... [2]

15 In the diagram below, $\angle AEC$ and $\angle ABH$ are right angles.
$AH = 29$ units, $EH = 9$ units and $AB = 20$ units.



(a) Show that triangle AEC is congruent to triangle ABH. [3]

(b) Find BC.

Answer .....units [1]

---

16 A map has a scale of 1: n.

The actual distance between Malaysia and Indonesia is 1450 km.
The distance shown on the map is 29 cm.

(a) Find n.

Answer ..... [1]

(b) The difference in actual area between the two countries is recorded in a website as 1574722 km^2.
Calculate the difference in area on the map, in square centimeters.

Answer ..... cm^2 [2]

17 It is given that $\sqrt[3]{\frac{x^3+2y}{y}} = 2x$.

(a) Rearrange the formula to make y as the subject.

Answer ..... [3]

(b) Find the value of y when x is -2.

Answer ..... [1]

(c) Determine with explanation, the value of y for which there is no solution for x.

Answer .....

..... [1]

18 **(a)** A pentagon is shaped such that the interior angles are 90°, 108° and one of the exterior angles is 64°. Each of the other two identical interior angles are k°. Find the value of k.

Answer k = ... [3]

(b) Mona measured an exterior angle of a regular n-sided polygon as 70°. Robert said her answer was wrong. Showing your working clearly, explain why Robert knew that Mona's answer was not correct.

Answer .....

..... [2]

(c) If her measurement is very close to the actual size of the angle, find n.

Answer n = ... [1]

19 The lowest common multiples of two integers, 440 and B is 1320.

(a) Express 440 as the product of its prime factors, giving your answer in index form.

Answer ..... [1]

(b) If B is 6, find the highest common factor of 440 and B.

Answer ..... [1]

(c) Given $1320 = 2^3 \times 3 \times 5 \times 11$, if the highest common factor is 55, find the smallest possible B.

Answer ..... [1]

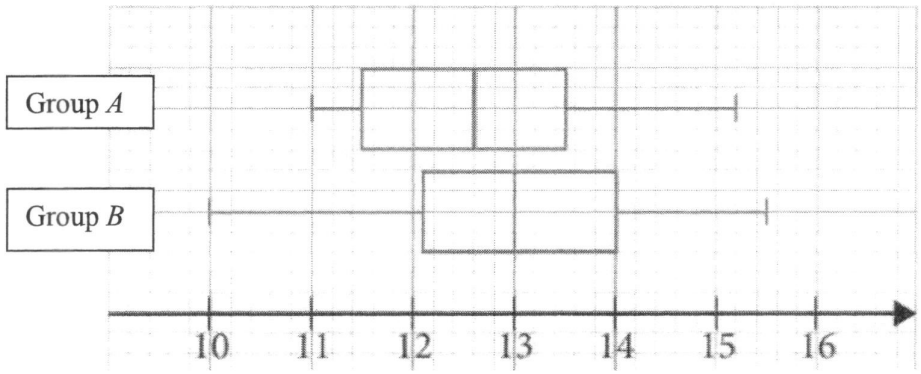
(d) Find the smallest positive integer h for which $\frac{42}{h}$ is a factor of 440.

Answer ..... [2]

(e) Jane has 440 five-centimetre cubes. She makes them into a cuboid. All the sides of the cuboid are greater than 20 cm. Determine the dimensions of the cuboid.

Answer .....cm by .....cm by .....cm [1]

20 The box and whiskers plots show information about the time, in hours spent serving in the community by two groups of 64 students in the month of July.



(a) Find the

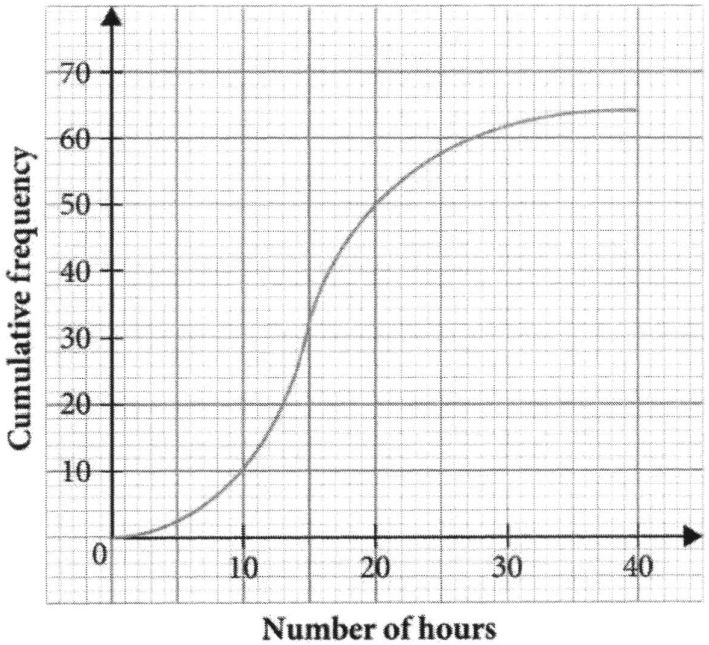
(i) median time spent for group *A*,

(ii) range for group *A*,

(iii) interquartile range for group *A*.

