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]

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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]

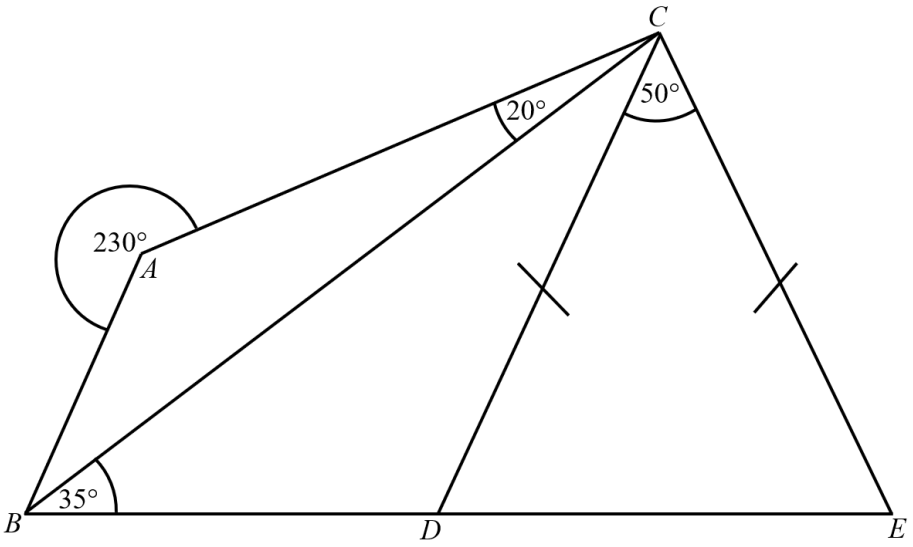
(c) Calculate the mean.

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?

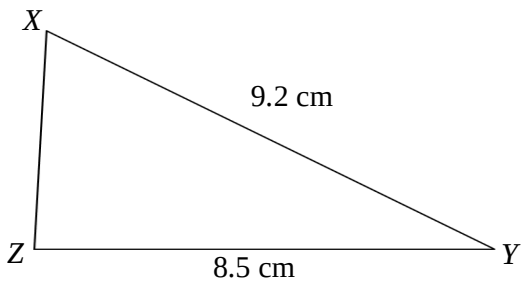
Answer \$ ..... [3]

(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]

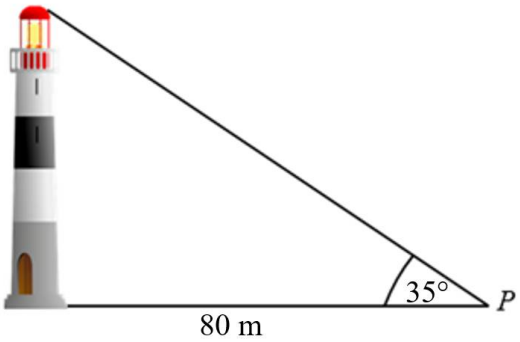
(ii) Determine whether triangle XYZ is a right-angled tringle.
Show your working to justify your answer.

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]

