Name:		Index Number:		Class:	

CATHOLIC HIGH SCHOOL
Preliminary Examination
Secondary 4 (O-Level Programme)

Mathematics

4048/01

Paper 1

31 August 2021

2 hours

Additional Materials: Booklets A and B

Candidates answer in the space provided on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions in the space provided.
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 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, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is **80**.

For Examiner's Use only
80

This document consists of **21** printed pages.

MATHEMATICAL FORMULAE

Compound interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

1 **(a)** Express 32.0987 correct to two decimal places.

Answer .....[1]

(b) Evaluate $\dfrac{-\sqrt{6.72}\times 95}{8.92-\sqrt[5]{460}}$ giving your answer correct to 2 significant figures.

Answer .....[1]

---

2 In Singapore, you will need to add a 10% service charge followed by 7% Goods and Services Tax (GST) when you dine-in at most places.

This is a segment of an online advertisement on a particular restaurant in Singapore.

State the information that is wrong and correct that mistake.

Chili Family Restaurant

Chili should be a household name for its free flow drinks and cheap set meals. With a wide spread of food to choose from, free flow of iced coffee, no service charge and no GST, you can now sit back, relax and enjoy your food without that extra 17%!

.....

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.....

.....

.....[2]

3 It is given that $p = \sqrt{\frac{qr-3}{r}}$, where r is non-zero.

Express r in terms of p and q.

Answer .....[2]

---

4 **(a)** Find the lowest common multiple of 16, 40 and 64.

Answer .....[2]

(b) Three scouts are assigned to send signals from three different posts starting at 0600 hours everyday. The first scout signals every 16 seconds, the second scout signals every 40 seconds and the third scout signals every 64 seconds. Find the two times between 0615 hours and 0625 hours, correct to the nearest minute, when the three scouts signal at the same time.

Answer ....., ...[2]

5 A contractor won a contract to build a road within 90 days. The road to be built was 4 km long. He hired 30 men for the job. After 30 days, he found that they had completed only 1 km of the road. Find the minimum number of additional men the contractor needed to employ to complete the job if the deadline remains unchanged.

Answer .....[2]

---

6 A property agent charges a commission of $(r+2)\%$ on the first \$40 000, r % on the next \$60 000 and $(r-1)$ % on the remainder of the selling price of a flat.

If he receives a commission of \$4 050 for selling a flat at \$225 000, find the value of r.

Answer $r =$ .....[2]

7 A regular polygon has n sides. The size of each interior angle is 4 times the size of each exterior angle.

(a) Find the size of each exterior angle.

Answer .....° [1]

(b) State the value of n.

Answer $n =$ .....[1]

(c) Write down the ratio of the exterior angle of a regular hexagon to the exterior angle of a regular octagon.

Answer .....:.....[1]

---

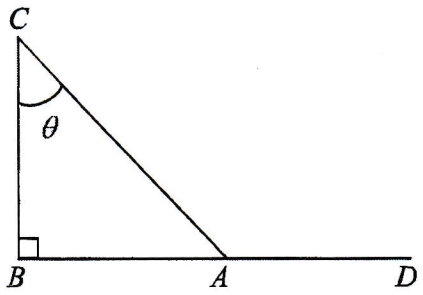
8 **(a)** Find the equation of the image of the line $y = 3x - 2$ under reflection in the x-axis.

Answer .....[1]

(b) Given that $x = -2$ is a solution of the equation $x(x-1) = g$, find the other solution of the equation.

Answer $x =$ .....[3]

9



The diagram shows a right angled triangle ABC.

Angle $ABC = 90°$, angle $ACB = \theta$ and $\frac{BC}{AC} = \frac{2}{5}$.

DAB is a straight line.

Find the exact value of

(a) $\cos(90° - \theta)$,

Answer .....[1]

(b) $\tan(90° + \theta)$.

Answer .....[2]

10 **(a)** Factorise $b^4 - 1$ completely.

Answer .....[2]

(b) Factorise $mn + 1 - n - m$.

Answer .....[2]

---

11 m is an integer such that $-3 \leq m < 6$.
n is an integer such that $-1 \leq n \leq 8$.

Calculate

(a) the least value of $m + n$,

Answer .....[1]

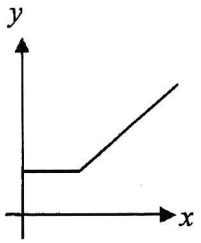
(b) the least value of mn,

Answer .....[1]

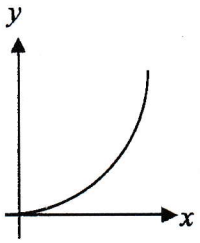
(c) the greatest value of $m^2 - n^2$.

Answer .....[1]

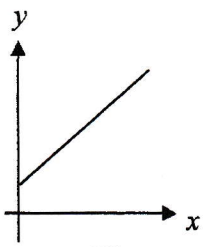
12 Select from the five graphs, one which illustrates each of the following statements.



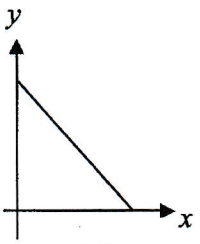
(A)



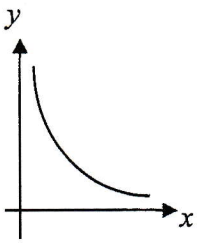
(B)



(C)



(D)



(E)

(a) The time y, taken for the journey varies inversely as the average speed, x.

Answer .....[1]

(b) The surface area, y, of a sphere is proportional to the square of the radius, x.

Answer .....[1]

(c) The cost, y of the hand phone bill consists of a fixed charge over a certain amount of talk time, after which the cost increases proportionally to the talk time, x.

Answer .....[1]

13 In an experiment, when chemical X is added into solution Y, the temperature of solution Y will decrease at a rate of 3°C per cubic metres.

If chemical Z is mixed with solution Y, the chemical will cause the temperature in solution Y to increase at a rate of 4°C per cubic metres.