Answer **(i)** .....hours **(ii)** .....hours **(iii)** .....hours [3]

(b) The time, in hours spent serving in the community by group *C* in the month of July is shown below.



(i) Find the 75th percentile for group *C*.

Answer .....hours [1]

(ii) Explain what this tells us about group *C* compared with students from group *B*.

Answer .....

..... [2]

One student is chosen at random from group *C*.

(iii) Find the probability that a student selected spent more than 10 hours serving the community in the month of July.

Answer ..... [2]

21 **(a)** Construct a rhombus $ABCD$ such that the side AB is 7 cm and the angle ABC is 130°. The side AB has been drawn for you.

[3]

(b) Measure and write down the length of each of the two diagonals.

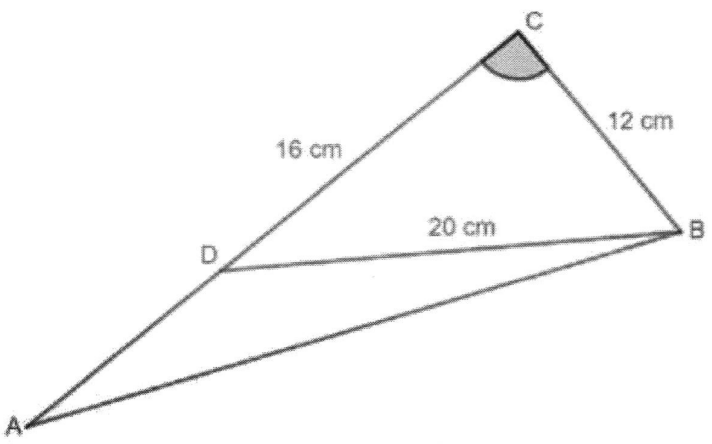
Answer The two diagonals are .....cm and .....cm [1]

(c) The table describes the properties of quadrilaterals.
Put a tick in the boxes below next to the correct statement.
Rhombus has been done for you.

	Diagonals bisect each other.	**Diagonals bisect each other at 90°.**	**Diagonals are equal in length.**	**Diagonals bisect the interior angles.**
Rhombus	✓	✓		✓
Square				
Rectangle				
Parallelogram				

[2]

22 In triangle BCD, $BC = 12$ cm, $CD = 16$ cm, $DB = 20$ cm.
CD is produced to A.



(a) Sarah commented that BC is perpendicular to CD. Show with mathematical working that she is correct.

Answer .....

..... [2]

(b) Find the exact value of $\cos \angle ADB + \sin \angle ADB$.

Answer ..... [2]

23 On a certain day, the exchange rate between Singapore dollars (SGD) and US dollars (USD) is 1 SGD = 0.76 USD.

(a) A tourist spent 22 SGD for his lunch, excluding 10% service charge and 8% GST. He wishes to pay in USD. Find the required equivalent amount in USD, including service charge and GST.

Answer ..... [2]

(b) It is also given that the exchange rate between New Zealand dollars (NZD) and US dollars (USD) is 1 NZD = 0.63 USD.
Find the exchange rate, correct to the nearest 3 decimal places, between SGD and NZD.

Answer ..... [2]

(c) The value of currency A is 20% of the value of currency B.
Alex worked out that B must then be 100% of A.
Do you agree? Explain your answer.

Answer .....

..... [1]

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PRELIMINARY EXAMINATION
SECONDARY FOUR EXPRESS

CANDIDATE NAME

CLASS | | E | | INDEX NUMBER | | |

MATHEMATICS

4052/02

Paper 2

11 August 2023

2 hour 15 minutes

Candidates answer on the Question Paper

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Mathematical Formulae

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$$\text{Total amount} = P\left(1+\frac{r}{100}\right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2}ab\sin C$$

$$\text{Arc length} = r\theta \text{ , where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2}r^2\theta \text{ , where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

1 **(a)** Simplify $\left(\frac{q^{-2}}{25p^{6}}\right)^{-\frac{1}{2}}$ and leave your answer in positive index.

Answer ..... [2]

(b) Simplify $\frac{16a^{2}-49(a+b)^{2}}{3a+7b}$.

Answer ..... [2]

(c) Express $\frac{x}{x^2+x-2}-\frac{1}{1-x}$ as a single fraction in its simplest form.

Answer ..... [3]

(d) Given that $4-3x<\frac{1}{2}(2x-3)$, find the least possible integer value of x.

