Geylang Methodist School (Secondary)
Preliminary Examination 2024

Candidate Name			
Class		**Index Number**	

MATHEMATICS (SYLLABUS A)

4045 / 01

Paper 1

4 Normal (Academic)

Candidates answer on the Question Paper.

2 hours

Setter: Ms Tan Kai Wei

Monday, 5 August 2024

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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 **70**.

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.

For Examiner's Use
70

Mathematical Formulae

Compound Interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Answer **all** the questions.

1 **(a)** Write $0.005\,625\,819$ correct to 4 significant figures.

Answer ……..……. [1]

(b) Express $3\frac{3}{8}$ as a percentage.

Answer ……..……% [1]

---

2 Find the smallest integer satisfying the inequality $3x > -17$.

Answer ……..……. [2]

---

3 **(a)** $\sin x° = 0.6$
Given that x is an obtuse angle, find x.

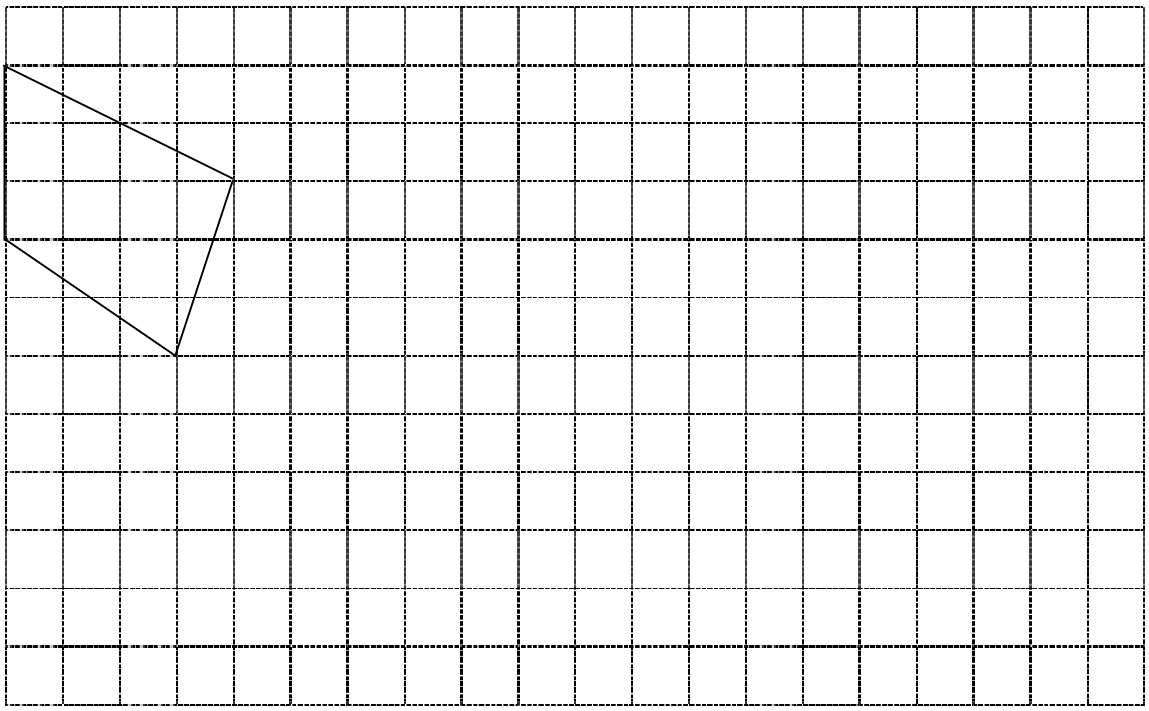
Answer x = ……..……. [1]

(b) $\cos 135° = -\cos y°$
Given that y is an acute angle, find y.

Answer y = ……..……. [1]

[Turn Over

4



Draw an enlargement of this pentagon using a scale factor of 2. [2]

---

5 The first 5 terms of a number sequence are

5, 9, 13, 17, 21, …

(a) Find an expression for the *n*th term of the sequence.

Answer ……..……. [1]

(b) Find the 30^{th} term.

Answer ……..……. [1]

(c) The *p*th term in the sequence is 249.

Find *p*.

Answer p = ……...……. [2]

6 **(a)** Express $\frac{2}{x-3}-\frac{3}{x^2-9}$ as a single fraction in its simplest form.

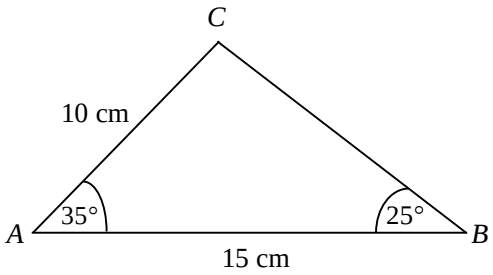
Answer ……..……. [3]

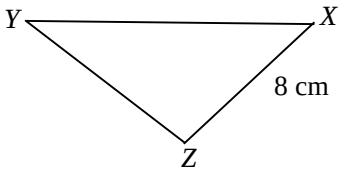
(b) Rearrange the formula to make z the subject.

$x = 5y + 2z^2$

Answer z = ……..……. [2]

7 Triangle *ABC* is similar to triangle *XYZ*.





(a) Find the value of angle *XYZ*.

Answer Angle *XYZ* = ……...……. [1]

(b) Find the value of *XY*.

Answer XY = ……...……. [2]

8 Given that $a : b = 7 : 5$ and $b : c = \frac{1}{3} : \frac{1}{2}$, find $a : c$.

Answer …… : ..…….. [2]

---

9 Factorise.

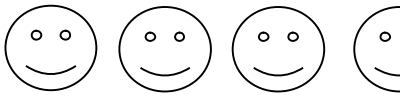
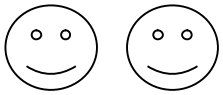
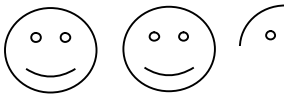
(a) $15x^3 + 3x$

Answer ……..……. [1]

(b) $2y^2 + y - 6$

Answer ……..……. [2]

10 The chart below shows the number of books read by each student in a year.

Jane	
Alex	
Revo	
Faris	
Hayd	

Key:  represents 20 books.

(a) Who reads the most number of books?

Answer ……..……. [1]

(b) Express the number of books Alex read, as a fraction of the number of books Faris read.

Answer ……..……. [1]

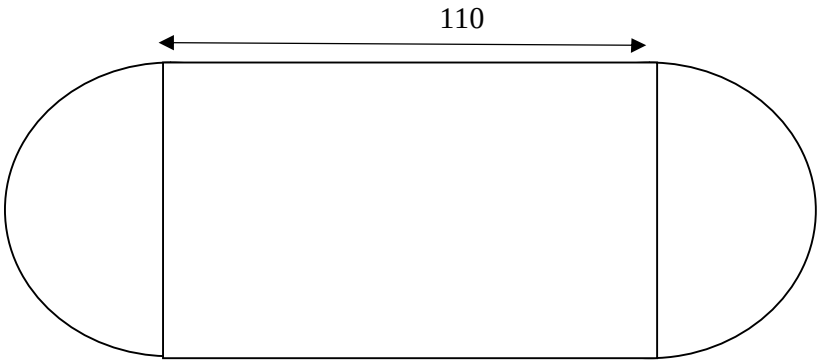
(c) Explain one limitation of using pictogram to represent data.

Answer

[1]

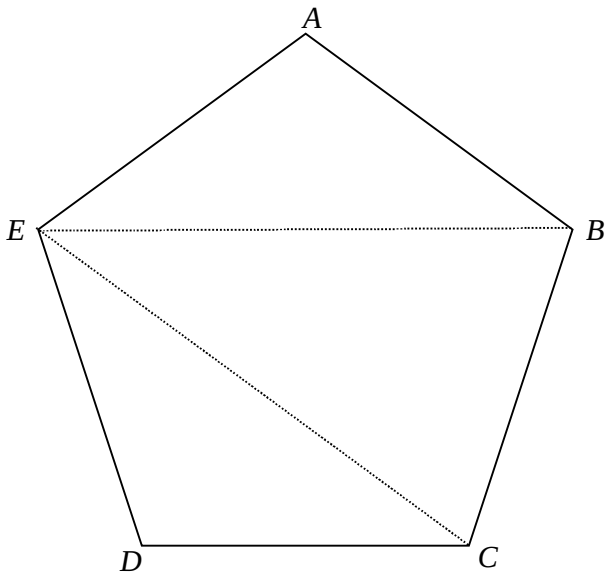
11 A stadium is made up of one rectangle and two semi-circles as shown.
The ratio of the length to the breadth of the rectangle is 5 : 3.
The length of rectangle is 110 m.

Calculate the area of the stadium.



Answer ……..……m^2 [3]

12



ABCDE is a regular pentagon. Calculate angle *BEC*.

Answer Angle *BEC* = ……..…… [3]

13 **(a)** Andy invests $12000 for 5 years.
His investment offers an annual interest rate of 1.8% compounded half-yearly.
How much is the investment worth at the end of the five years?

Answer $……..……. [2]

(b) Betty sold her car for $82 000 and made a loss of 36%.
How much did she buy her car for?