Assuming that the temperature changes at a constant rate, calculate

(i) the temperature of a cubic metre of solution Y at an initial temperature of – 4°C in container A if only chemical X is added,

Answer ..... °C [1]

(ii) the temperature of 3.5 m^3 of solution Y at an initial temperature of 7°C in container B if only chemical X is added,

Answer ..... °C [1]

(iii) the temperature of 500 000 cm^3 of solution Y at an initial temperature of –5°C in container C if an equal amount of chemical X and Z are added in at the same time, assuming that there is no chemical reaction between X and Z.

Answer ..... °C [2]

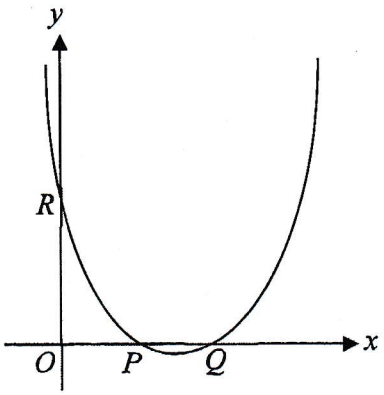
14 The diagram shows a line segment AB on a field.

(a) Construct the perpendicular bisector of AB. [1]

Treasure T is buried in the field where angle $ATB = 90°$ and $AB = 2AT$.

(b) By using compasses only, find the two possible positions of T.
Label these two possible positions as T_1 and T_2. [2]

15 The diagram shows a sketch of part of the graph of $y = x^2 + ax + 6$.



The point Q has coordinates (3,0).

Find

(i) the value of a,

Answer $a =$ .....[1]

(ii) the coordinates of P and R,

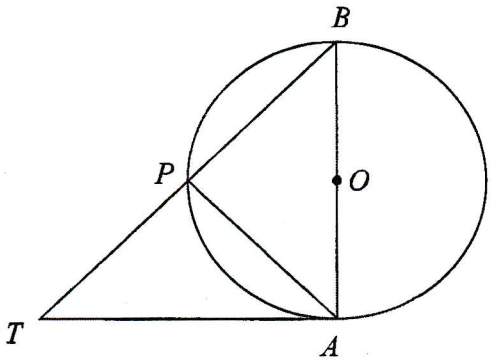
Answer P (....., ...) [1]

R (....., ...) [1]

(iii) angle PRQ, in degrees.

Answer .....° [2]

16 In the diagram, AB is the diameter of the circle, with centre O.
AT is the tangent to the circle at A and TB cuts the circle at P.



(i) Prove that triangle TAB is similar to triangle TPA.

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.....

.....

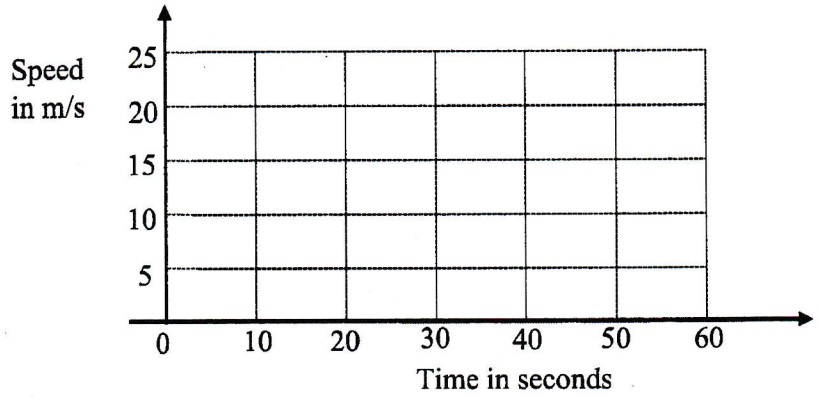
.....[2]

(ii) Given that $AT = 12$ cm and $PT = 6$ cm, calculate the length of BP.

Answer $BP =$ .....cm [2]

17 A car travels at a constant speed of 25 m/s for 40 seconds. It then slows down uniformly until it comes to rest after a further 20 seconds.

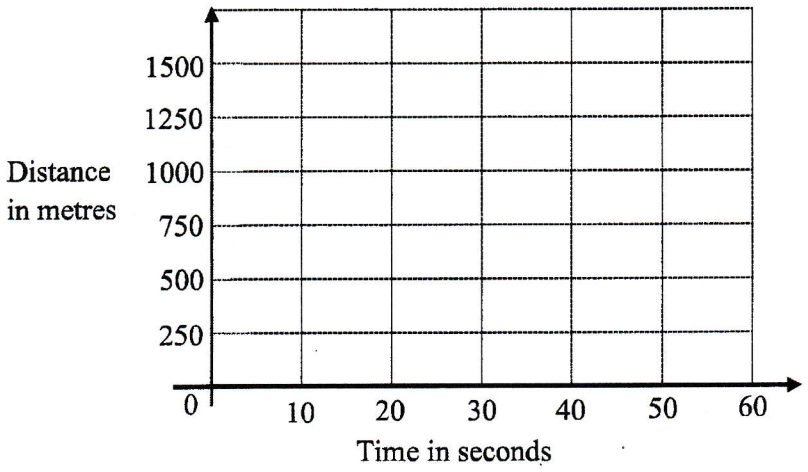
(a) On the grid provided, draw the speed – time graph for the journey. [1]



(b) **(i)** Calculate the total distance travelled in 60 seconds.

Answer ..... m [2]

(ii) Draw the distance – time graph for the same journey. [2]



18 $\varepsilon = \{ \text{integers } x : 2 \leq x \leq 9 \}$
$P = \{ 3x : x \text{ is a factor of } 6 \}$
$Q = \{ 3, 4, 6 \}$

(a) Draw a Venn diagram to illustrate this information. [2]

(b) Circle the correct statement(s) from the list below. [2]

$P \cup Q = \varepsilon$ $\quad$ $P' \cap Q = \{3, 4\}$ $\quad$ $9 \subset P$ $\quad$ $8 \in (P \cup Q)'$

19 Two cylindrical steel containers are geometrically similar.
The ratio of their base areas is 9 : 16.
The radius of the base of larger cylinder is 12 cm.
The height of the larger cylinder is h cm.