Answer ..... [2]

2 The table below shows the time taken in minutes by 60 working adults travelling to work daily by train.

Time, t (mins)	$0 < t \leq 10$	$10 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 40$	$40 < t \leq 50$	$50 < t \leq 60$	$60 < t \leq 70$
Number of adults	5	p	8	12	18	7	4

(a) Find the value of p.

Answer $p =$ ..... [1]

(b) Estimate the

(i) mean travelling time.

Answer .....minutes [1]

(ii) standard deviation

Answer .....minutes [1]

The table below shows the mean and standard deviation of the time taken by 60 working adults travelling to work daily by bus.

Mean travelling time (mins)	45
Standard deviation	14.5

(c) Make two comparisons between the time taken by the working adults who travel by train and by bus.

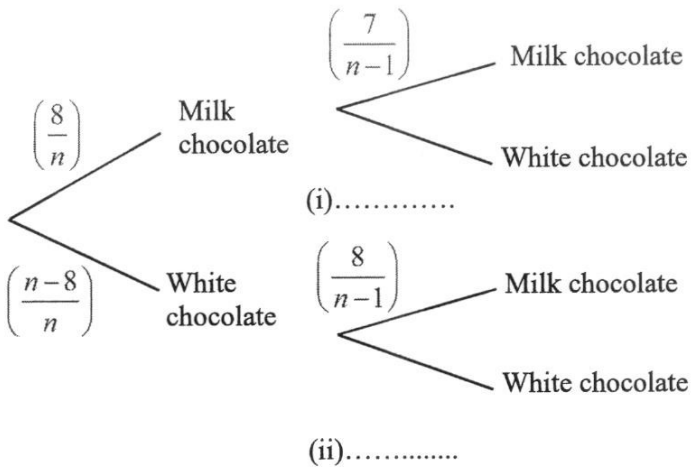
Answer

(1) .....
.....
..... [1]

(2) .....
.....
..... [1]

3 A box contains n chocolates.
There are 8 milk chocolates and the rest are white chocolates.
Lily picks a chocolate, selected at random, and eats it. Leon then picks a chocolate from the box at random.

(a) Complete the tree diagram to show the probabilities of the possible outcomes.



[2]

(b) Given that the probability of picking the same type of chocolates is $\frac{19}{39}$, write down an equation to represent this information and show that it can be simplified to $5n^2 - 161n + 1248 = 0$.

Answer

[3]

(c) Solve the equation $5n^2 - 161n + 1248 = 0$.

Answer $n =$ ..... , ... [2]

(d) Explain why one of the solutions in part **(c)** is rejected.

Answer .....

..... [1]

(e) Hence, find as a fraction in its simplest form,

(i) the probability that Leon picks a milk chocolate given that Lily picks a white chocolate.

Answer ..... [1]

(ii) the probability that Leon picks a white chocolate.

Answer ..... [1]

4 The table below shows the number of parcels, cards and letters sent by Peter and Jane.

	Parcel	Cards	Letters
Peter	5	4	5
Jane	3	8	6

(a) Represent the information in the table in a 2×3 matrix **N**.

Answer **N** = ... [1]

Postage is charged at \$7 for a parcel, \$0.50 for a card and \$0.40 for a letter.

(b) Represent the postage charges in a column matrix **C.**

Answer **C** = ... [1]

(c) Evaluate the matrix **P** = **NC**.

Answer **P** = ... [2]

(d) Explain what the elements in **P** represent.

Answer .....

..... [1]

If the postage charges are increased by 10% for parcels and 15% for letters and the postage charge for cards is decreased by 10%,

(e) write down a 3×3 matrix **R** such that when multiplied to matrix **C** will give the revised postage charges.

Answer **R** = ... [1]

(f) Explain why **RN** is not possible.

Answer .....

..... [1]

(g) By matrix multiplication, find the new postage charges Peter and Jane each had to pay.

Answer Peter: $ .....

Jane: $ .....

[2]

5 A canvas bag printer makes a profit of y thousand dollars from the printing of x thousand canvas bags where $y = 8 - 1.5x - \dfrac{10}{x+1}$.

The table below shows some corresponding values of x and y for this equation.

x	0	1	2	3	4	5	6
y	−2	1.5	1.67	1	0	− 1.17	− 2.43

(a) From the table, explain the significance of the values, $x = 0, y = -2$.

Answer .....

..... [1]

(b) On the grid given on the next page, plot the points given in the table of values and draw the graph of $y = 8 - 1.5x - \dfrac{10}{x+1}$ for $0 \le x \le 6$. [3]

(c) Using your graph,

(i) solve the equation $8 = 1.5x + \dfrac{10}{x+1}$.

Answer $x =$ ..... , ... [2]

(ii) find the number of canvas bags that should be printed to obtain the maximum profit.