Answer $……..……. [2]

(c) The price of an oven is $1800.
Cindy decides to pay by hire purchase.
She pays a 20% deposit and then 12 equal payments of $135.
How much does she pay in total?

Answer $……..……. [2]

14 In triangle ABC, $AC = 8.5$ cm and $BC = 7$ cm.

(a) Construct triangle ABC.
AB has been drawn for you.

A B

[2]

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

(c) X is the point where the perpendicular bisector of AB crosses AC.
Measure XB.

Answer …….. cm [1]

15 $x^2 + 8x - 3 = (x + a)^2 + b$

(a) Find the value of a and the value of b.

Answer a = …….

b = ……. [2]

(b) Hence solve $x^2 + 8x - 3 = 0$.
Give your answers correct to 2 decimal places.

Answer x = …… or x = …… [2]

[Turn Over

16 John has a map drawn to the scale of 1 : 400 000.

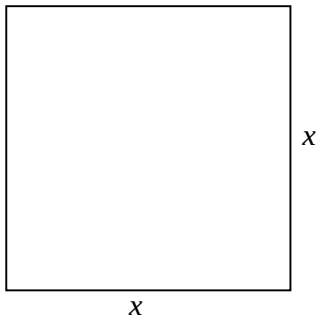
(a) The distance of a road drawn on the map is 8 cm.
Calculate the actual distance, in kilometres, the length of the road.

Answer ……..……. km [2]

(b) The area of the forest is 136 km^2.
Calculate the area, in cm^2, of the forest on the map.

Answer ……..……. cm^2 [2]

17



The length of each side of a square is increased by 25%.
Will the percentage increase in area be 25% too? Explain your answers with workings.

Answer

[3]

18 Amy went on a holiday trip to South Korea.
The exchange rate between Singapore dollars (SGD) and Korean won (KRW) is 1 SGD = 1020 KRW.

She decides to exchange SGD 1500 for her holiday trip. During the vacation, she spent 60% of the money she brought along.

(a) Calculate the remaining amount of money in KRW.

Answer ……..…….. KRW [2]

(b) When Amy returned back to Singapore, she checked that the exchange rate is 1 SGD = 1035 KRW.

Would you recommend that Amy change her remaining money to Singapore dollars at this rate? Explain your answer clearly with workings.

Answer

[3]

19 A solid cone with a volume of 1232 cm^3 has a circular base of radius 7 cm.

(a) Using $\pi = \frac{22}{7}$, show that the height of the cone is 24 cm.

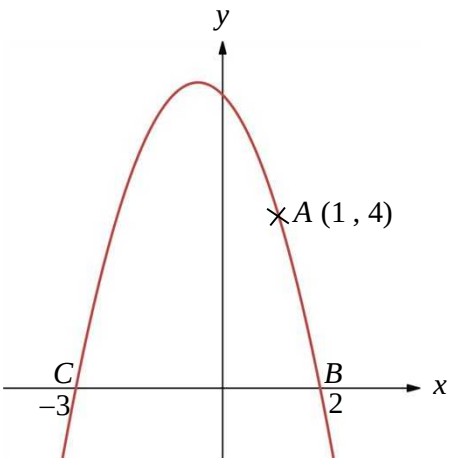
Answer

[2]

(b) Calculate its total surface area.

Answer …….…….. cm^2 [3]

20 The sketch below shows a quadratic curve.



(a) Write down the equation of the curve in the form $y = (x - a)(x - b)$.

Answer ……..……..…….. [1]

(b) Write down the line of symmetry.

Answer ……..……..…….. [1]

Point *A* (1,4) lies on the curve. A straight line is drawn from *A* to *B*.

(c) Find the equation of the line *AB*.

Answer ……..……..…….. [3]

END OF PAPER

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

Answer **all** the questions.

1 **(a)** Write $0.005\,625\,819$ correct to 4 significant figures.

Ans: 0.005626 (4sf)

Answer ……..……. [1]

(b) Express $3\frac{3}{8}$ as a percentage.

Ans: 337.5%

Answer ……..……% [1]

---

2 Find the smallest integer satisfying the inequality $3x > -17$.

$3x > -17$

$x > -5\frac{2}{3}$ [M1]

Smallest integer = -5 [A1]

Answer ……..……. [2]

---

3 **(a)** $\sin x° = 0.6$

Given that x is an obtuse angle, find x.

$\sin x° = 0.6$

$x = \sin^{-1} 0.6$

$= 36.9°$ or $143.1°$ (1dp)

Since x is an obtuse angle, $x = 143.1$. [B1]

Answer x = ……..……. [1]

(b) $\cos 135° = -\cos y°$

Given that y is an acute angle, find y.

$y = 180° - 135°$

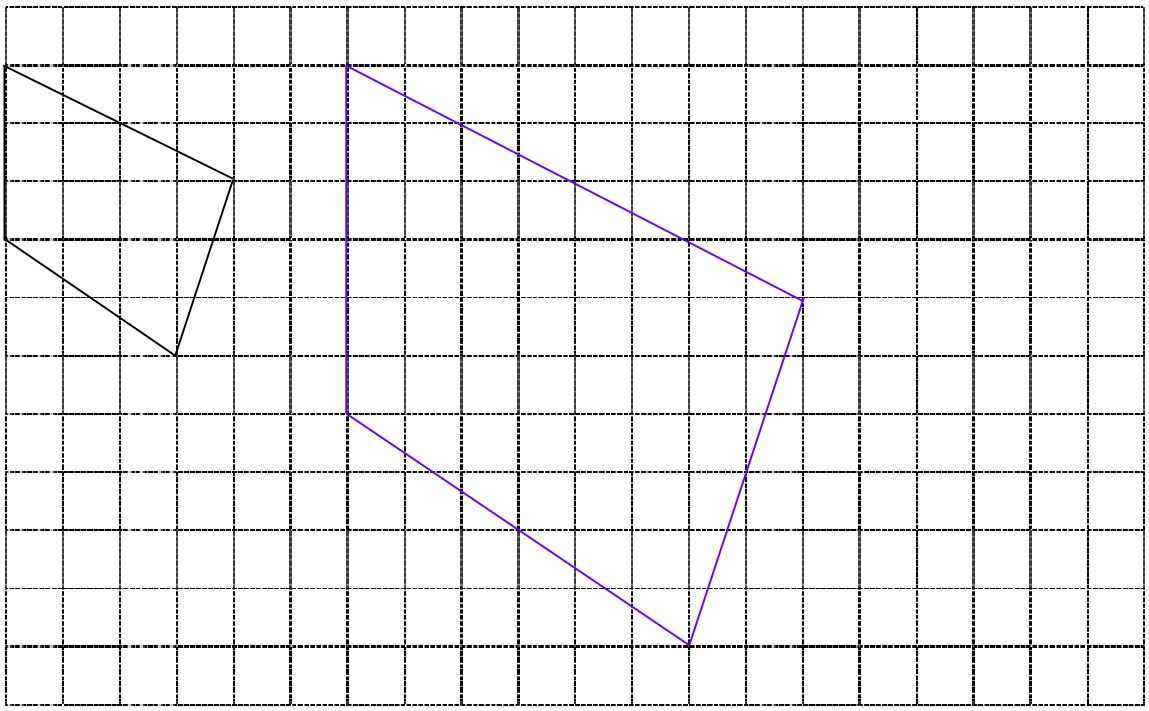
$= 45°$

$y = 45$ [B1]

Answer y = ……..……. [1]

[Turn Over

4



[B1 for 2 correct lines drawn x2]

Draw an enlargement of this pentagon using a scale factor of 2. [2]

---

5 The first 5 terms of a number sequence are

5, 9, 13, 17, 21, …

(a) Find an expression for the *n*th term of the sequence.

*n*th term = $4n + 1$ [B1]

Answer ……..……. [1]

(b) Find the 30^{th} term.

30^{th} term = $4(30) + 1 = 121$ [B1]

Answer ……..……. [1]

(c) The *p*th term in the sequence is 249.

Find *p*.

$4n + 1 = 249$ [M1 – ECF from (a)]
$4n = 248$
$n = 62$ [A1]

Answer p = ……..……. [2]

6 **(a)** Express $\frac{2}{x-3}-\frac{3}{x^2-9}$ as a single fraction in its simplest form.

$$\frac{2}{x-3}-\frac{3}{x^2-9}$$
$$=\frac{2}{x-3}-\frac{3}{(x+3)(x-3)}$$ [M1 for showing $(x+3)(x-3)$]
$$=\frac{2(x+3)}{(x-3)(x+3)}-\frac{3}{(x+3)(x-3)}$$
$$=\frac{2x+6}{(x-3)(x+3)}-\frac{3}{(x+3)(x-3)}$$ [M1 for showing $2x+6$]
$$=\frac{2x+6-3}{(x-3)(x+3)}$$
$$=\frac{2x+3}{(x-3)(x+3)}$$ [A1]

Answer ……..……. [3]

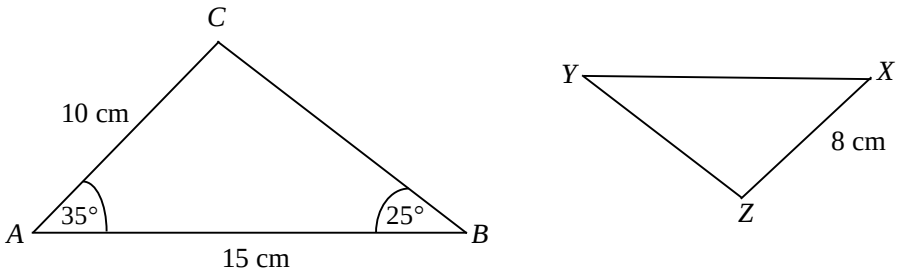
(b) Rearrange the formula to make *z* the subject.

$$x=5y+2z^2$$

$$x=5y+2z^2$$
$$2z^2=x-5y$$ [M1 for having $2z^2$ on one side]
$$z^2=\frac{x-5y}{2}$$
$$z=\pm\sqrt{\frac{x-5y}{2}}$$ [A1 including $\pm$]

Answer z = ……..……. [2]

7 Triangle *ABC* is similar to triangle *XYZ*.



(a) Find the value of angle *XYZ*.