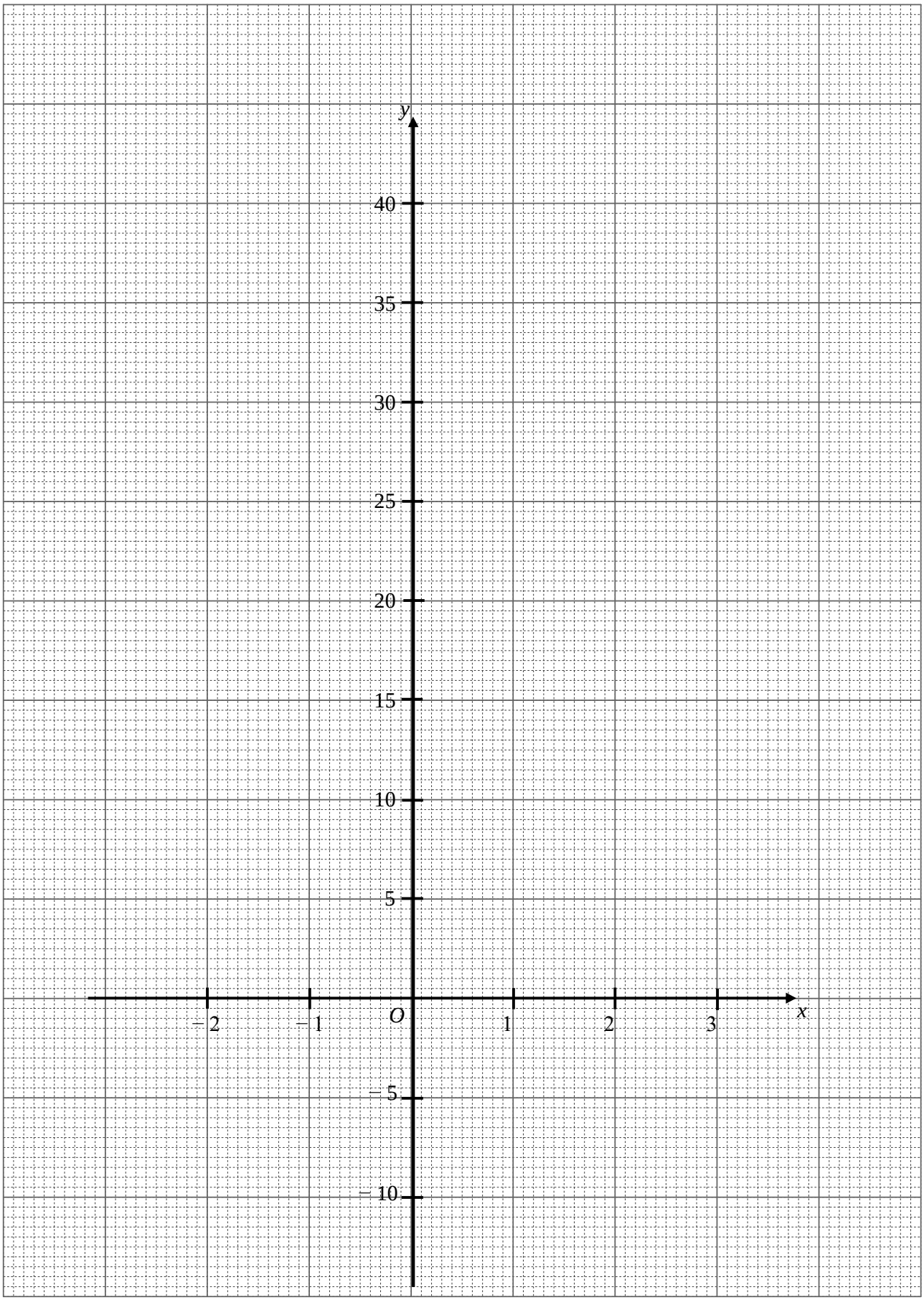
(c) On the same grid, draw a suitable tangent to find the gradient of the curve when $x = -0.5$.

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]