Answer ..... thousands of canvas bags [1]

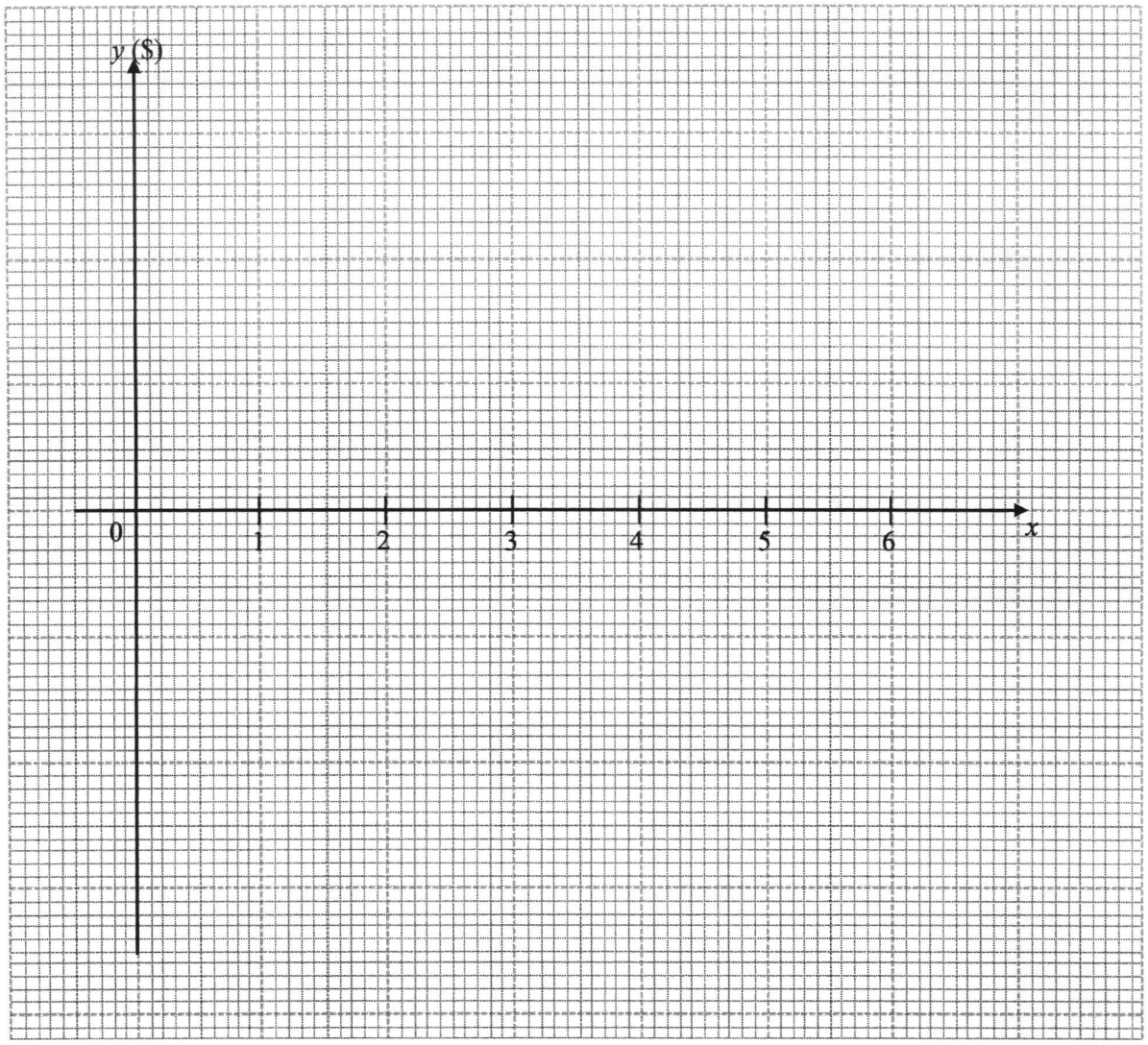
(d) **(i)** By drawing a tangent, find the gradient of the curve at $x = 3$.

Answer ..... [2]

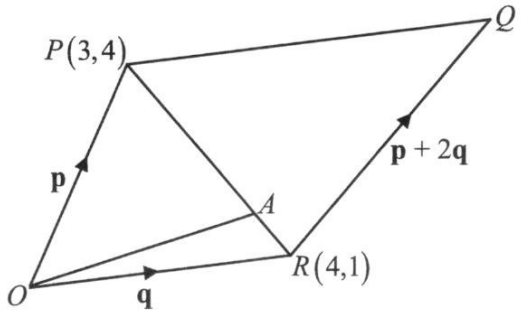
(ii) Explain what this gradient represent.

Answer .....

..... [1]


y ($)
0
1
2
3
4
5
6
x

6 The diagram shows a quadrilateral, $OPQR$.



Given that the coordinates of points P and R are $(3,4)$ and $(4,1)$ respectively,

(a) find the equation of the line parallel to OP and passing through the point R .

Answer ..... [3]

(b) find the column vector $\overrightarrow{PR}$..

Answer ..... [1]

(c) find $\left|\overrightarrow{PR}\right|$.