$\angle XYZ = \angle ABC = 25°$ [B1]

Answer Angle *XYZ* = ……..……. [1]

(b) Find the value of *XY*.

$\frac{XY}{AB} = \frac{XZ}{AC}$

$\frac{XY}{15} = \frac{8}{10}$ [M1 or M1 awarded for finding scale factor]

$10XY = 120$

$XY = 12$ [A1]

Answer XY = ……..……. [2]

8 Given that $a : b = 7 : 5$ and $b : c = \frac{1}{3} : \frac{1}{2}$, find $a : c$.

$b : c = \frac{1}{3} : \frac{1}{2}$
$= 2 : 3$ [M1 – converting ratio in fraction to integer]
$= 10 : 15$

$a : b = 7 : 5 = 14 : 10$

$a : c = 14 : 15$ [A1]

Answer …… : ..…….. [2]

---

9 Factorise.

(a) $15x^3 + 3x$

$15x^3 + 3x$
$= 3x(5x^2 + 1)$ [B1]

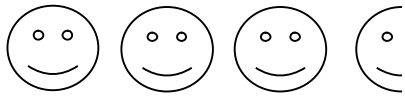
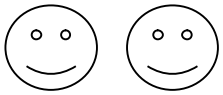
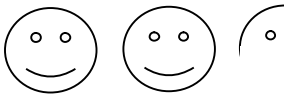
Answer ……..…….. [1]

(b) $2y^2 + y - 6$

$2y^2 + y - 6$
$= (2y - 3)(y + 2)$ [B1 for each bracket x2]

Answer ……..…….. [2]

10 The chart below shows the number of books read by each student in a year.

Jane	
Alex	
Revo	
Faris	
Hayd	

Key:  represents 20 books.

(a) Who reads the most number of books?

Faris [B1]

Answer ……..……. [1]

(b) Express the number of books Alex read, as a fraction of the number of books Faris read.

$\frac{2}{7}$ [B1]

Answer ……..……. [1]

(c) Explain one limitation of using pictogram to represent data.

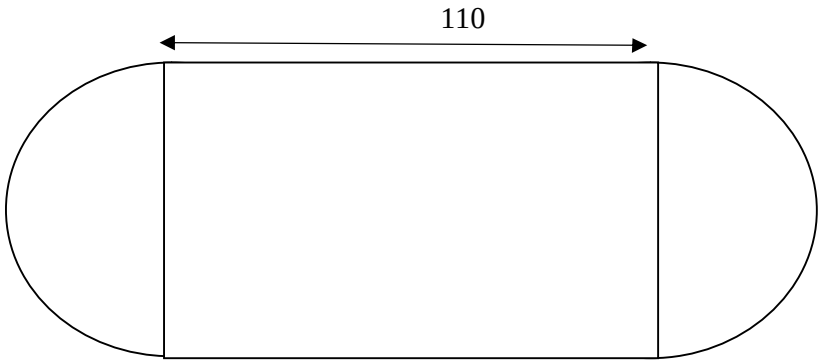
Answer

It may lead to misinterpretation of data as it is difficult to represent data which are not multiples of 20. [B1]

[1]

11 A stadium is made up of one rectangle and two semi-circles as shown.
The ratio of the length to the breadth of the rectangle is 5 : 3.
The length of rectangle is 110 m.

Calculate the area of the stadium.



Breadth = $\frac{110}{5} \times 3$ = 66m [M1]

Radius = 33m

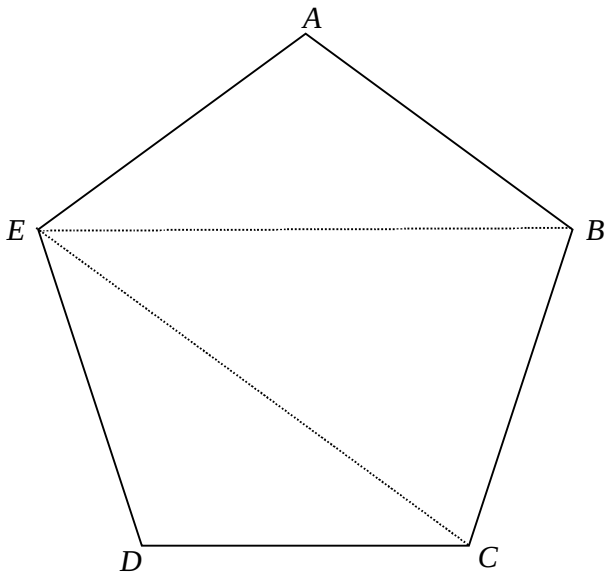
Area of 2 semi-circles = $2 \times \frac{1}{2} \times \pi \times (33)^2$ = 1089π m^2 [M1]

Area of rectangle = 110×66 = 7260 m^2

Total area = 1089π + 7260 = 10681.1944 = 10700 m^2 [A1]

Answer ……..……m^2 [3]

12



ABCDE is a regular pentagon. Calculate angle *BEC*.

Regular pentagon → all sides equal & all interior angles equal

Each interior angle
$= [(5-2)\times 180°] \div 5$
$= 108°$ [M1]

Triangle ABE and DEC are exactly the same and both are isosceles triangles.
angle *ABE*
= angle *DEC*
$= (180-108) \div 2$
$= 36°$ [M1]

angle *BEC*
$= 108 - 36 - 36$
$= 36°$ [A1]

Answer Angle *BEC* = ……..…… [3]

13 **(a)** Andy invests \$12000 for 5 years.
His investment offers an annual interest rate of 1.8% compounded half-yearly.
How much is the investment worth at the end of the five years?

Total amount
$= 12000\left(1+\frac{0.9}{100}\right)^{10}$ [M1]
$= 13124.81$ (2dp) [A1]

To accept \$13100 (to 3sf) as well.

Answer \$……..……. [2]

(b) Betty sold her car for \$82 000 and made a loss of 36%.
How much did she buy her car for?

Original price of car
$= 82000 \div \frac{64}{100}$ [M1]
= \$128125 [A1]

Answer \$……..……. [2]

(c) The price of an oven is \$1800.
Cindy decides to pay by hire purchase.
She pays a 20% deposit and then 12 equal payments of \$135.
How much does she pay in total?

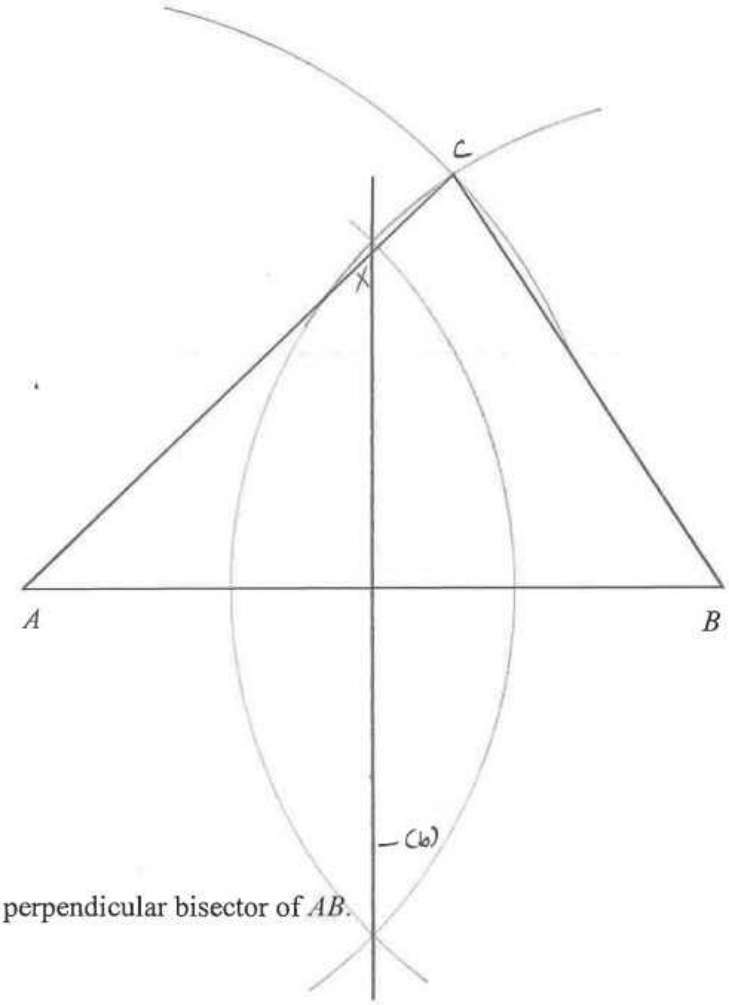
Total payments made
$= 20\% \times 1800 + 12 \times 135$ [M1 – 12 equal payments]
= \$1980 [A1]

Answer \$……..……. [2]

[Turn Over

14 In triangle *ABC*, *AC* = 8.5 cm and *BC* = 7 cm.

(a) Construct triangle *ABC*.
AB has been drawn for you.



