



AHMAD IBRAHIM SECONDARY SCHOOL
GCE N-LEVEL PRELIMINARY EXAMINATION 2024

SECONDARY 4 NORMAL (ACADEMIC)

Name:	Class:	Register No.:
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MATHEMATICS SYLLABUS A

Paper 1

4045/01
30 July 2024
2 hours

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number 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.

Answer **all** 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.

For Examiner's Use

/ 70

Mathematical Formulae*Compound Interest*

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

[Turn Over]

Answer **all** the questions.

- 1 Calculate $\frac{\sqrt{4.9} + 2}{5.8^{0.7} - 3}$, leaving your answer to 4 significant figures.

Answer [1]

- 2 Write these numbers in order of size, starting with the smallest.

$$\frac{21}{50}, 0.25^{\frac{2}{3}}, 0.412, \sqrt{0.16}, 39\%$$

Answer , , , , [2]

- 3 Find the largest integer satisfying $3x < -22.5$.

Answer [2]

- 4 (a) Steven makes a candy salad.

He uses gummy bears, candy corn and jellybeans in the ratio 7 : 3 : 5 respectively.

He uses 1.4 kg of jellybeans.

How much gummy bears does he use?

Answer kg [1]

- (b) Irene makes a candy salad using fruit pastilles, mints and liquorice.

The ratio of fruit pastilles : mints is 2 : 3.

The ratio of mints : liquorice is 4 : 9.

Find the ratio of fruit pastilles : mints : liquorice.

Answer : : [1]

- 5 y is inversely proportional to the square of x .

Given that $y = 15$ when $x = 3$, find y when $x = 5$.

Answer [2]

[Turn Over]

6 Simplify

(a) $8x^2 \times 3x^4$,

Answer [1]

(b) $(27y^6)^{\frac{2}{3}}$

Answer [1]

7 Given that $2^{-a} \times \frac{1}{8} = 32$, find a .

Answer [2]

- 8 Daniel has a bag of marbles.

$\frac{3}{10}$ of the marbles are red.

40% of the remaining marbles are orange.

The other 21 marbles are yellow.

How many marbles are there in the bag?

Answer [2]

- 9 The graphs of $y = x - 5$ and $3x + 4y = 29$ meet at point P .

Find the coordinates of point P .

Answer (.....,) [3]

[Turn Over]

10 Solve $5(x - 4) = 6 - (2 - x)$.

Answer $x = \dots\dots\dots$ [2]

11 Simplify $\frac{4y^2 - 1}{6y^2 - 13y + 5}$.

Answer $\dots\dots\dots$ [3]

12 The scale of a map is given as 1 : 50 000.

(a) A road on the map is 19 cm long.

Find the actual length of the road in kilometres.

Answer km [1]

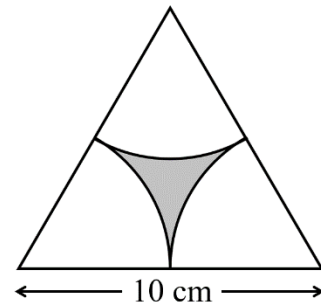
(b) A farm has an area of 35 km².

Find the area of the farm on the map in square centimetres.

Answer cm² [2]

[Turn Over]

- 13** The diagram shows an equilateral triangle of side 10 cm and three identical sectors. Calculate the shaded area.



Answer cm^2 [3]

-
- 14** Bhutia invested \$5000 in an account paying compound interest at $r\%$ per year. After 3 years, she earned an interest of \$800. Calculate the value of r .

Answer [3]

15 The expression $x^2 - 18x + 19$ can be written in the form $(x - 9)^2 + n$.

(a) Find the value of n .

Answer $n = \dots\dots\dots$ [1]

(b) Hence solve $x^2 - 18x + 19 = 0$.

Answer $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]

16 $a = \frac{13bc + 1}{2b + c}$

(a) Calculate a when $b = 1.5$ and $c = -1.2$.