Answer .....units [2]

(d) Given that $\overrightarrow{OP} = \mathbf{p}$, $\overrightarrow{OR} = \mathbf{q}$ and $\overrightarrow{RQ} = \mathbf{p} + 2\mathbf{q}$;

(i) find $\overrightarrow{PQ}$ in terms of **p** and or **q.**

Answer $\overrightarrow{PQ}$ = ... [2]

(ii) Hence what can we say about PQ and OR ?

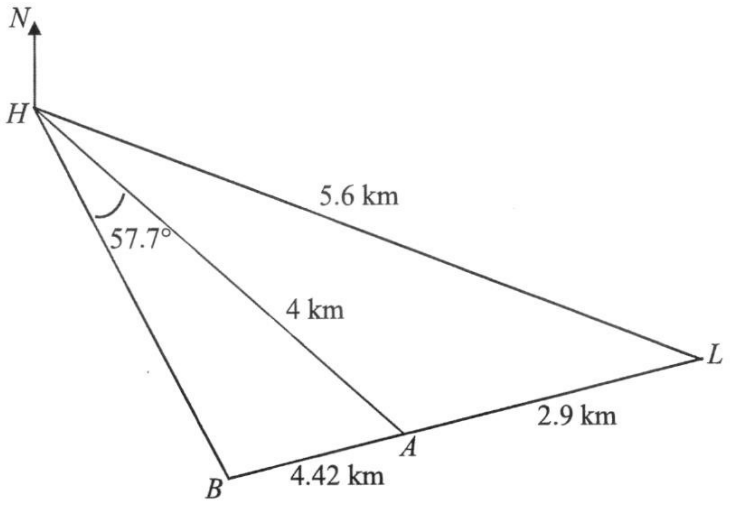
Answer .....

..... [1]

(e) Point A lies on PR such that $\overrightarrow{PR} = 4\overrightarrow{AR}$. Find the numerical value of $\dfrac{\text{Area of } \Delta OAR}{\text{Area of } \Delta OPA}$.

Answer ..... [1]

7 The diagram shows the positions of a harbour, H, a lighthouse, L and a lifebuoy, A.
$HA = 4$ km, $AL = 2.9$ km and $HL = 5.6$ km.



(a) Find angle HAL.

Answer ..... [2]

The bearing of A from H is 138°.

(b) Find the bearing of L from A.

Answer ..... [2]

B is a second lifebuoy such that LAB is a straight line, distance $AB = 4.42$ km and angle $AHB = 57.7°$.

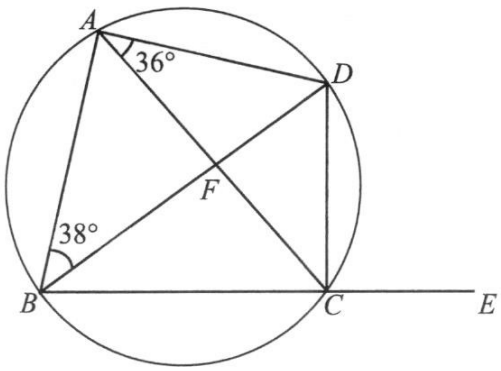
(c) Find the distance HB.

Answer $HB =$ ..... [3]

(d) Given that the angle of elevation of the top of the lighthouse, L from lifebuoy B is 21°, find the height of the lighthouse, L .

Answer ..... km [2]

8



(a) A, B, C and D are points on the circle. BC produced to E and BFD is a straight line. Angle $ABD = 38°$ and angle $CAD = 36°$.

(i) Justify with reasons why AC is not a diameter of the circle, $ABCD$.

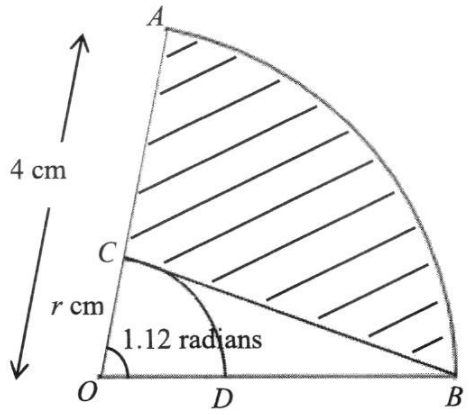
Answer

[2]

(ii) Given that angle $BAC = 59°$, find angle DCB.

Answer Angle DCB = ... ° [1]

(b) The diagram shows two arcs AB and CD of two circles with centre O. Arc CD has radius r cm and arc AB has radius 4 cm. C and D lie on OA and OB respectively. BC is tangent to the arc CD at C and angle AOB is 1.12 radians.



(i) Show with clear working that the value of r is 1.743 cm.