[2]

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

(c) *X* is the point where the perpendicular bisector of *AB* crosses *AC*.
Measure *XB*.

Answer *XB* = 6.9 ± 0.1 cm [1]

[Turn over

15 $x^2 + 8x - 3 = (x + a)^2 + b$

(a) Find the value of a and the value of b.

$x^2 + 8x - 3$
$= x^2 + 8x + 4^2 - 4^2 - 3$
$= (x + 4)^2 - 19$

$a = 4$ [B1]
$b = -19$ [B1]

Answer a = …….

b = ……. [2]

(b) Hence solve $x^2 + 8x - 3 = 0$.
Give your answers correct to 2 decimal places.

$(x + 4)^2 - 19 = 0$
$(x + 4)^2 = 19$
$x + 4 = \pm\sqrt{19}$ [M1 with ± written]
$x = \pm\sqrt{19} - 4$
$x = 0.36$ (2dp) or -8.36 (2dp) [A1 for both correct]

[ECF1 awarded if all workings correct using the wrong answer from (a)]

Answer x = …… or x = …… [2]

16 John has a map drawn to the scale of 1 : 400 000.

(a) The distance of a road drawn on the map is 8 cm.
Calculate the actual distance, in kilometres, the length of the road.

Map	Actual		Map	Actual	
1 cm	400000 cm		1 cm	400000 cm	
8 cm	3200000 cm	[M1]	1 cm	4 km	[M1]
8 cm	32 km	[A1]	8 cm	32 km	[A1]

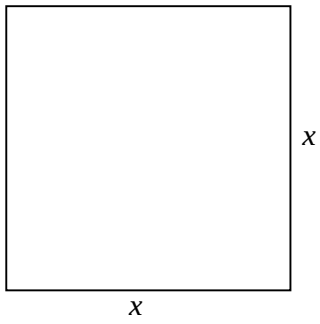
Answer ……..……. km [2]

(b) The area of the forest is 136 km^2.
Calculate the area, in cm^2, of the forest on the map.

Map		Actual		Map		Actual	
1 cm		4 km		1 cm		16 0000000000 cm^2	
1 cm^2		16 km^2	[M1]	1 cm^2		16 km^2	[M1]
8.5 cm^2	[A1]	136 km^2		8.5 cm^2	[A1]	136 km^2	

Answer ……..……. cm^2 [2]

17



The length of each side of a square is increased by 25%.
Will the percentage increase in area be 25% too? Explain your answers with workings.

Answer

New length of square = $1.25x$
New area of square = $1.25x \times 1.25x = 1.5625x^2$ [M1]
Change in area of square $= 1.5625x^2 - x^2$
$= 0.5625x^2$ [M1]
Percentage increase in area of square
$= \frac{0.5625x^2}{x^2} \times 100\%$
= 56.25% (shown) [A1]
The percentage increase in area is not 25%.

Alternative solution:
Let length be 4 cm,
New length = 5 cm [M1]
New area = 25 cm^2 [M1]
Percentage increase in area
$= \frac{25-16}{16} \times 100\%$
= 56.25% [A1]
The percentage increase in area is not 25%.

[3]

18 Amy went on a holiday trip to South Korea.
The exchange rate between Singapore dollars (SGD) and Korean won (KRW) is 1 SGD = 1020 KRW.

She decides to exchange SGD 1500 for her holiday trip. During the vacation, she spent 60% of the money she brought along.

(a) Calculate the remaining amount of money in KRW.

Since S$1 = 1020 KRW,
S$1500 = 1020 KRW × 1500 = 1530000 KRW [M1]

Since she spent 60% of the money, she has 40% leftover.
Amount leftover = $40\% \times 1530000$
= 612000 KRW [A1]

Answer ……..…….. KRW [2]

(b) When Amy returned back to Singapore, she checked that the exchange rate is 1 SGD = 1035 KRW.

Would you recommend that Amy change her remaining money to Singapore dollars at this rate? Explain your answer clearly with workings.

Answer

Since S$1 = 1020 KRW, 1 KRW = S$$\frac{1}{1020}$$
By using the exchange rate before she went to Korea,
612000 KRW = $\frac{1}{1020} \times 612000$
= S$ 600 [M1]

Since S$1 = 1035 KRW, 1 KRW = S$$\frac{1}{1035}$$
By using the exchange rate after she came back from Korea,
612000 KRW = $\frac{1}{1035} \times 612000$
= S$ 591.30 (2dp) [M1]
[ECF1 for either working shown]

I would recommend Amy not to change her remaining money to Singapore dollars as the amount of money she will get when she return to Singapore is lesser than the amount of money she changed before she went to South Korea. [A1 – qualitative reasoning]
[ECF1 for comparison made]

[3]

19 A solid cone with a volume of 1232 cm^3 has a circular base of radius 7 cm.

(a) Using $\pi = \frac{22}{7}$, show that the height of the cone is 24 cm.

Answer

$\frac{1}{3} \times \frac{22}{7} \times 7^2 \times h = 1232$ [M1 – applying volume of cone formula]

$h = 1232 \div \frac{1}{3} \div \frac{22}{7} \div 7^2$

$h = 24$ [A1 – showing h = 24]

Cannot assume h = 24 and find volume

[2]

(b) Calculate its total surface area.

Slant height of cone

$= \sqrt{7^2 + 24^2}$

= 25 cm [M1 for finding slant height]

Total surface area

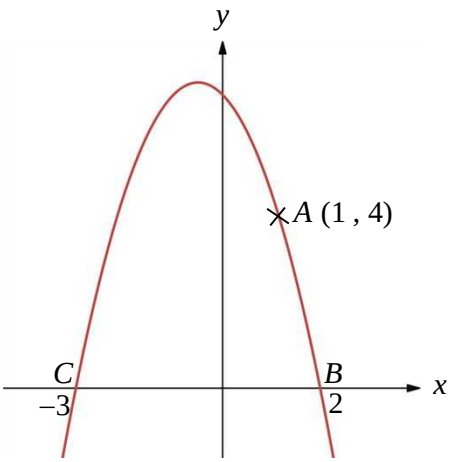
$= \left(\frac{22}{7}\right)(7)(25) + \left(\frac{22}{7}\right)(7)^2$ [M1 – for finding curved surface area πrl]

= 704 cm^2 [A1]

Answer ……..…….. cm^2 [3]

[Turn Over

20 The sketch below shows a quadratic curve.



(a) Write down the equation of the curve in the form $y = (x-a)(x-b)$.

$y = (x-2)(x+3)$ [B1]

Answer ……..……..…….. [1]

(b) Write down the line of symmetry.

$x = -0.5$ [B1]

Answer ……..……..…….. [1]

Point *A* (1,4) lies on the curve. A straight line is drawn from *A* to *B*.

(c) Find the equation of the line *AB*.

Gradient
$= \dfrac{4-0}{1-2}$
$= -4$ [M1]
$y = -4x + c$
$4 = -4(1) + c$
$c = 8$ [M1]
$y = -4x + 8$ [A1]

Answer ……..……..…….. [3]

END OF PAPER

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Geylang Methodist School (Secondary)
Preliminary Examination 2024

Candidate Name			
Class		**Index Number**	

MATHEMATICS (SYLLABUS A) **4045 / 02**

Paper 2 **4 Normal (Academic)**

Candidates answer on the Question Paper. **2 hours**

Setter: Mdm Faridah Ahmad **Thursday, 15 August 2024**

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name in the spaces at the top of this page.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A
Answer **all** questions.

Section B
Answer **one** question.

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 **70**.

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
70

This document consists of **17** printed pages and **3** blank pages.

[Turn Over

Mathematical Formulae

Compound Interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Section A (62 marks)
Answer **all** the questions in this section.

1 **(a)** **(i)** Write 42.1 million to the nearest thousand.

Answer thousand [1]

(ii) Write 0.005 187 62 correct to 4 decimal places.

Answer ..... [1]

(b) By rounding each number to 1 significant figure, **estimate** the value of

$$\frac{6.582 \times 0.891^2}{\sqrt{435.18}}$$

You must show your working.

Answer ..... [2]

---

2 **(a)** $7^a \times 49 = 7^5$

Find the value of a.

Answer ..... [2]

(b) Simplify $\left(\frac{16}{x^4}\right)^{-\frac{3}{4}}$, leaving your answer in positive index.

Answer ..... [2]

3 Tommy records the number of hours he spends exercising each week for a period of 40 weeks. The results are shown in the table below.

Number of hours of exercise per week	0	1	2	3	4	5
Frequency	3	7	p	12	8	5

(a) State the value of p.