(a) The curved surface area of the smaller container is 540π cm^2.

(i) Find, in terms of π, the curved surface area of the larger container.

Answer .....cm^2 [1]

(ii) Find the value of h.

Answer .....cm [2]

(b) Find the amount of water, in litres, that the larger cylinder can hold.

Answer .....litres [2]

(c) Hence, or otherwise, find the capacity, in litres, of the smaller cylinder.

Answer .....litres [2]

20 The unit price, in dollars, of two brands of running shoes X and Y sold at Shop A and Shop B is represented by the matrix **P**.

$$\mathbf{P} = \begin{matrix} \\ \text{X} \\ \text{Y} \end{matrix} \begin{matrix} \begin{matrix} \text{A} & \text{B} \end{matrix} \\ \begin{pmatrix} 118 & 105 \\ 75 & 96 \end{pmatrix} \end{matrix}$$

(a) John wants to buy 10 pairs of brand X running shoes and 5 pairs of brand Y running shoes. Represent this information in a 1×2 matrix **Q**.

Answer **Q** = [1]

(b) Evaluate the matrix **T** = **QP**.

Answer **T** = [2]

(c) Suggest which shop, A or B, John should make his purchase from. Explain your answer clearly.

John should purchase from shop.....[1]

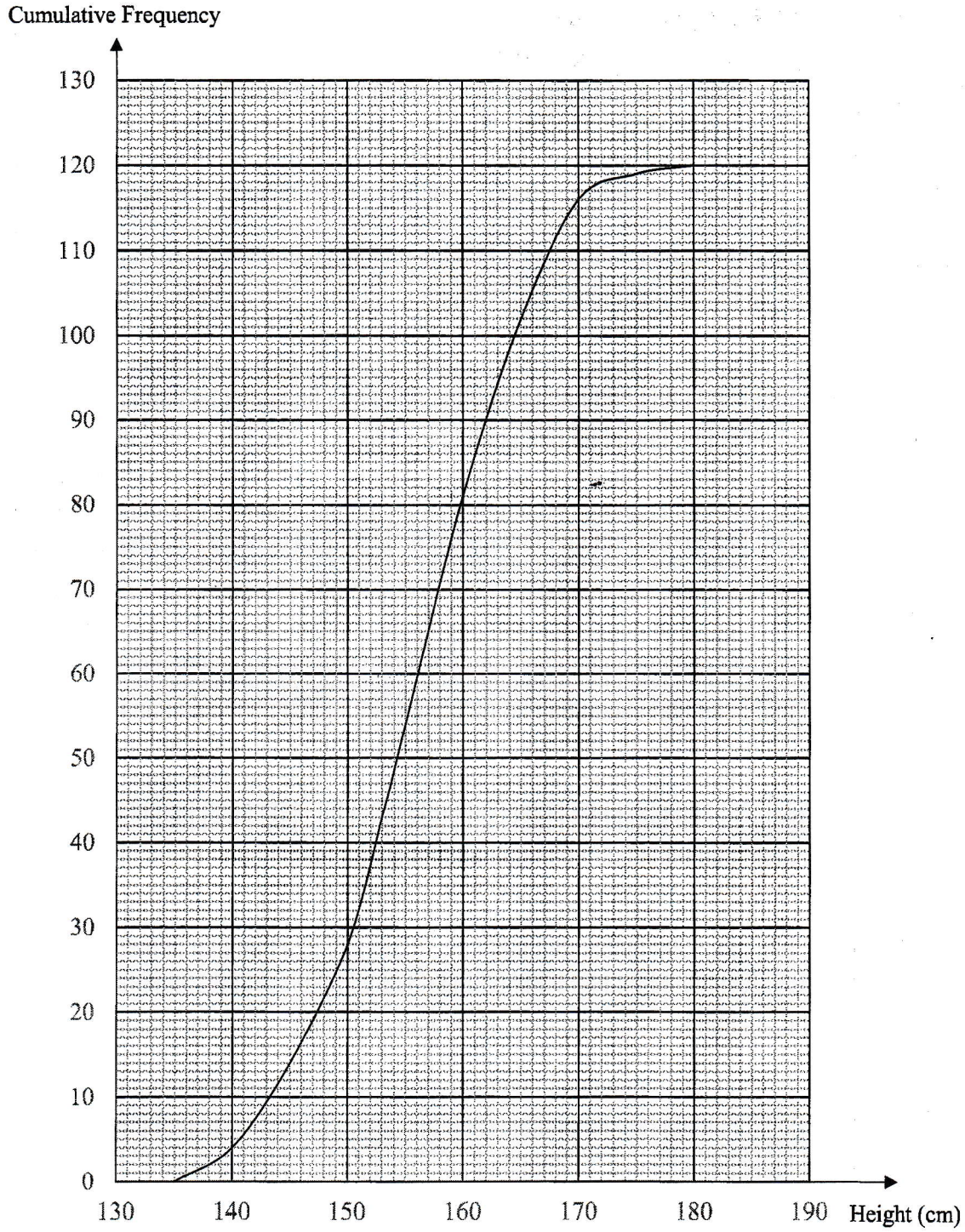
.....

.....

.....

.....[1]

21 The cumulative frequency graph represents the height of 120 students in School A.



(a) Use the graph to find

(i) the median height of the students,

Answer .....cm [1]

(ii) the interquartile range of the heights,

Answer .....cm [2]

(iii) the number of students whose heights are greater than 153 cm,

Answer ..... [1]

(iv) the minimum height of the tallest 15% of the students.

Answer .....cm [1]

(b) Several days later it was noticed that the ruler had been wrongly positioned, and that all heights had been understated by 2 cm.

Write down the new

(i) median,

Answer .....cm [1]

(ii) the interquartile range.

Answer .....cm [1]

(c) The mean of the height of p students from School B is 176 cm. Their standard deviation is found to be 3.2 cm and the sum of squares of their height is 2974679.04 cm^2. Find the value of p.

Answer $p =$ ..... [2]

End of test

P1 ANS Cathol2

2021 CHS Sec 4 Mathematics Preliminary Examinations Paper 1 Answer Key

1. (a) 32.10 (b) -45 2. 17% is incorrect. It should 17.7%.