Answer $a = \dots\dots\dots$ [1]

(b) Rearrange the equation to make b the subject.

Answer $b = \dots\dots\dots$ [2]

[Turn Over]

- 17 Solve $\frac{2}{x+7} - \frac{1}{x} = 5$, giving your answer correct to 2 decimal places.

Answer $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [4]

18 The first five terms of a sequence are 4, 7, 10, 13, 16.

(a) Find an expression, in terms of n , for the n th term of the sequence.

Answer [1]

(b) Find the 15th term of the sequence.

Answer [1]

(c) Chye Joo says that 547 is a term in this sequence.

Is he correct? Explain your answer.

Answer

[1]

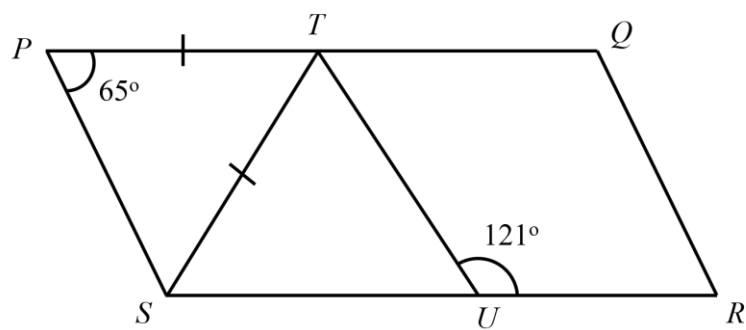
(d) The first five terms of another sequence are 5, 11, 19, 29, 41.

Using **part (b)**, deduce the expression, in terms of n , for the n th term of the sequence.

Answer [1]

[Turn Over]

- 19 The diagram shows a parallelogram $PQRS$.



$PT = ST$, angle $SPT = 65^\circ$, and angle $TUR = 121^\circ$.

Find

- (a) reflex angle PSU ,

Answer $^\circ$ [2]

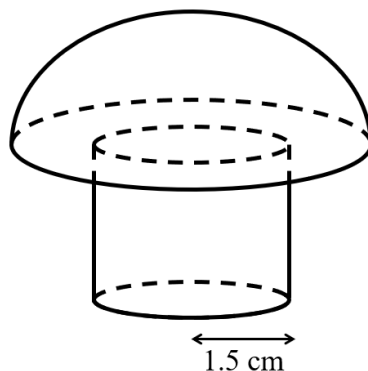
- (b) angle PTU ,

Answer $^\circ$ [1]

- (c) angle STU .

Answer [2]

- 20** A model of a mushroom is made using a solid hemisphere and a solid cylinder. The solid hemisphere has a volume of 170 cm^3 . The solid cylinder has a radius 1.5 cm .



- (a)** Calculate the radius of the hemisphere.

Answer cm [2]

- (b)** The total volume of the model is 190 cm^3 . Calculate the height of the cylinder.

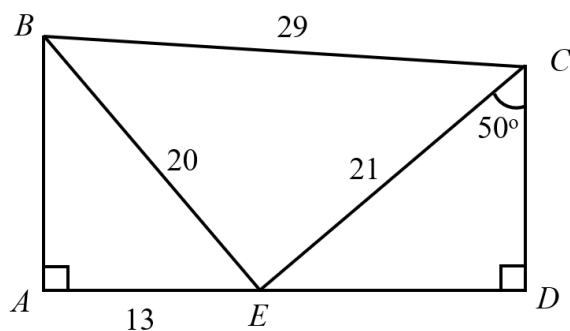
Answer cm [2]

[Turn Over]

- (c) Calculate the total surface area of the model.

Answer cm^2 [3]

- 21 In the diagram, $AE = 13$ m, $BC = 29$ m, $BE = 20$ m, $CE = 21$ m and angle $DCE = 50^\circ$.



- (a) Find the length of AB .

Answer m [2]

- (b) Prove that triangle BCE is a right-angled triangle.

Answer

[2]

- (c) Calculate angle CBE .

Answer $^\circ$ [2]

- (d) Find CD .