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

(b) Show that the probability of exercising more than 2 hours a week is 0.625.

Answer

[2]

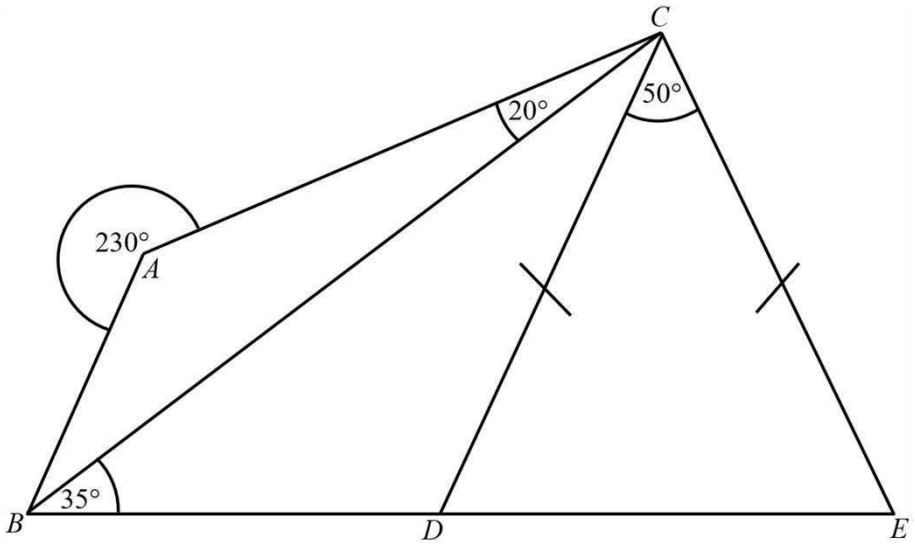
(c) Calculate the mean.

Answer ..... [2]

4 **(a)** The ratio of an interior angle to an exterior angle of an n-sided regular polygon is 13 : 2. Find the value of n.

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

(b)



ABC, BCD and CDE are triangles.
BDE is a straight line and $CD = CE$.
Angle $ACB = 20°$, angle $CBD = 35°$ and angle $DCE = 50°$.
Reflex angle $BAC = 230°$.

Show that AB is parallel to CD.
Give a reason for all your statements.

Answer

[4]

[Turn Over

5 **(a)** Mr Ong drove 300 km from Town *A* to Town *B*.
He took 1.8 hours for the first 180 km.
For the remaining journey, he drove at an average speed of 75 km/h.
Find Mr Ong's average speed for the entire journey.

Answer ..... km/h [3]

(b) A hockey disc, which is cylindrical, has a radius of 7.6 cm and a height of 2.5 cm.
Find the total surface area of the disc.

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

6 Tina and Zoe each bought two handbags at a sale.

Grand Sales!!!

- 1st handbag at 30% discount
- 2nd handbag at 40% discount

Remark:
Price of the 2nd item should be equal to or lower than price of the 1st item

(a) Tina bought two handbags that were priced at \$95 and \$149 before discount.

How much did Tina pay for the handbags?

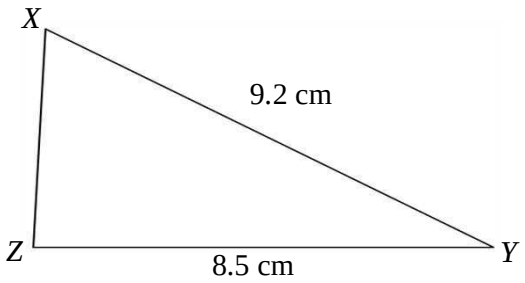
Answer \$ ..... [3]

(b) Zoe paid a total of \$184.20 for two handbags.
She paid \$25.80 less for the 2nd handbag than the 1st handbag.

Find the price of the 1st handbag before discount.

Answer \$ ..... [3]

7 **(a)**



In triangle XYZ, $XY = 9.2$ cm and $YZ = 8.5$ cm.
The area of triangle XYZ is 16.2 cm^2.

(i) Calculate the perpendicular height from X to YZ.

Answer ..... cm [2]

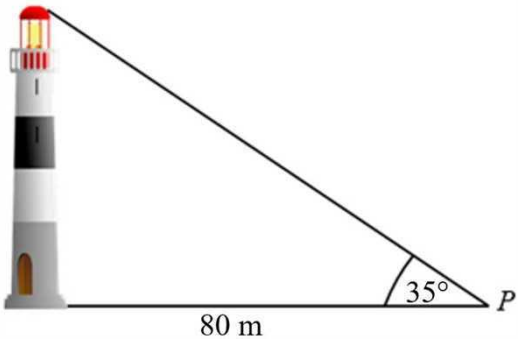
(ii) Determine whether triangle XYZ is a right-angled tringle.
Show your working to justify your answer.

Answer

[2]

(b) A man wants to determine the height of a lighthouse.
He stands at point P, which is 80 m away from the foot of the lighthouse.
He measures the angle from point P to the top of the lighthouse, which is 35°.

Find the height of the lighthouse.



Answer ..... m [2]

8 **(a)** Solve $5x^2 - 3x = 7$.
Give your answers correct to 2 decimal places.

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

(b) Solve the simultaneous equations.

$$2x - 6y = 31$$
$$x = 8 - 12y$$

Answer $x =$ .....

$y =$ ..... [3]

(c) At present, Amy is x years old.
Her father, Mr Pang, is currently three times as old as his daughter, Amy.
In 15 years, Mr Pang will be twice as old as Amy will be then.

Write down an equation in x and solve it to find Amy's present age.

Answer ..... years old [3]

9 The variables x and y are connected by the equation $y = 2x^3 - 6x + 1$.
Some corresponding values of x and y are given in the following table.

x	-2	-1	0	1	2	3
y	h	5	1	-3	k	37

(a) Calculate the value of h and of k.

Answer $h =$ ..... [1]

$k =$ ..... [1]

(b) On the grid on the next page, plot the graph of $y = 2x^3 - 6x + 1$ for $-2 \le x \le 3$. [3]

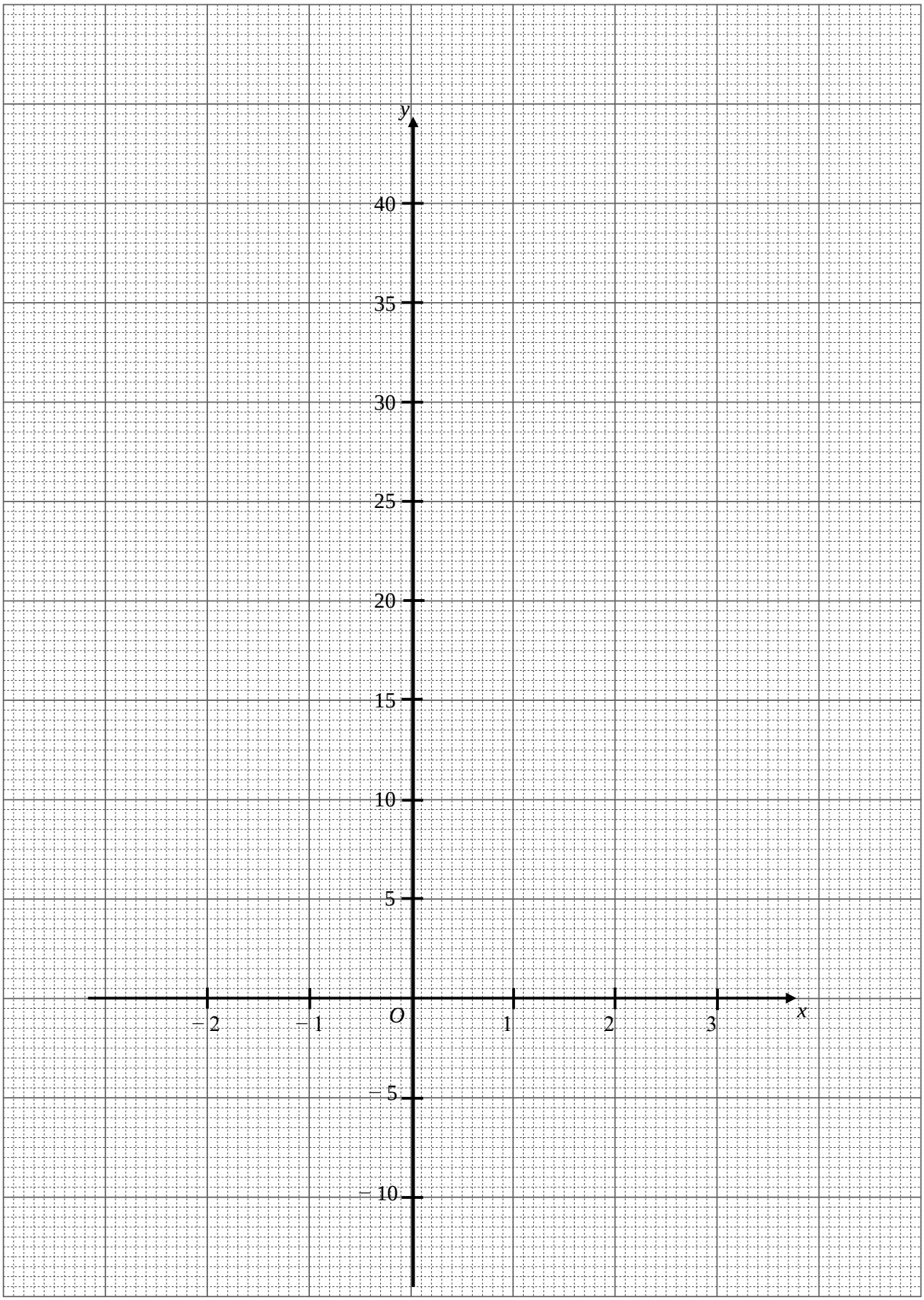
(c) On the same grid, draw a suitable tangent to find the gradient of the curve when $x = -0.5$.