3. $r=\dfrac{3}{q-p^2}$ 4. (a) 320 (b) 0616, 0621

5. 4 6. $r=2$

7. (a) 36 (b) $n=10$ (c) 4 : 3

8. (a) $y=-3x+2$ (b) $x=3$ 9. (a) $\dfrac{\sqrt{21}}{5}$ (b) $-\dfrac{2}{\sqrt{21}}$

10. (a) $(b-1)(b+1)(b^2+1)$ (b) $(m-1)(n-1)$

11. (a) -4 (b) -24 (c) 25

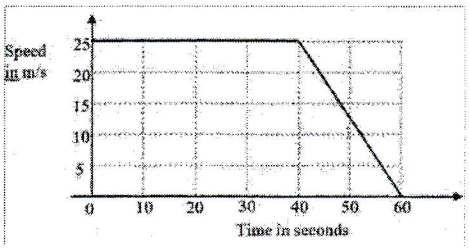
12. (a) E (b) B (c) A

13. (i) -7 (ii) -3.5 (iii) -4.5

15. (i) $a=-5$ (ii) P(2,0) R(0,6) (iii) 8.1

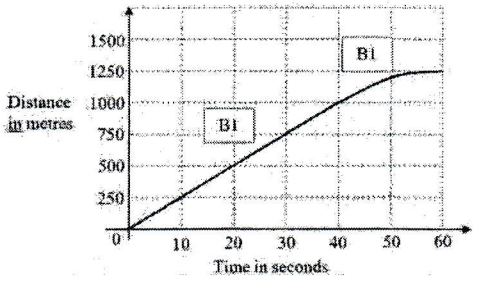
16. (ii) 18

17. (a)

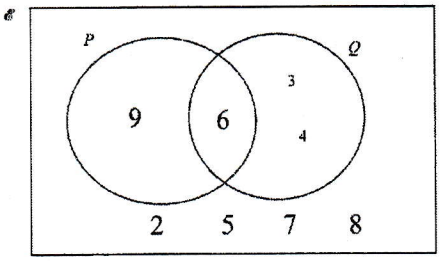


(b)(i) 1250

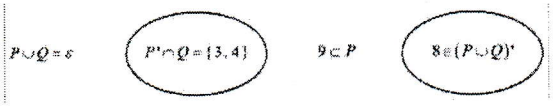
(b)(ii)



18. (a)



(b)



19. (a)(i) 960π (a)(ii) 40 (b) 18.1 or 5.76π (c) 7.63 or 2.43π

20. (a) $\mathbf{Q} = \begin{pmatrix} 10 & 5 \end{pmatrix}$ (b) $\mathbf{T} = \begin{pmatrix} 1550 & 1530 \end{pmatrix}$

(c) B. The total cost of shoes is cheaper in shop B than shop A.

21. (a)(i) 156 (a)(ii) 11.5 (a)(iii) 165 (b)(i) 158 (b)(ii) 11.5

(c) $p = 96$

Name:		Index Number:		Class:	

CATHOLIC HIGH SCHOOL
2021 Preliminary Examination
Secondary 4 (O-Level Programme)

Mathematics

4048/02

Paper 2

1 September 2021
2 hours 30 minutes

Additional Materials: Booklets A, B and C

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Calculators should be used where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer answer to **three significant figures.**
Give answers in **degrees to one decimal place.**
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

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

The total of the marks for this paper is **100.**

For examiner's use:

1	2	3	4	5	Total Marks
/ 8	/ 12	/ 10	/ 12	/ 8	/ 50

This booklet contains **14** printed pages.

Mathematical Formulae

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

1 **(a)** Simplify $\frac{3}{2-x}-\frac{1-6x}{(2x-4)^2}$ into a single fraction.

Answer ..... [3]

(b) Simplify $\frac{(2xy)^2}{5}\div\frac{10yz}{x}$.

Answer ..... [2]

(c) Solve $\frac{1}{2x-1}+\frac{4}{x+3}=2$.

Answer $x =$ ..... or ..... [3]

2 **(a)** The table below shows some information on food waste in Singacity.

Year	Food Waste Disposed of ('000 tonnes)	Food Waste Recycled ('000 tonnes)
2020	589	134
2019	652	141

* 1 tonne = 1000 kg

(i) Find percentage of food waste recycled in year 2020.

Answer .....% [2]

(ii) Find the percentage decrease in food waste from 2019 to 2020.

Answer .....% [2]

(iii) The population of Singacity in 2020 is 5.56 million. Find the average amount of food waste, in kg, generated per person in 2020. Leave your answer in standard form.

Answer .....kg [2]

(b) A birthday goodie bag contains three chocolates and one lollipop.

A second birthday goodie bag contains two chocolate, two lollipop and one marshmallow.

Caden picks one item at random from each bag.

(i) Construct a possibility diagram to show all the possible outcomes.

Answer On space provided [2]

(ii) Giving your answer as a fraction in its simplest form, find the probability that

(a) Caden doesn't pick a lollipop at all,

Answer ..... [1]

(b) Caden picks at least one chocolate.

Answer ..... [1]

(iii) A third birthday goodie bag containing two lollipops and one marshmallow was given to Caden. Find the probability that he does not choose a lollipop for all three picks.

Answer ..... [2]

3 **(a)** Two groups of students participated in a mathematics competition.

Their scores are shown in the stem-and-leaf diagram.

Group A						Group B							
	9	9	6	3	1	6	2	4	4	8			
	7	5	3	2	0	7	4	4	8	9			
8	6	5	5	4	1	8	0	2	3	7	7	7	9
		8	7	3	2	9	0	1	1	6	7		

Key: 1 | 6 | 2 means a score of 61 in group A and a score of 62 in group B

(i) State the modal mark of group B.

Answer ..... [1]

(ii) Complete the box-and-whisker plot to show the distribution of marks for students in group A with appropriate labelling of values on the number line.

Marks

Answer On space provided [3]

(iii) Calculate the mean marks and standard deviation of the marks of students in group B.