Answer m [2]

[Turn Over]

- 22 Wai Yean recorded the eye colour and gender of 75 students.

The results are shown in the table below.

	Brown	Black	Blue	Total
Male		17		
Female	13	18		38
Total	25	35	15	75

- (a) Complete the table. [2]

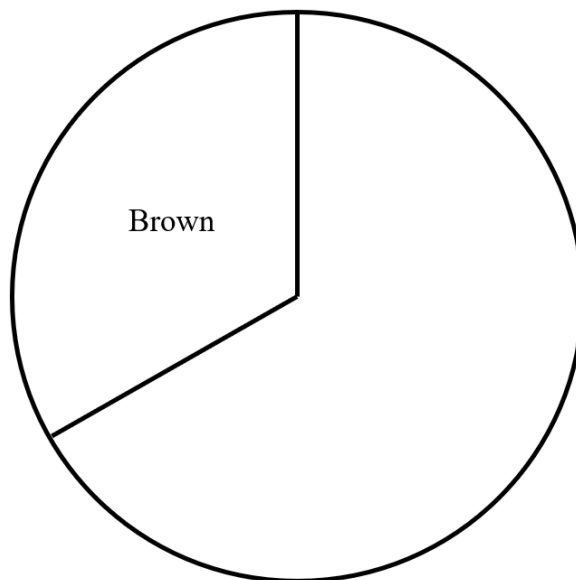
Wai Yean displays his results for each eye colour in a pie chart.

The sector angle for brown eyes 120° .

- (b) Calculate the angle sector for black eyes.

Answer $^\circ$ [1]

- (c) Complete the pie chart.



[1]

End of Paper

Setter: Miss Melody Ho



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GCE N-LEVEL PRELIMINARY EXAMINATION 2024

SECONDARY 4 NORMAL (ACADEMIC)

Name:	Class:	Register No.:
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MATHEMATICS SYLLABUS A

Paper 2

4045/02

31 July 2024

2 hours

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Section A

Answer **all** questions.

Section B

Answer **one** question.

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Section A (62 marks)

Answer **all** the questions in this section.

- 1 (a) By rounding the numbers to 1 significant figure, estimate the value of

$$\frac{82.98 \times \sqrt{8.93}}{4.45}.$$

You must show your working.

Answer [2]

- (b) The number of coronavirus cases as of June 2022 in Singapore is 1 397 074.

The total number of coronavirus cases in the world is 548 million.

Calculate the percentage of coronavirus cases in Singapore compared to the cases in the world.

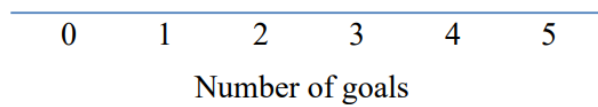
Give your answer in standard form.

Answer [2]

- 2 The table shows the number of goals scored in 20 soccer matches.

2	1	1	3	4
1	4	0	1	5
4	3	1	0	2
5	2	1	3	3

- (a) Represent the information by completing the dot diagram below.



[2]

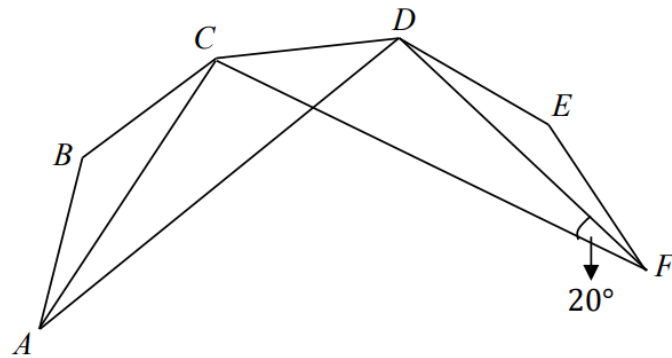
- (b) State the median number of goals.

Answer [1]

- (c) What is the probability of the soccer match ending with a single goal?

Answer [1]

3



$ABCDEF\dots$ represents part of a regular 15-sided polygon.