Answer ..... [2]

(d) The line $y = m$ intersects the curve $y = 2x^3 - 6x + 1$ exactly at three points.

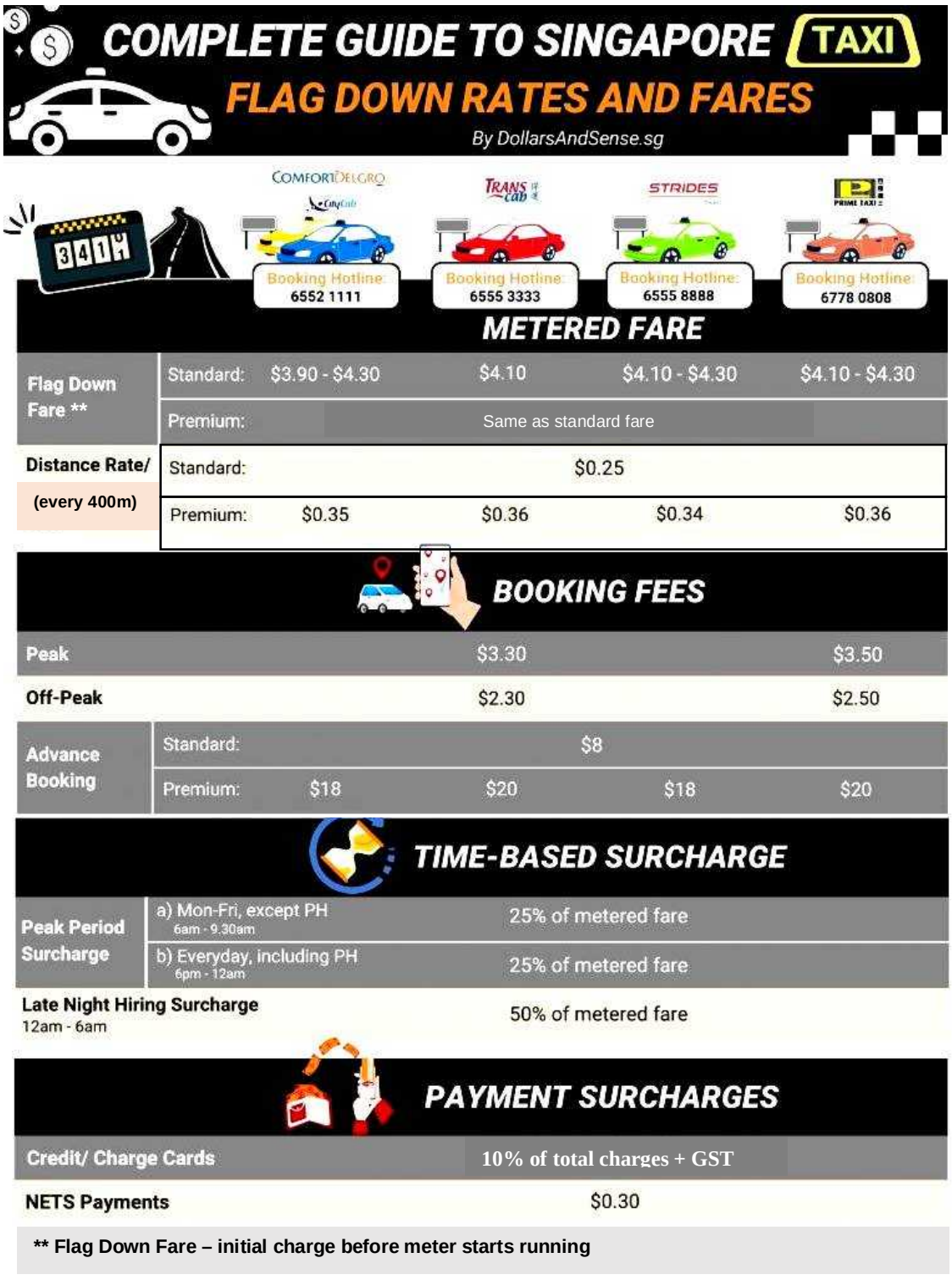
For $-2 \le x \le 3$, write down the range of values for m that will satisfy this condition.

Answer ..... $< m <$ ..... [2]



[Turn Over

10 The costs between different taxi companies in Singapore are listed in the diagram.



COMPLETE GUIDE TO SINGAPORE TAXI

FLAG DOWN RATES AND FARES

By DollarsAndSense.sg

		ComfortDelGro / CityCab	Trans Cab	Strides	Prime Taxi
		Booking Hotline: 6552 1111	Booking Hotline: 6555 3333	Booking Hotline: 6555 8888	Booking Hotline: 6778 0808
METERED FARE					
Flag Down Fare **	Standard:	$3.90 - $4.30	$4.10	$4.10 - $4.30	$4.10 - $4.30
	Premium:	Same as standard fare			
Distance Rate/ (every 400m)	Standard:	$0.25			
	Premium:	$0.35	$0.36	$0.34	$0.36
BOOKING FEES					
Peak		$3.30			$3.50
Off-Peak		$2.30			$2.50
Advance Booking	Standard:	$8			
	Premium:	$18	$20	$18	$20
TIME-BASED SURCHARGE					
Peak Period Surcharge	a) Mon-Fri, except PH 6am - 9.30am	25% of metered fare			
	b) Everyday, including PH 6pm - 12am	25% of metered fare			
Late Night Hiring Surcharge 12am - 6am		50% of metered fare			
PAYMENT SURCHARGES					
Credit/ Charge Cards		10% of total charges + GST			
NETS Payments		$0.30			

**** Flag Down Fare – initial charge before meter starts running**

Source: dollarsandsense.sg

10 **(a)** Maria is considering between the premium ComfortDelGro or the premium Strides to travel from her home to her office.

The distance from her home to her office is 12 km.

(i) Calculate the total metered fare for the two companies and determine which company would be a cheaper option.

Answer

[3]

(ii) Maria needs to book a taxi at 7.30am on a Monday.
Based on your answer to **part (a)(i)**, calculate how much total she needs to pay in cash.

Answer $ ..... [2]

(b) Maria's colleague, Sally, also intends to book a taxi to travel from her home to the office.
She calculated that the total charges for her taxi booking would be $25.40.
Sally intends to pay using a credit card.
The current GST rate is 9%. GST is paid in addition to the price of goods and services.

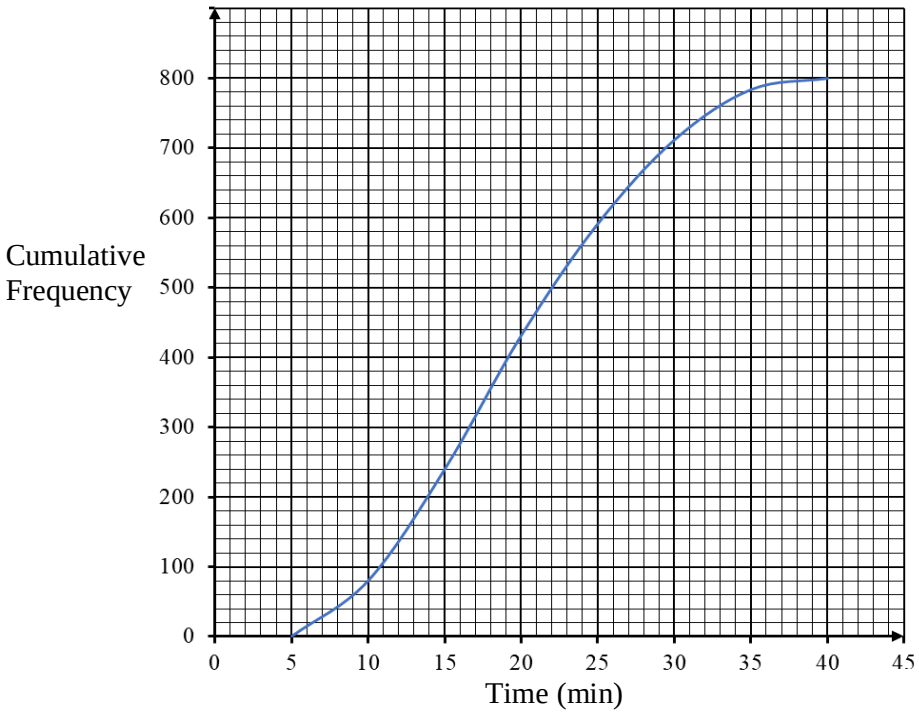
Calculate the total amount Sally has to pay to the taxi company using credit card payment.