Answer Mean = ... [1]

Standard deviation =..... [1]

(iv) Explain whether the students in group A or the students in group B performed better in the competition.

.....

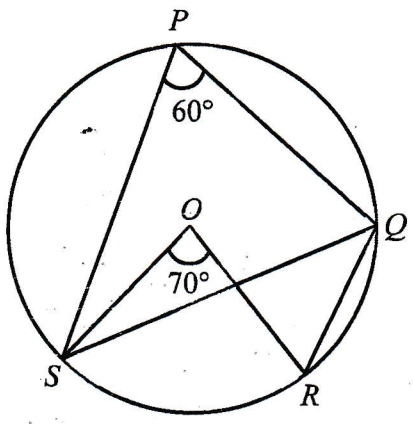
.....

.....

.....[1]

(b) In the diagram, P, Q, R and S are points on a circle, centre O.

Angle $SPQ = 60°$ and angle $SOR = 70°$.



(i) Find angle SQR.

Answer ..... [1]

(ii) Explain, with clear workings and reasonings, whether lines OS and QR are parallel.

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.....[2]

4 **(a)** The diagram shows the first four figures of a sequence.

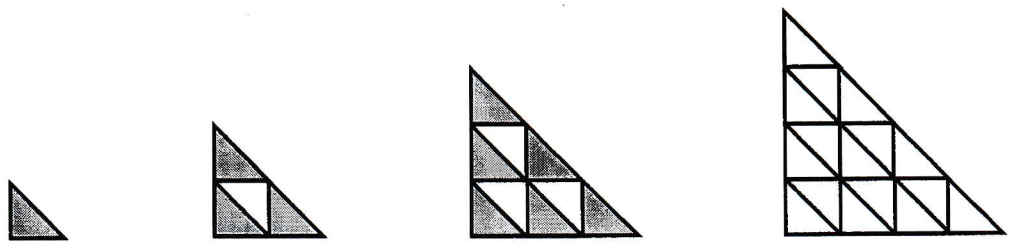
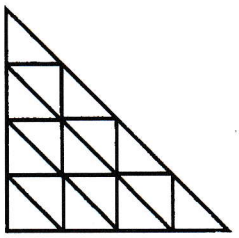


Figure 1 Figure 2 Figure 3 Figure 4

(i) In the diagram below, shade the triangles for Figure 4. State the number of shaded triangles for Figure 4.



Answer ..... [2]

(ii) The number of shaded triangles for Figure n is given by $\frac{n(n+a)}{b}$ where a and b are integers. Find the value of a and of b.

Answer $a =$ ..... [1]

$b =$ ..... [1]

(iii) Hence, find the number of shaded triangles in Figure 200.

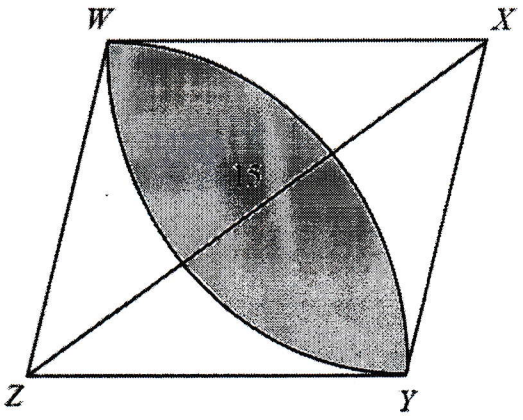
Answer ..... [1]

(iv) Using your answer in part **(iii)**, find the sum of $3+6+9+12+...+600$.

Answer ..... [1]

(b) $WXYZ$ is a rhombus with an area of 97.5 cm^2 and diagonal $XZ = 15$ cm.

WXY and WZY are two sectors with X and Z as their centres respectively.



(i) Find angle WZY in radians.

Answer .....rad [3]

(ii) Find the area of the shaded region.

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

5 Alex and Peter set out on their bicycles from Boon Lay and Loyang respectively to meet each other at some point along a common cycling route of 40 km. Alex was riding at an average speed of x km/h while Peter was riding at an average speed of 5 km/h slower than Alex.

(a) Find the time (in hours), in terms of x, they each took to cycle before meeting each other.

Answer ..... h [1]

(b) Given also that the time they took to cycle before they met each other is one-fifth the average speed at which Peter was riding, form an equation in x and show that it reduces to $2x^2 - 15x - 175 = 0$.

Answer

[2]

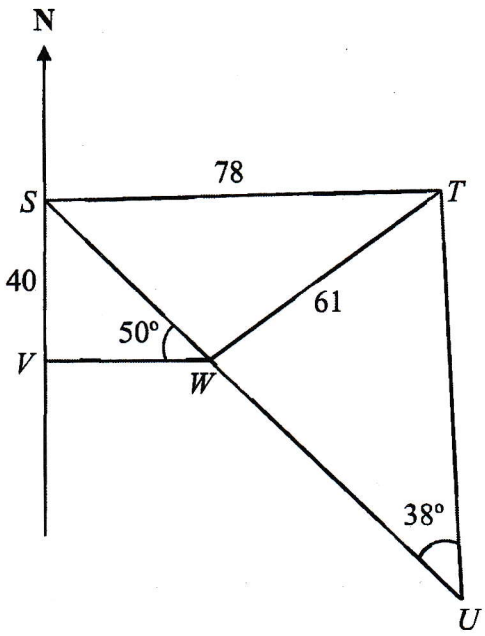
(c) Solve the equation $2x^2 - 15x - 175 = 0$, giving your solutions correct to two decimal places.

Answer $x =$ ..... or ..... [3]

(d) Hence, find the distance in km, which Alex has cycled when he met Peter.

Answer ..... km [2]

6 **(a)** The diagram shows a pentagon $STUWV$. W is due east of V and SWU is a straight line.
$SV = 40$ cm, $ST = 78$ cm and $TW = 61$ cm.
Angle $SWV = 50°$ and angle $WUT = 38°$.



(i) Find the bearing of U from T.

Answer ..... [2]

(ii) Find angle SWT and hence explain if TW is the shortest distance from T to SU.