Answer

[2]

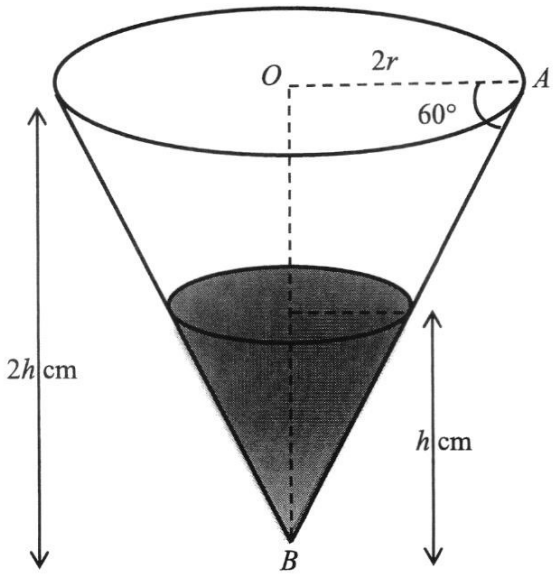
(ii) Find the perimeter of the shaded region, ABC.

Answer ..... cm [3]

(iii) Find the area of the shaded region, *ABC*.

Answer ..... cm^2 [3]

9

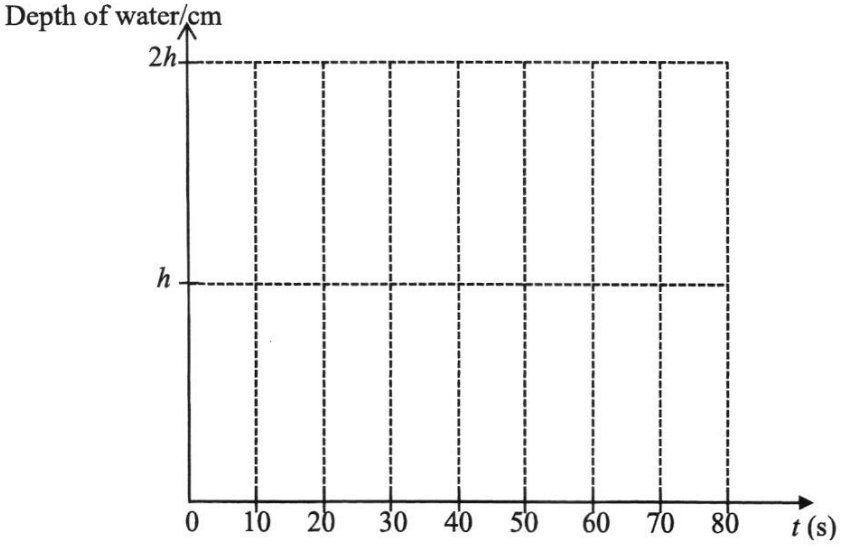


A conical container of height $2h$ cm and base radius of $2r$ cm is filled with water to a height of h cm.

(a) If it takes 80 seconds to fill the empty container to the brim with water, find the time taken to fill it to a height of h cm.

Answer ..... seconds [2]

(b) On the grid below, sketch the graph to show the relationship between the depth of water, h cm, and the time, t seconds, as the container is being filled.



[1]

(c) Given that angle $OAB = 60°$ and $r = 4$ cm, find the area of the container in contact with the water and give your answer in terms of π.

Answer ..... cm^2 [4]

10 Mr Tan wishes to invest in a $2 000 000 property. On top of the purchase price, he has to pay $5 000 lawyer's fee, a certain amount of Buyer's Stamp Duty (BSD) and Additional Buyer's Stamp Duty (ABSD).

(a) The partially completed table shows the amount of BSD payable on Mr Tan's property.

Purchase/Market Value	**Rate in percentage for residential properties**	**Amount payable on Mr Tan's property purchase**
First $180 000	1%	$1 800
Next $180 000	2%	$3 600
Next $640 000	3%	$19 200
Next $500 000	4%	$20 000
Next $1 500 000	5%	...
Remainder	6%	...

Show that the total BSD payable on Mr Tan's property purchase is $69 600.

Answer

[2]

(b) Given that Mr Tan has to pay 20% of the property price for ABSD, calculate the total amount of money Mr Tan has to pay to purchase this property.

Answer Total amount to be paid = $ ..... [1]

(c) Mr Tan is able to rent out this property at an estimated market rental of $3 500 a month with the help of a property agent. For every two-year contract, Mr Tan needs to pay the agent a fee equivalent to 1 month rental. He also needs to pay annual property tax based on the property tax formula shown in the table:

Annual Value (AV, $)	Property Tax Rates	Annual Property Tax Payable
First $8 000 Next $22 000	0% 4%	$0 $880
First $30 000 Next $10 000	- 6%	$880 $600
First 40 000 Next $15 000	- 10%	$1 480 $1 500
First $55 000 Next $15 000	- 14%	$2 980 $2 100
First $70 000 Next $15 000	- 20%	$5 080 $3 000
First $85 000 Next $15 000	- 26%	$8 080 $3 900
First $100 000 Above $100 000	- $32%	$11 980

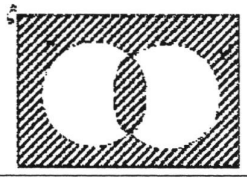
Annual Value (AV) refers to the estimated gross annual rent of the property if it were to be rented out. Annual property tax payable is calculated by multiplying the AV of the property with the Property Tax Rates that apply to the owner.