Answer $ ..... [3]

Section B (8 marks)

Answer **one** question from this section. Each question carries 8 marks.

11 **(a)** The cumulative frequency curve shows the time taken for 800 students to travel to school by public transportation.



(i) Use the diagram to estimate the 80th percentile.

Answer ..... minutes [1]

(ii) Use the diagram to estimate the inter-quartile range.

Answer ..... [1]

(iii) Find the number of students who took more than 15 minutes.

Answer ..... [1]

11 (b) There are 15 ribbons in a box.
x ribbons are silver, and the rest of the ribbons are gold.

(i) Express the probability of drawing a gold ribbon, in terms of x.

Answer ..... [1]

(ii) Two ribbons are drawn at random **without** replacement.

Show that the probability of drawing the first ribbon is gold and the second ribbon is silver is $\frac{15x - x^2}{210}$.

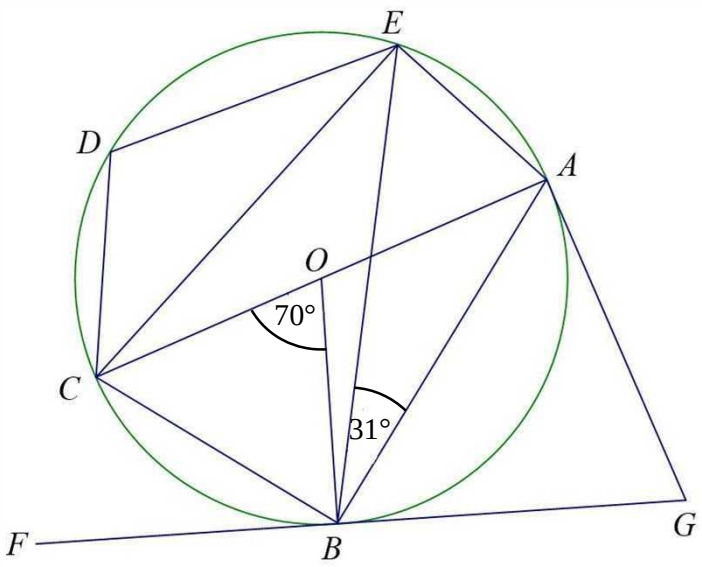
Answer

[2]

(iii) When two gold ribbons are drawn, it is found that the probability of drawing the second gold ribbon is $\frac{4}{7}$. Write down an equation in x and solve it to find x.

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

12 (a)



A, *B*, *C*, *D* and *E* are points on the circumference of the circle centre *O* and diameter *AC*.
FBG and *AG* are tangents to the circle.
Angle $BOC = 70°$ and angle $ABE = 31°$.

By clearly stating the reasons, find

(i) angle *BEC*,

Answer Angle *BEC* = ... [1]

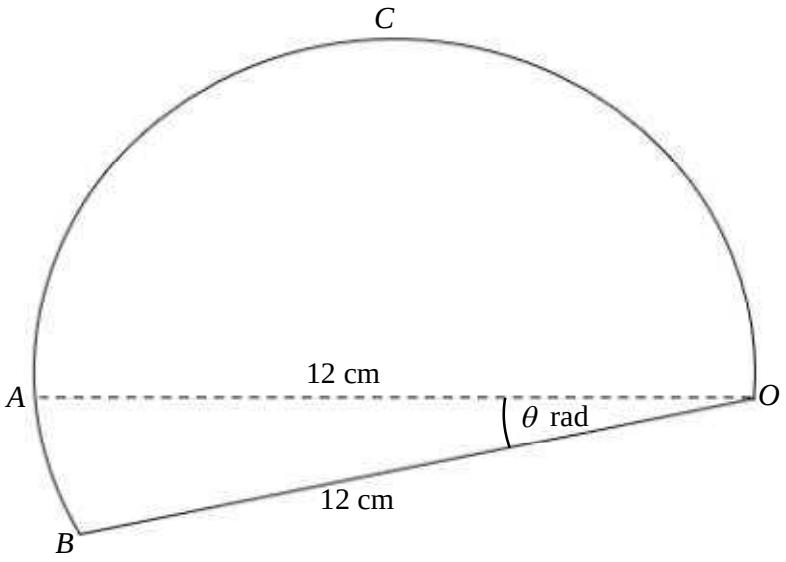
(ii) angle *ACE*,

Answer Angle *ACE* = ... [1]

(iii) angle *AGB*.

Answer Angle *AGB* = ... [2]

12 (b)



In the diagram, *OAB* is a sector of a circle with centre *O* and radius 12 cm.
Angle *BOA* is θ radians.
AOC is a semi-circle with diameter *AO*.
The area of the semi-circle *AOC* is thrice the area of the sector *OAB*.

(i) Find the area of sector *OAB*, in terms of π.

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

(ii) Show that θ = 0.262 radians, correct to 3 significant figures.

Answer

[2]

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SECONDARY 4 NORMAL (ACADEMIC) MARKING SCHEME
PRELIMINARY EXAMINATION 2024
ELEMENTARY MATHEMATICS

PAPER 2

SECTION A

Question	Answer	Marks	Guidance
1(a)(i)	42.1 million = 4 21 000 00 = 42 100 thousand	B1	
1(a)(ii)	0.005 187 62 $\approx$ 0.0052 (4 decimal places)	B1	
1(b)	$\frac{6.582\times0.891^2}{\sqrt{435.18}}$ $\approx\frac{7\times1^2}{\sqrt{400}}$ $=0.35$	M1 A1	
	Total	**4**	

Question	Answer	Marks	Guidance
2(a)	$7^a\times49=7^5$ $7^a\times7^2=7^5$ $\therefore a+2=5$ $a=3$	M1 A1	
2(b)	$\left(\frac{16}{x^4}\right)^{-\frac{3}{4}}$ $=\left(\frac{x^4}{16}\right)^{\frac{3}{4}}$ $=\left(\frac{x^4}{2^4}\right)^{\frac{3}{4}}$ $=\frac{x^3}{8}$	M1 A1	
	Total	**4**	

Question	Answer	Marks	Guidance
3(a)	$p = 40 - (3 + 7 + 12 + 8 + 5)$ $p = 5$	B1	
3(b)	p(more than 2) = $\frac{12+8+5}{40}$ = $\frac{25}{40}$ = 0.625	M1 A1	
3(c)	mean = $\frac{(0\times3)+(1\times7)+(2\times5)+(3\times12)+(4\times8)+(5\times5)}{40}$ = $\frac{110}{40}$ = 2.75	M1 A1	
	Total	**5**	

Question	Answer	Marks	Guidance
4(a)	15 units --- 180° 1 unit --- $\frac{180°}{15}$ = 12° 2 units (exterior angle) ---- $12°\times2$ = 24° $\therefore n = \frac{360°}{24°}$ = 15	M1 A1	

4(b)	angle $CDE = \frac{180^\circ - 50^\circ}{2}$ $= 65^\circ$ (isosceles triangle) angle $BAC = 360^\circ - 230^\circ$ $= 130^\circ$ (angles at a point) angle $ABC = 180^\circ - 130^\circ - 20^\circ$ $= 30^\circ$ (angles in sum of triangle) $\therefore$ angle $ABD = 35^\circ + 30^\circ$ $= 65^\circ$ Conclusion: Since angle $ABD = 65^\circ$ and angle $CDE = 65^\circ$, by corresponding angles, line AB is parallel to line CD.	M1 M1 M1 M1 A1	
	Total	**6**	