Answer .....

.....

.....

.....

.....[4]

(iii) Find TU.

Answer ..... [2]

(b) A lucky draw box contains 12 green balls and 17 blue balls. Jason draws two balls from the box at random without replacement.

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

Answer

[2]

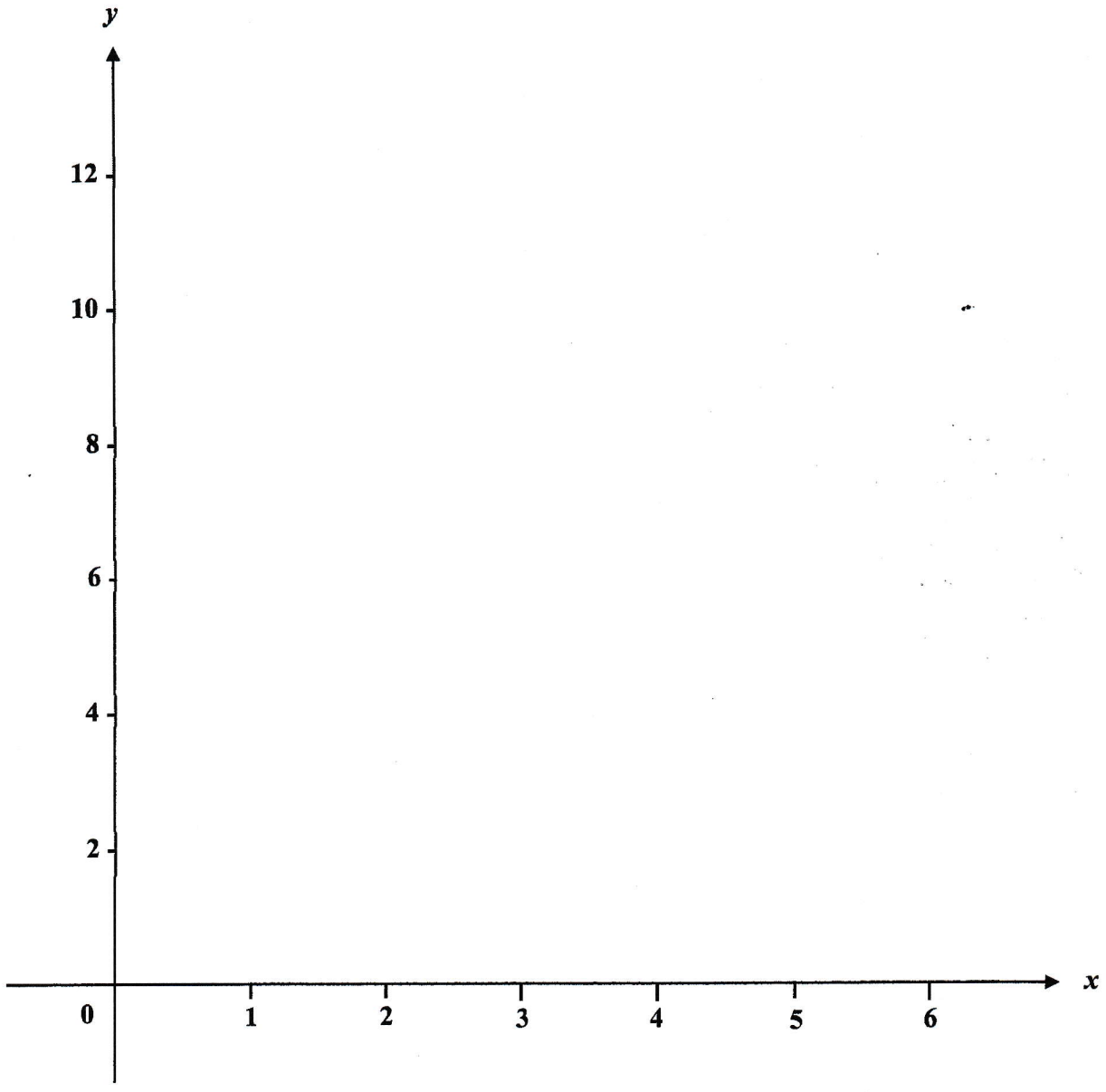
(ii) Find, as a fraction in its simplest form, the probability that he draws two balls of the same colour.

Answer ..... [2]

7 The variables x and y are connected by the equation $y = \frac{x^2}{4} + \frac{6}{x}$.

x	0.5	1	1.5	2	3	4	5	6
y	12.1	6.25	4.6	4	4.25	5.5	7.45	10

(a) On the grid, draw the graph of $y = \frac{x^2}{4} + \frac{6}{x}$ for $0.5 \leq x \leq 6$. [3]



(b) Using your graph, find the minimum value of the graph.

Answer ..... [1]

(c) On the same grid, draw the graph of $y - x = 4$ for $0 \leq x \leq 6$.

[1]

(d) Hence, find the range of values of x for which $4x^2 + 16x > x^3 + 24$.

Answer ..... [2]

(e) By drawing a tangent on your graph, estimate the value of the x–coordinate of the point on the graph where the gradient is 1.

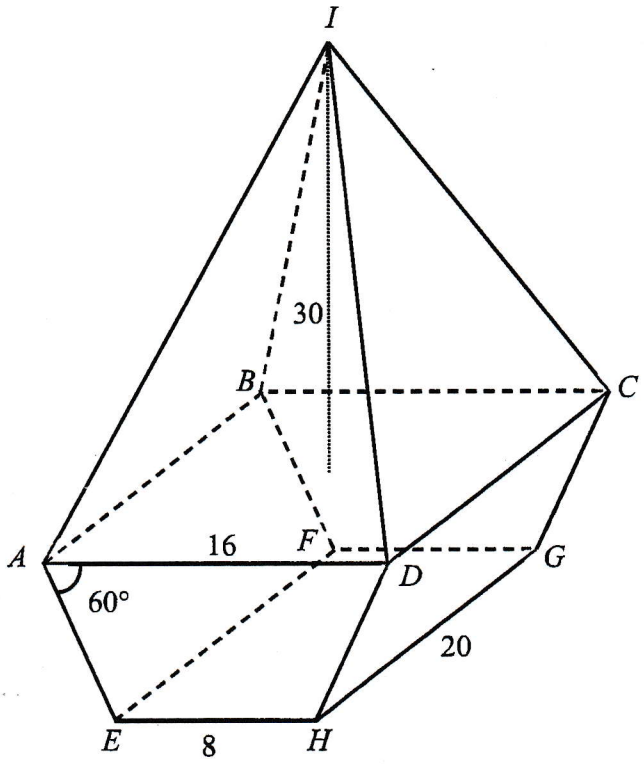
Answer $x =$ ..... [2]

8 The diagram shows a solid which consists of a pyramid and a prism whose cross-section is an isosceles trapezium where $AE = DH$.