- (a) Calculate angle ABC .

Answer $^{\circ}$ [2]

- (b) Given that triangle ACD is congruent to triangle FDC and angle $CFD = 20^{\circ}$, calculate angle ADC .

Answer $^{\circ}$ [3]

-
- 4 (a) Find 240 as a product of its prime factors.

Answer [1]

- (b) Find the smallest positive integer value of a such that $240a$ is a perfect square.

Answer [1]

- (c) Green pens are sold in packets of 240.
Black pens are sold in packets of 210.
Amy wants to buy the same number of green and black pens.

What is the smallest number of packets of each type of pens she could buy?

Answer Green :
Black : [3]

5 A car costs \$22 500.

Andy bought a car at a 10% discount.

(a) He intends to sell it for a cash price of \$28 888.

Calculate his percentage profit.

Answer% [2]

(b) Andy has two interested buyers, Mary and Jane.

Mary offers to pay a deposit of 20% of the cash price and 58 monthly instalments of \$510 each. Jane offers to pay a deposit of 15% and 60 monthly instalments of \$520.

Which buyer should Andy sell it to? Explain your answer. [3]

Answer

6 The coordinates of points A and B are $(2, 5)$ and $(5, 9)$ respectively.

(a) Calculate the length of the line segment AB .

Answer [2]

(b) Find the equation of the line AB .

Answer [2]

(c) The point C lies on AB produced.

Given that $AB = BC$, find the coordinates of point C .

Answer (.....,) [2]

7 (a) Factorise

(i) $3uv + 2v - 12u - 8$,

Answer [2]

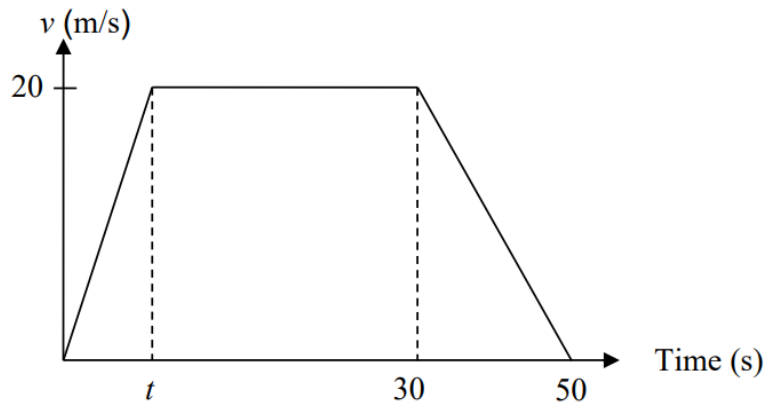
(ii) $2x^2 - 11x + 5$.

Answer [2]

(b) Simplify $\frac{9x^3}{4} \div \frac{3x^2}{8}$.

Answer [2]

8



The diagram shows the speed-time graph of a car.

The car travelled with an acceleration of 2.5 m/s^2 to reach a speed of 20 m/s in the first t seconds.

Find

(a) the value of t ,

Answer [1]

(b) the speed of the car at 36 seconds,

Answer m/s [2]

(c) the total distance travelled.

Answer m [2]