For a 10-year loan on 75% of the property purchase price, Mr Tan has to pay about $270 000 interests. Based on the current trend, the value of this property will appreciate at 4.9% compounded yearly. Mr Tan plans to rent out this property for 10 years before selling it. When selling the property, he has to pay 1% of the selling price as commission to his agent.

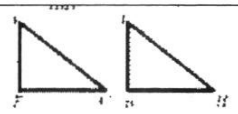
Mr Tan claims that he will make a profit of at least $800 000 in 10 years. Is Mr Tan correct? Justify your decision with calculations. State one assumption made in your calculations.

Answer

Answer Key

Qn	Answer	Qn	Answer
1a	$\sqrt[3]{\frac{-21.3^2}{10^0}-7\frac{1}{4}}$ $=\sqrt[3]{\frac{-23047}{50}}$ $=-7.7246972$ $=-7.72$	6c	$5x^2-2x^2=\frac{17}{4}-(x-\frac{5}{2})^2$ $5x^2-2x^2-5=\frac{17}{4}-5-(x-\frac{5}{2})^2$ $=\frac{3}{4}-(x-\frac{5}{2})^2$ $c=\frac{3}{4}$
1b	0.000012345 $=1.2345\times10^{-5}$	7a	$n^2-1=288$ $n^2=289$ $n=17(n>0)$
2a	$n=2$,	7b	n^2-1-5 $=n^2-6$
2b	$n=1$	8	90
	$\frac{y}{6}-\frac{2y+3}{7}=1$ $7y-6(2y+3)=42$ $7y-12y-18=42$ $-5y=42+18$ $y=-12$	9	The chart is misleading because the vertical axis didn't start from 0. The effect is that it exaggerated the difference in score such that Class A mean score looks like 50% more than that of the other 2 Classes, when the actual difference is 12%.
4a	$360°-x°$ (angles at a point)	10a	$\frac{3}{ab^2}\div12b^{-1}=\frac{3}{ab^2}\div\frac{12}{b^{-1}}$ $=\frac{3}{ab^2}\times\frac{b^{-1}}{12}$ $=\frac{1}{4ab}$
4b	$180°-\frac{1}{2}x°$ *(angle at centre = twice angle at circumference)*	10b	$-2^{x-1}=-1024$ $\frac{2^x}{2}=1024$ $2^x=2048$ $2^x=2^{11}$ $x=11$
4c	$x-55=\frac{1}{2}x$ $x=110$	11a	$R'\cup S$ or $[R\cap S']'$
5a	0.4	11b	
5b	$0.8\times0.6+0.2\times0.75=0.48+0.15$ $=0.63$	11c	$n(C')=4$ $1\in(A\cup C')$ ~~$4\notin A$~~ ~~$(A\cap C')=\{\varnothing\}$~~

6a	$5x-2-x^2=-x^2+5x-2$ $=-(x^2-5x)-2$ $=-[(x-\frac{5}{2})^2-(-\frac{5}{2})^2]-2$ $=-(x-\frac{5}{2})^2+\frac{17}{4}$ $=\frac{17}{4}-(x-\frac{5}{2})^2$	12	**8% p.a** $downpayment=0.25x$ $remaining\ amount=0.75x$ $\text{interest payable}=0.75x\times\frac{8}{100}\times\frac{26}{12}$ $=0.13x$ $(0.75x+0.13x)\div 26=88$ $\frac{22}{25}x=2288$ $x=2600$ **8%** $downpayment=0.25x$ $remaining\ amount=0.75x$ $\text{interest payable}=0.75x\times\frac{8}{100}$ $=0.06x$ $(0.75x+0.06x)=88$ $0.81x=2288$ $x=2824.69$
6b	Maximum turning point is $\left(\frac{5}{2},\frac{17}{4}\right)$	13	$5h-15h^2-2y+6hy$ $=5h(1-3h)-2y(1-3h)$ $=(1-3h)(5h-2y)$

14	$A\sqrt{B}=25\sqrt{B_{new}}$ $B_{new}=\frac{16}{100}\times B$ $A\sqrt{B}=25\sqrt{\frac{16}{100}\times B}$ $A=10$	15a	
		15b	9 units
16a	5 000 000	16b	630 cm^2
17a	$y=\frac{x^3}{(8x^3-2)}$	17b	$y=\frac{4}{33}$
17c	When $y = 0$, the fraction is undefined, there is no solution for x.		
18a	113	18b	Let number of sides of a polygon be n. $n=\frac{360}{70}$ $=5.14$