$AD = 16$ cm, angle $EAD = 60°$ and the length of the prism is 20 cm.

I is vertically above the centre of the rectangular base $ABCD$.

The vertical height of the pyramid is 30 cm.



(a) Find the area of trapezium $ADHE$.

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

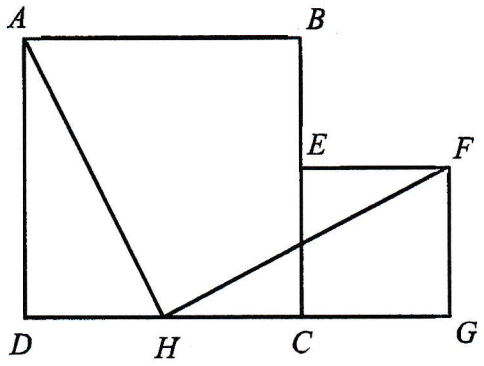
(b) Find the volume of the solid.

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

(c) Find the angle of elevation of I from E.

Answer .....° [3]

9 **(a)** The diagram shows two squares $ABCD$ and $EFGC$ such that $FG = DH$.



(i) Identify and prove a pair of congruent triangles.

.....

.....

.....

.....

.....[3]

(ii) Hence, show that angle AHF is a right angle.

.....

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.....

.....

.....[2]

(iii) Find $\dfrac{\text{sum of areas of square } ABCD \text{ and } EFGC}{\text{area of triangle } AFH}$.

Answer ..... [2]

(b) A quadratic curve, where the coefficient of x^2 is 2, passes through the points $(-3, k)$, $(5, k)$ and has a y-intercept of -18.

(i) Find the x-coordinate of the turning point.

Answer $x =$ ..... [1]

(ii) Find the equation of the curve.

Answer ..... [2]

10 Mr Tan and his family uses an average of 430 kWh of electricity per month. The electrical tariffs as mentioned below are not inclusive of goods and services tax (GST) of 7%.

Mr Tan's current electricity plan with electricity provider, U-Electrical, is such that he enjoys a 25% discount on the electricity tariff of $0.2582 per kWh. There is also a monthly administrative service fee of $4.99.

(a) Calculate Mr Tan's average monthly electrical bill inclusive of GST.

Answer $..... [3]

It is known that for every 1 kWh of electricity generated, 0.92 pounds of carbon dioxide is produced, which contributes to the greenhouse effect that the world is facing.

With the introduction of Singapore Green Plan 2030, Mr Tan wants to switch to another electricity provider, Grid Power, for an environmentally friendly electricity plan that aims at reducing carbon footprint.

The reduction in carbon dioxide is achieved by paying an additional cost for every kWh of electricity consumed and Grid Power will use these add-on funds to invest in carbon emission reduction technologies. For such electricity plans, consumers can match a percentage of their monthly electricity consumption with an equivalent amount of carbon dioxide to be reduced.

The electrical tariff for these plans is fixed at $0.21 per kWh. The additional tariffs per kWh to pay for reducing carbon dioxide are provided in the table below.

Plan	Percentage of carbon dioxide generated to be reduced	Additional tariff (in cents) per kWh on total monthly consumption	Administrative Service Fee ($)
1	25% of monthly consumption	0.11	5.99
2	50% of monthly consumption	0.22	3.99
3	75% of monthly consumption	0.32	2.99
4	100% of monthly consumption	0.43	1.99

* 1 kg = 2.205 pounds

(b) Without changing his average monthly electrical consumption of 430 kWh, Mr Tan hopes to reduce his monthly carbon dioxide emission through this green plan by at least 120 kg and that his new electrical bill would be at most 8% higher than what he paid previously.

Suggest the plan Mr Tan should subscribe.

Justify the decision you make and show your calculations clearly.

.....

.....[7]

Cathon2

P2

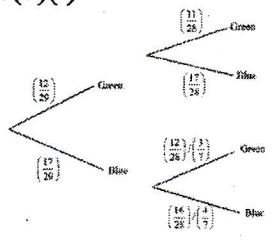
Answer Key

1(a) $\frac{23-6x}{4(2-x)^2}$ (b) $x=-1\frac{1}{4}$ or 1

(c) $\frac{2x^3y}{25z}$

6(a)(i) 178° (ii) 86.7° (iii) 98.9cm

6(b)(i)



(ii) $\frac{101}{203}$

2(a)(i) 18.5% (ii) 8.83%

(iii) 1.30×10^2 kg/person

8(a) $83.1cm^2$ (b) $4860cm^3$

(c) 73.7°

2(b)(i)

	C	C	C	L
C	CC	CC	CC	CL
C	CC	CC	CC	CL
L	LC	LC	LC	LL
L	LC	LC	LC	LL
M	MC	MC	MC	ML

(b)(ii) (a) $\frac{9}{20}$ (b) $\frac{17}{20}$ b(iii) $\frac{3}{20}$

9(a)(i)

$DH = GF$(given) and $\angle ADH = \angle HGF = 90°$

Let $DH = FG = x$ and $AD = y$

$DG = x + y$

$HG = DG - DH$

$= y + x - x$

$= y = AD$

$AD = HG$

$\Delta ADH \equiv \Delta HGF$ (SAS)

(a)(ii)

$\angle DAH = \angle FHG$ (from (a))

$\angle AHF = 180° - \angle FHG - \angle AHD$ (angle on a straight line)

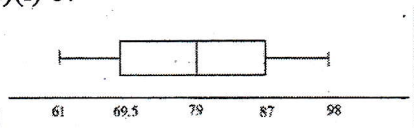
$= 180° - \angle DAH - \angle AHD$ (angle sum of Δ)

$= 90°$

(a)(iii) 2

3(a)(i) 87

(ii)



(iii) Mean = 81.15

Standard deviation = 10.4

(iv) Students in group B did better as they have a higher median of 82.5 as compared to students in group A with a median of 79.