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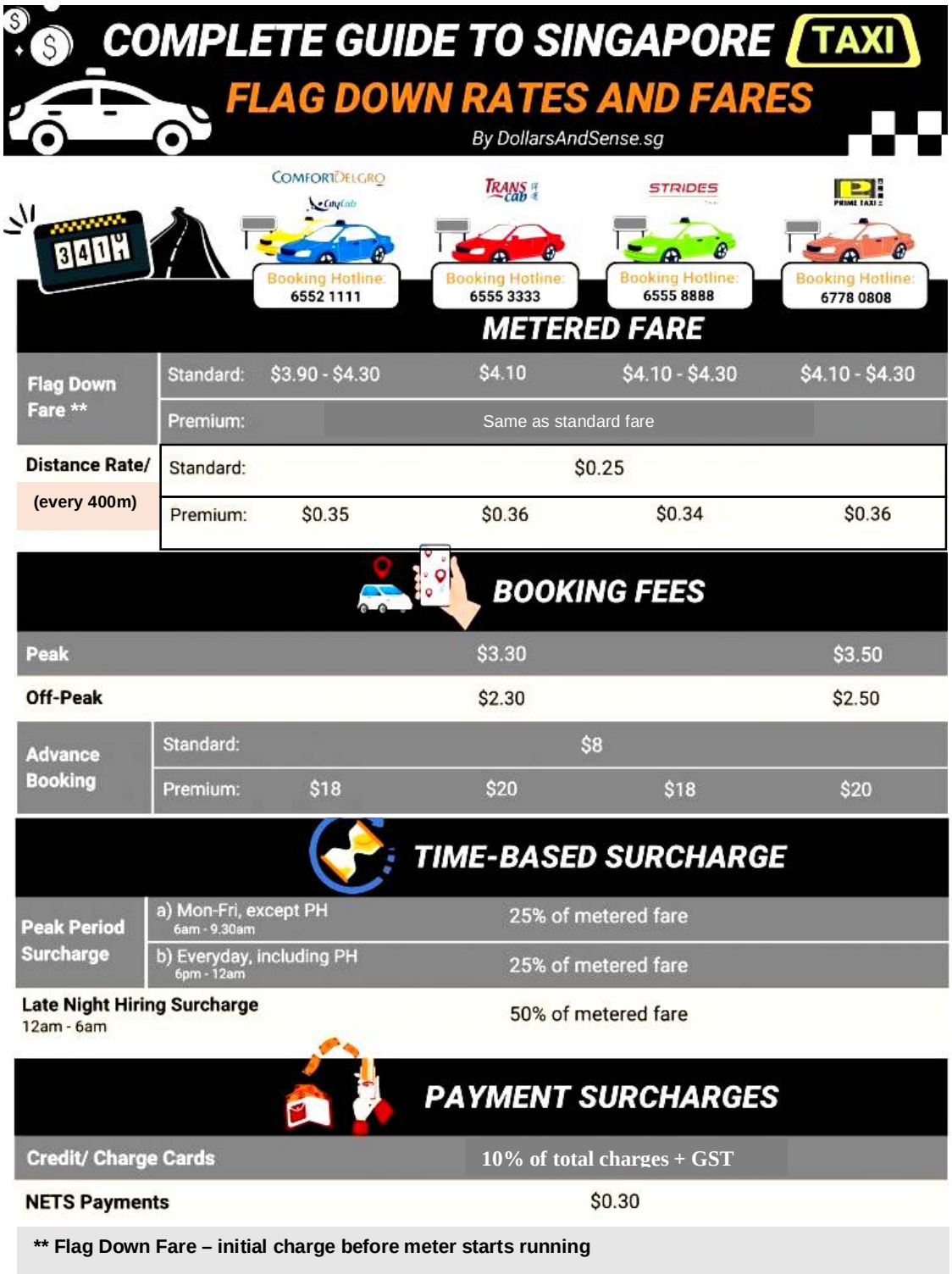
10 The costs between different taxi companies in Singapore are listed in the diagram.



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.

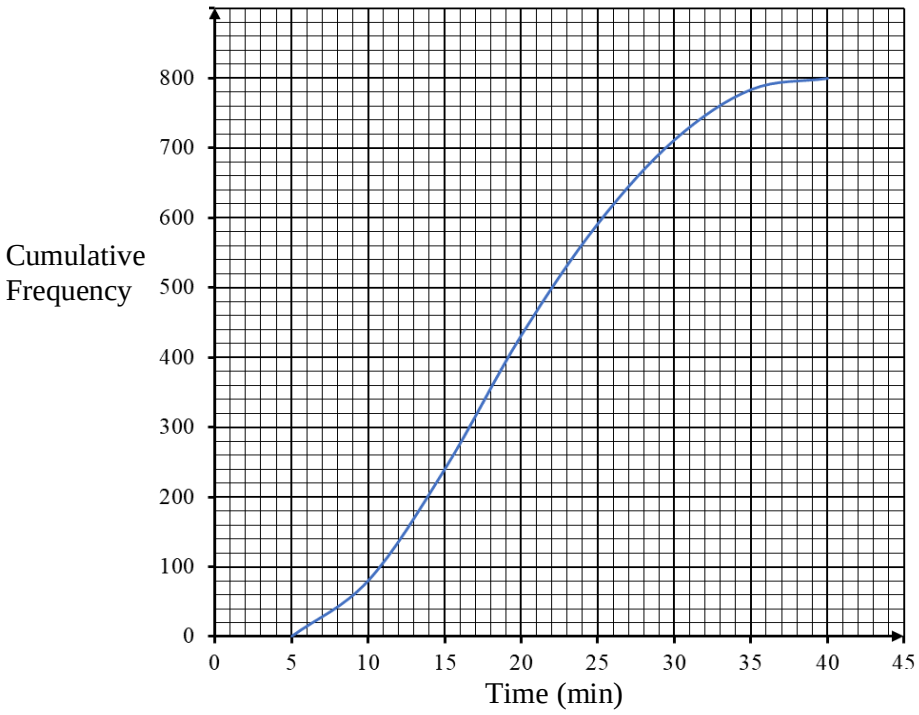
Calculate the total amount Sally has to pay to the taxi company using credit card payment.