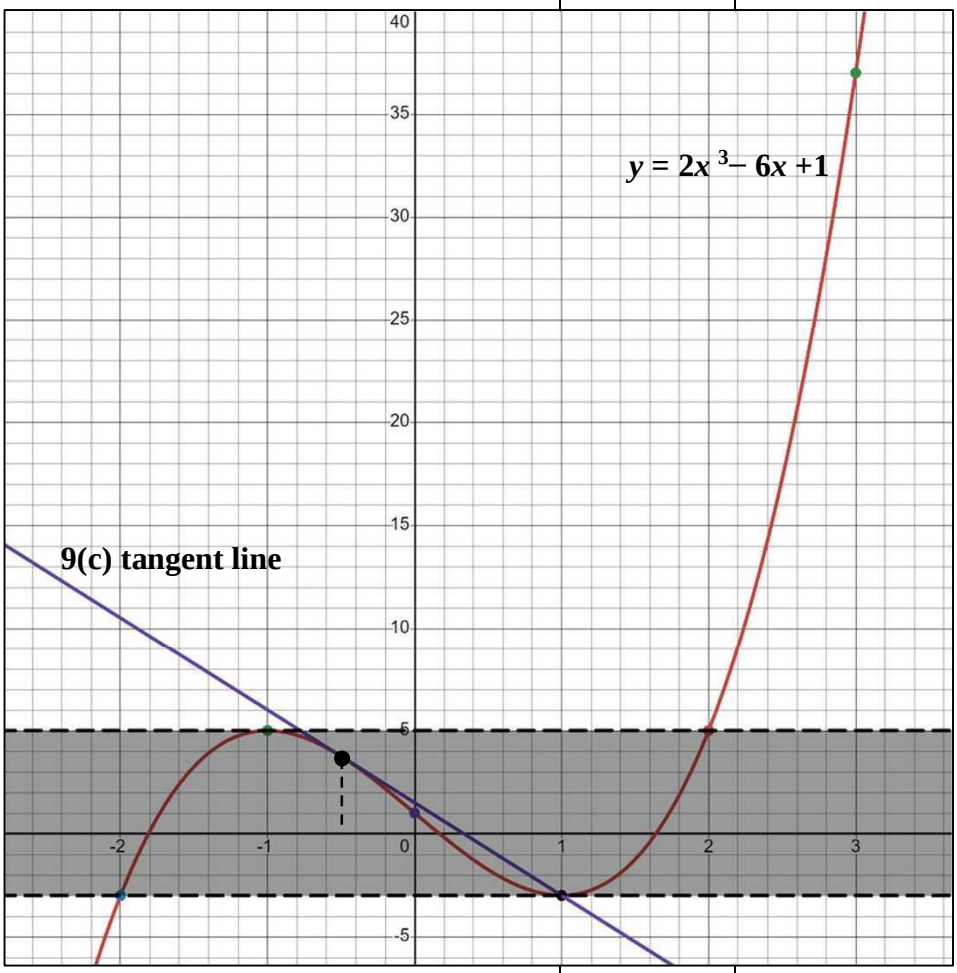
Question	Answer	Marks	Guidance
5(a)	For the first part of the journey, remaining distance = 300 - 180 = 120 km Time taken for remaining journey = $\frac{D}{s}$ $= \frac{120}{75}$ $= 1.6$ h Average speed for entire journey = $\frac{\text{Total Distance}}{\text{Total Time}}$ $= \frac{300}{1.8 + 1.6}$ $\approx$ 88. 23529412 $\approx$ 88.2 km/h (3 sig fig)	M1 M1 A1	Accept answer in fraction: $88\frac{4}{17}$ km/h

5(b)	Total surface area = $2\pi(7.6)(2.5) + 2\pi(7.6)^2$ = 482.2973042 ≈ 482 cm^2 (3 sig. fig)	M1 A1	
	Total	**5**	
Question	**Answer**	**Marks**	**Guidance**
6(a)	70% × \$149 = \$104.30 60% × \$95 = \$57 Total = \$104.3 + \$57 = \$ 161.30	M1 M1 A1	
6(b)	Let x be the price of the 1st handbag paid after discount. $x + (x - \$25.80) = \$184.20$ $2x = \$210$ $x = \$105$ 70% --- \$105 $100\% = \frac{\$105}{70} \times 100$ = \$150	 M1 M1 A1	
	Total	**6**	

Question	**Answer**	**Marks**	**Guidance**
7(a)(i)	$h = \frac{16.2}{\frac{1}{2} \times 8.5}$ $h = 3.811764706$ ≈ 3.81 (3 sig.fig)	M1 A1	
7(a)(ii)	If angle Z is a right-angle, then by PT, $XZ = \sqrt{9.2^2 - 8.5^2}$ $= 3.519943181$ ≈ 3.52 (3 sig.fig) Since length of XZ is not equal to 3.81 (answer in a(i)), XZ is not the perpendicular height from X to YZ. Thus, triangle XYZ is not a right-angled triangle.	 M1 A1	

7(b)	$\tan 35^\circ = \dfrac{\text{height}}{80}$ $\therefore$ height = $\tan 35^\circ \times 80$ $= 56.01660306$ ≈ 56.0 (3 sig.fig)	M1 A1	
	Total	**6**	

Question	**Answer**	**Marks**	**Guidance**
8(a)	$5x^2 - 3x = 7$ $5x^2 - 3x - 7 = 0$ $x = \dfrac{-(-3) \pm \sqrt{(-3)^2 - 4(5)(-7)}}{2(5)}$ $x = \dfrac{3 \pm \sqrt{149}}{10}$ $x = 1.520655562$ or $x = -0.920655616$ $x = 1.52$ or $x = -0.92$	 M1 M1 A1	
8(b)	$2x - 6y = 31y$ $2(8 - 12y) - 6y = 31$ $16 - 24y - 6y = 31$ $-30y = 15$ $y = -0.5$ when $y = -0.5$, $x = 8 - 12(-0.5)$ $x = 14$	 M1 A1 A1	
8(c)	Amy : x years old Mr Pang: $3x$ years old <u>15 years time</u> Amy: $x + 15$ Mr Pang: $3x + 15$ $3x + 15 = 2(x + 15)$ $3x + 15 = 2x + 30$ $x = 15$	 M1 M1 A1	
	Total	**9**	

Question	Answer	Marks	Guidance
9(a)	$h = -3$ $k = 5$	B1 B1	
9(b)	Plotting all the points correctly. Smooth curve. 	B2 B1	Award B1 for only at most 1 incorrect plotted point.
9(c)	Drawing the correct tangent at $x = -0.5$. Gradient = –4.5 (±1)	M1 A1	 Award A1 based on finding the gradient correctly with their own tangent
9(d)	$-3 < m < 5$ (see the shaded region above, where the horizontal line will cut exactly at 3 points)	B1, B1	B1 for correct min value B1 for correct max value
	Total	**9**	

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>10(a)(i)</td><td>
<table>
<tr><td></td><td>Comfort</td><td>Strides</td></tr>
<tr><td>Flag down fare (Premium)</td><td>$4.10

(take the average between $3.9-$4.3)</td><td>$4.20

(take the average between $4.1 to $4.3)</td></tr>
<tr><td rowspan="2">Distance Rate fare</td><td colspan="2">12 km = 12 000m
12 000 /400 = 30</td></tr>
<tr><td>$0.35 ×30
= $10.50</td><td>$0.34 ×30
= $10.20</td></tr>
<tr><td>Metered Fare</td><td>$4.10 + $10.5
= <u>$14.60</u></td><td>$4.20 + $10.20
= <u>$14.40</u></td></tr>
</table>
Hence, Strides is a cheaper option as compared to ComfortDelGro by $0.20.</td><td>M1

M1

A1</td><td>Award M1 for taking the maximum value/minimum value as the flag-down fare (instead of taking average)

Award M1 for metered fare based on the chosen flag down fare

A1 for writing down the conclusion statement</td></tr>
<tr><td>10(a)(i)</td><td>
<table>
<tr><td>Booking Fee</td><td>$3.30</td></tr>
<tr><td>Timed Based Surcharge</td><td>25% × $14.40

= $3.60</td></tr>
<tr><td>Total metered fare (MF + BF + TBS)</td><td>$14.40 + $3.30 + $3.60

= $21.30</td></tr>
</table></td><td>M1

A1</td><td></td></tr>
<tr><td>10(b)</td><td>10% × $25.40
= $2.54

9% GST = 9% × ($25.40 + $2.54)
= $2.5146

Payment surcharges = $2.54 + $2.5146
= $5.0546

Total payment = $25.40 + $5.0546
= $30. 4546 (≈ $30.45)</td><td>M1

M1

A1</td><td></td></tr>
<tr><td colspan="2">Total</td><td>8</td><td></td></tr>
</table>

SECTION B

Question	Answer	Marks	Guidance
11(a)(i)	27 min	B1	
11(a)(ii)	LQ (200) = 14 min UQ (600) ≈ 25.5 min IQR = 25.5 – 14 = 11.5 min	 B1	 No marks for UQ to be exact at 25. Award B1 for their estimated UQ in the following range: $25 < \text{UQ} \leq 25.5$.
11(a)(iii)	800 – 240 = 560	 B1	
11(b)(i)	$\frac{15-x}{15}$	B1	
11(b)(ii)	$\frac{15-x}{15} \times \frac{x}{15-1}$ $= \frac{(15-x)(x)}{210}$ $= \frac{15x-x^2}{210}$	M1 A1	
11(b)(iii)	P(first ribbon gold) = $\frac{15-x}{15}$ P(second ribbon gold) = $\frac{15-x-1}{15-1}$ $= \frac{14-x}{14}$ $\therefore \frac{14-x}{14} = \frac{4}{7}$ $\Rightarrow 14-x=8$ $\Rightarrow x=6$		
	Total	**8**	

SECTION B

Question	Answer	Marks	Guidance
12(a)(i)	angle $BEC = \frac{70^\circ}{2}$ $= 35^\circ$ (angle at centre = $2 \times$ angle at circumference)	B1	
12(a)(ii)	angle $ACE = 31^\circ$ (angle in same segment)	B1	
12(a)(iii)	angle $BOA = 180^\circ - 70^\circ$ $= 110^\circ$ (adjacent angles on a straight line) $\therefore$ angle $AGB = 360^\circ - 110^\circ - 90^\circ - 90^\circ$ $= 70^\circ$ (2 external tangents from a point)	M1 A1	
12(b)i)	area of semi-circle = $\frac{1}{2}\pi(6)^2$ $= 18\pi$ cm^2 area sector = $\frac{18\pi}{3}$ $= 6\pi$ cm^2	M1 A1	
12(b)ii)	$\frac{1}{2}(12)^2\theta = 6\pi$ $72\theta = 6\pi$ $\theta \approx 0.2617993878$ ≈ 0.262 (3 sig.fig)	M1 A1	
	Total	**8**	