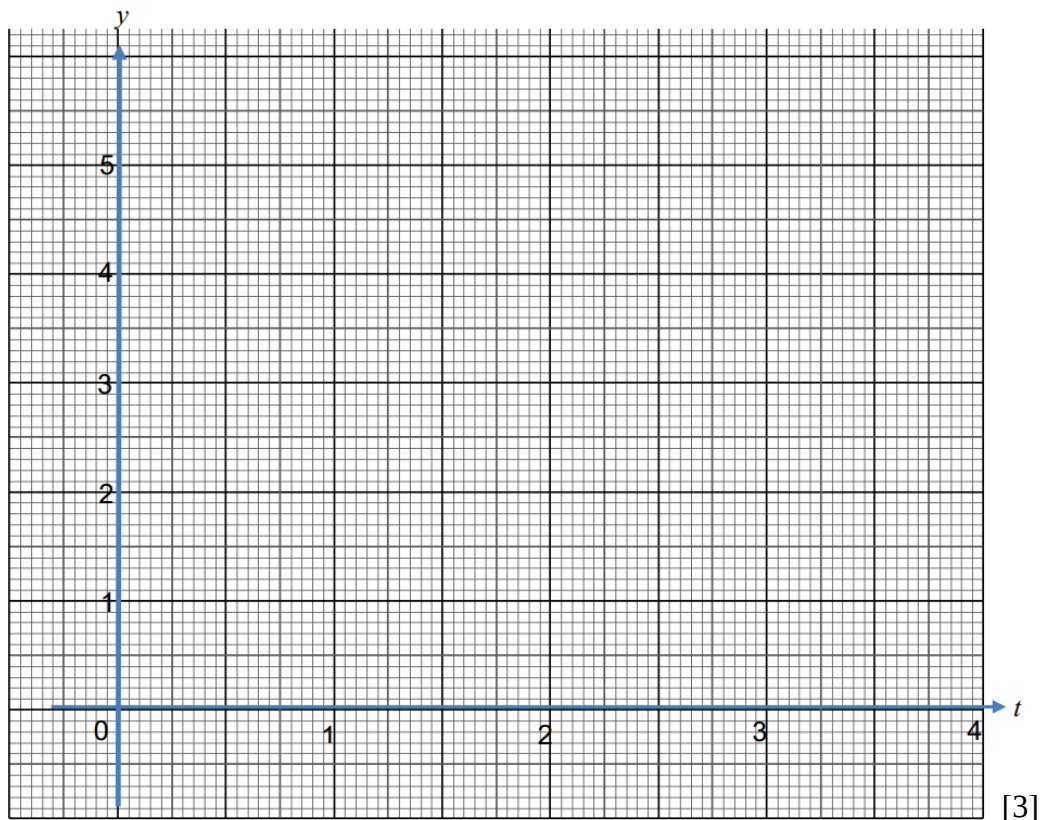
- 9 The size of a cell, $y \text{ mm}^3$, is given by $y = t + \frac{1}{2t} - 1$, where t is the time in seconds.

t	0.1	0.3	0.5	0.8	1	2	3	4
y	4.1	1.0	0.5	0.4	0.5	1.3	p	3.1

- (a) Calculate the value of p .

Answer [1]

- (b) Draw the graph of $y = t + \frac{1}{2t} - 1$ for $0.1 \leq t \leq 4$.



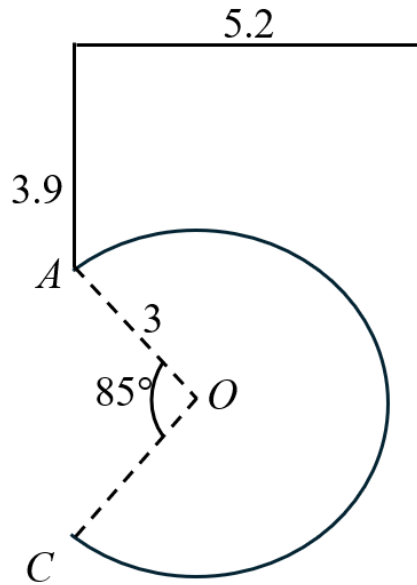
- (c) Use your graph to find the values of t when $y = 2$.

Answer $t = \dots\dots\dots$ [2]

- (d) By drawing a tangent, find the gradient of the curve at $t = 0.3$.

Answer [2]

10



A thin piece of wire is bent into a figure '5' shape as shown.

The shape has two straight sections of length 5.2 cm and 3.9 cm.

The curved part is the major arc of a circle, centre O and radius 3 cm.

The minor arc of the same circle subtends an angle of 85° at the centre.