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 $\frac{15x - x^2}{210}$.

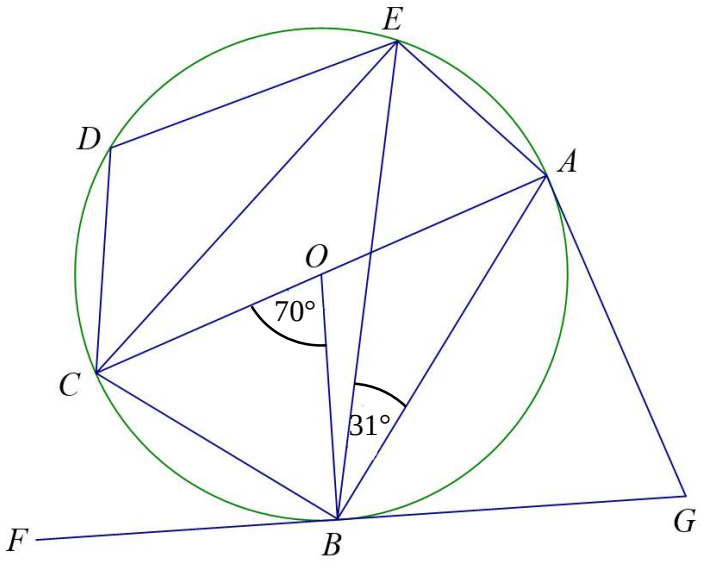
Answer

[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]

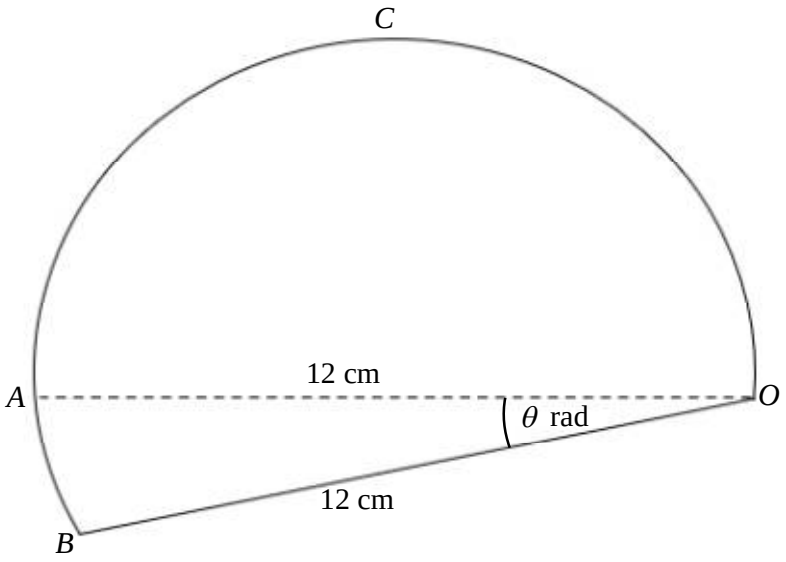
(ii) angle ACE,

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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