(b)(i) $x = 1$

(b)(ii) $y = 2(x-1)^2 - 20$ or

$y = 2x^2 - 4x - 18$

3(b)(i) 35°

Angle SRQ = 180° − 60°

= 120° (supp angles in opp seg)

Angle $OSR = \frac{180° - 70°}{2}$

= 55° (base ∠ of isosceles Δ)

Since angle SRQ + angle OSR = 120° + 55°

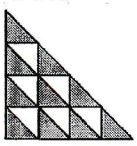
= 175°, (≠ 180°)

they are not interior angles, hence OS is not parallel to QR.

10(a) \$94.44

(b) Plan 4 (\$100.73) is cheaper than plan 3 (within budget) and can give the highest carbon footprint reduction.

4(a)(i)



(a)(i) 10 (a)(ii) $a = 1$ $b = 2$

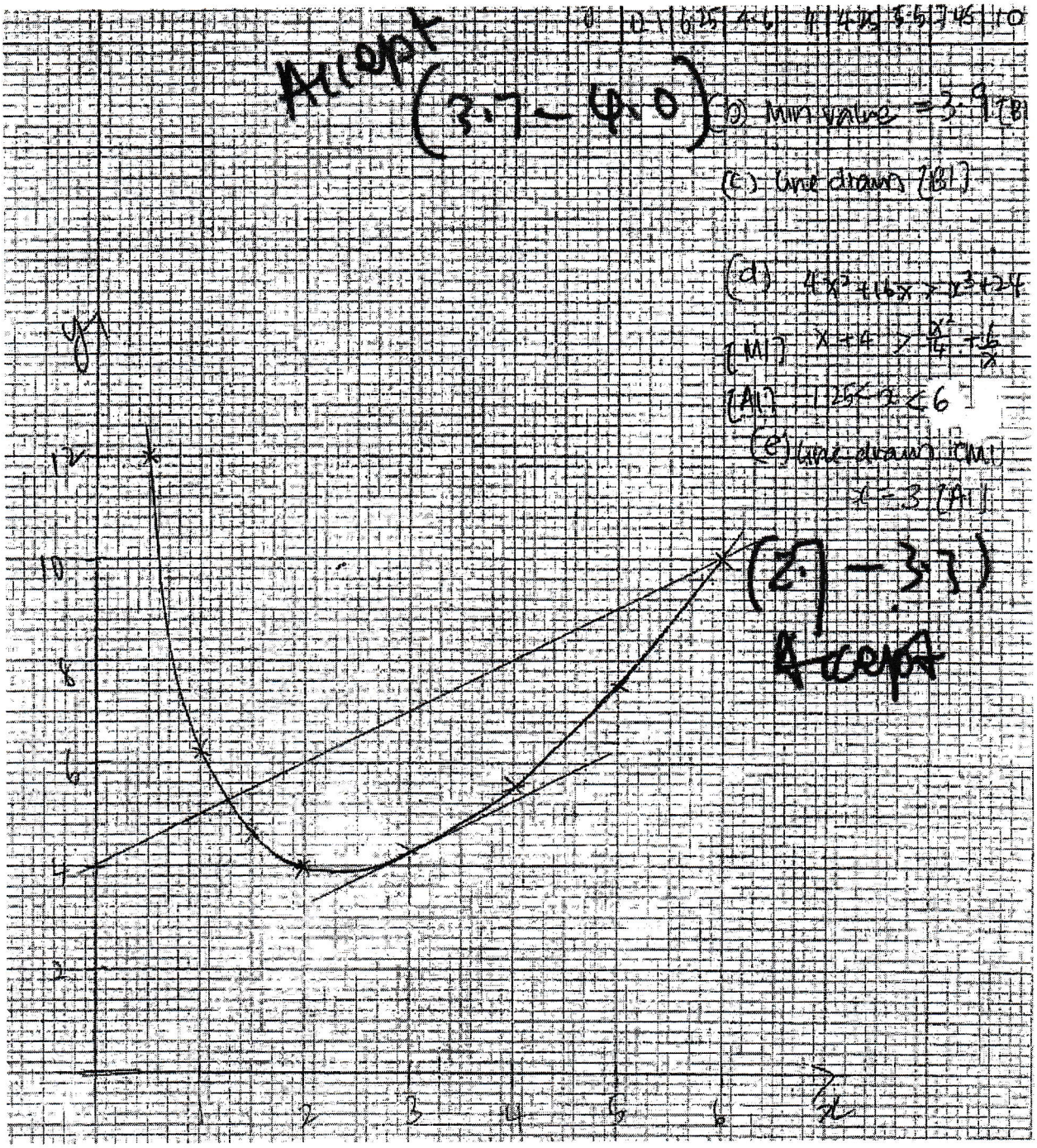
(iii) 20100 (iv) 60300

4(b)(i) 1.43rad (ii) 43.2

5(a) $\frac{40}{2x-5}$

(c) = 13.83 *or* −6.33 (d) 24.4km

7


A (0.8, 12.5)
(3.7, 4.0)
(2.7, 3.7)
A (0.8, 12.5)
(3.7, 4.0)
(b) Min value = 3.9 [B]
(c) Line drawn [B1]
(d) $4x^2 + 16x > x^3 + 25$
[M1] $x + 4 > \frac{25}{4x} + \frac{16}{x}$
[A1] $1.25x^2 - x < 6$
(e) Line drawn [M1]
$x = 3$ [A1]
y
x