			Since n is not a positive integer greater than 2, Mona answer is wrong.
18c	5		
19a	$440 = 2^3 \times 5 \times 11$	19b	2
19c	165	19d	21
19e	$440 = 2^3 \times 5 \times 11$ $\therefore$ dimension is 40 cm × 25 cm × 55 cm		
20a	(i)12.6 hours (ii) range = max – min = 15.2 – 11 = 4.2 hours (iii) interquartile range = UQ – LQ = 13.5 – 11.5 = 2 hours	20b	(i) 19 hours (ii) Top 25% of students spent more than 19 hours serving the community compared to group B which spent 14 hours. (UQ value) (iii) from the graph, number of students who spend more than 10 hours = 64 – 10 = 54 P (a student selected > 10 hours) $= \frac{54}{64}$ $= \frac{27}{32}$
21a		21b	5.9 cm and 12.7 cm
22a	$16^2 + 12^2 = 400$ $20^2 = 400$ Since $DC^2 + BC^2 = DB^2$, by the converse of Pythagoras Theorem, $\angle BCD = 90^\circ$, $\therefore BC$ is perpendicular to DC.	22b	$\cos \angle ADB + \sin \angle ADB$ $= -\cos \angle BDC + \sin \angle BDC$ $= \frac{-16}{20} + \frac{12}{20}$ $= -\frac{1}{5}$
23a	**Total SGD payable** = 22 × 1.1 × 1.08 = 26.136SGD **26.136 SGD** = 26.136 × 0.76USD = 19.86USD	23b	1 SGD = 0.76USD 1 NZD = 0.63USD 1 SGD = $\frac{0.76\text{USD}}{0.63\text{USD}} \times 1\text{NZD}$ = 1.206 NZD
23c	$A = 20\%$ of B $A = \frac{1}{5}B$ $B = 5A$ $B = 500\%$ of A I disagree. B is 500% of A.		

Answer Key

1a	$5p^3q$	1b	$-(11a+7b)$
1c	$\frac{2x+2}{(x+2)(x-1)} / \frac{2x+2}{x^2+x-2}$	1d	2
2a	$p=6$	2bi	36.5 mins
2bii	16.2 mins	2c	(1)The travelling time by train is shorter as the mean travelling time is 36.5 minutes which is shorter than the mean travelling time by bus of 45 minutes. (2)The mean travelling time by bus is more consistent/has a smaller spread as the standard deviation (14.5 minutes) is less than that by train(16.2 minutes).
3ai	$\frac{n-8}{n-1}$	3aii	$\frac{n-9}{n-1}$
3b	show	3c	13 , 19.2
3d	As n represents the number of chocolates in the box, then n = 19.2 is rejected as it is not a positive integer.	3ei	$\frac{2}{3}$
3eii	$\frac{5}{13}$		
4a	$\begin{pmatrix} 5 & 4 & 5 \\ 3 & 8 & 6 \end{pmatrix}$	4b	$\begin{pmatrix} 7 \\ 0.50 \\ 0.40 \end{pmatrix}$
4c	$\begin{pmatrix} 39 \\ 27.40 \end{pmatrix}$	4d	Peter paid \$39 and Jane paid \$27.40 postage charges *or* **P** represents the postage charges paid by Peter and Jane respectively.
4e	$\begin{pmatrix} 1.1 & 0 & 0 \\ 0 & 0.9 & 0 \\ 0 & 0 & 1.15 \end{pmatrix}$	4f	Order of **R** is 3×3 and order of **N** is 2×3. **RN** is not possible as the number of columns in **R**, 3, is not equal to the number of rows in **N**, 2.
4g	$\begin{pmatrix} 42.60 \\ 29.46 \end{pmatrix}$		
5a	When no canvas bag is printed ($x=0$), there is a loss of \$2 000 ($y=-2$).	5b	graph
5ci	4, 0.35	5cii	Maximum max number of canvas bag is 1.7 thousands of canvas bags.

5di	$-1 <$ gradient < -0.7	5dii	It represents the rate of decrease of the profit made in printing 3 000 canvas bags is \$1 per canvas bag. At x=3, (3 000 canvas bags), the rate of decrease of profit is \$1 per bag
6a	$y = \frac{4}{3}x - \frac{13}{3}$	6b	$\begin{pmatrix} 1 \\ -3 \end{pmatrix}$
6c	3.16	6di	3q
6dii	Since $\overrightarrow{PQ}$ is a scalar multiple of $\overrightarrow{OR}$, PQ is parallel to OR.	6e	$\frac{1}{3}$
7a	107.4°	7b	065.4°
7c	4.99 km	7d	2.81 km
8ai	show	8aii	85
8bi	show	8bii	10.3 cm
8biii	5.82 sq cm		
9a	10	9b	Refer to graph below
9c	32π		
10a	show	10b	\$ 2 474 600
10c	RWC qn (Mr Tan is correct)