Find

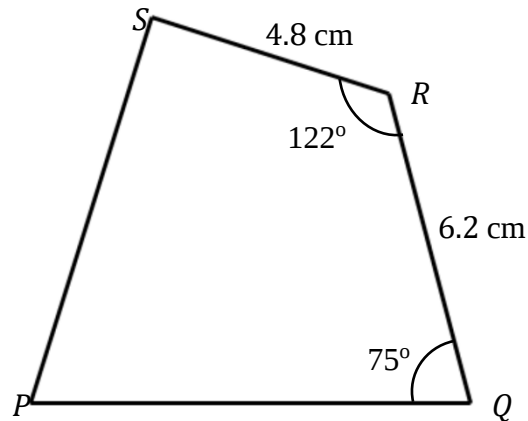
- (a) the reflex angle AOC ,

Answer $^\circ$ [1]

- (b) the total length of the wire needed to make the figure '5'.

Answer cm [2]

- 11 The diagram shows the sketch of a quadrilateral $PQRS$.



- (a) Construct the quadrilateral accurately.
The side PQ has been drawn for you.

P _____ Q [2]

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

- (c) X is a point where the perpendicular bisector of PS crosses QR .
Measure QX .

Answer cm [1]

- 12 This year, 10 blocks in Woodlands Drive were declared as a moderate-risk dengue cluster. A total of 50 people had been infected with dengue fever.

Table 10.1 shows the distribution of dengue cases among the 10 blocks.

Block	520	521	522	523	524	525	526	527	528	529
No of cases	4	3	3	23	9	1	1	3	1	2

Table 10.1

- (a) Calculate the mean number of dengue cases per block.

Answer [1]

- (b) Explain why the mean calculated in (a) is not a good representation of the central tendency of the dengue cases in the Woodlands Drive cluster.

Suggest another method to better represent the central tendency of dengue cases per block in the Woodlands Drive cluster.

Answer

 [2]

- (c) Table 10.2 shows the number of homes with mosquito breeding habitats in each block.

Block	520	521	522	523	524	525	526	527	528	529
No of cases	2	1	1	8	5	0	0	2	0	1

Table 10.2

To contain the dengue outbreak in the Woodlands Drive cluster, the National Environment Agency (NEA) has decided to engage the services of Pestbusters, an external pest control company.

Table 10.3 shows the works that need to be carried out.

- Fogging of all blocks with 5 or more breeding habitats
- Larvicide treatment of all homes with breeding habitats
- Installation of external mosquito traps at the stairwells of blocks with 5 or more breeding habitats.

Table 10.3

Table 10.4 shows the quantities of the items required to carry out the works.

ITEM	QUANTITY REQUIRED	COSTS
Fogging Chemical	10 units per block	\$38 per unit or \$220 per carton of 6 units
Larvicide Chemical	1 unit for every 5 homes	\$18 per unit or \$50 per pack of 3 units
External mosquito trap	5 units per block	\$75 per unit
Labour	3 man-hours per block for fogging and 0.5 hours per home for larvicide treatment	\$40 per man-hour

Table 10.4

The Sales Manager of Pestbusters gave NEA a quotation of \$2 500 for the services.

Do you think it is a reasonable quotation?

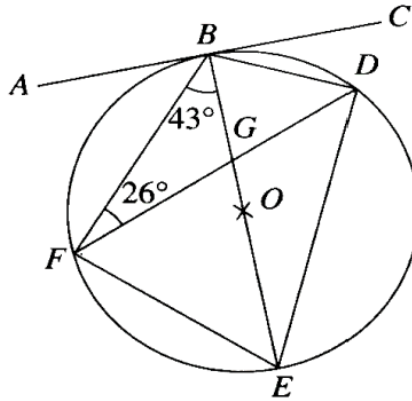
Justify your answer with working.

[4]

Section B (8 marks)

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

13



In the figure, O is the centre of the circle.

Angle $BFD = 26^\circ$, angle $FBE = 43^\circ$ and ABC is a tangent to the circle at B .

(a) Find, giving reasons for each answer,

(i) angle GDE ,

Answer $^\circ$ [1]

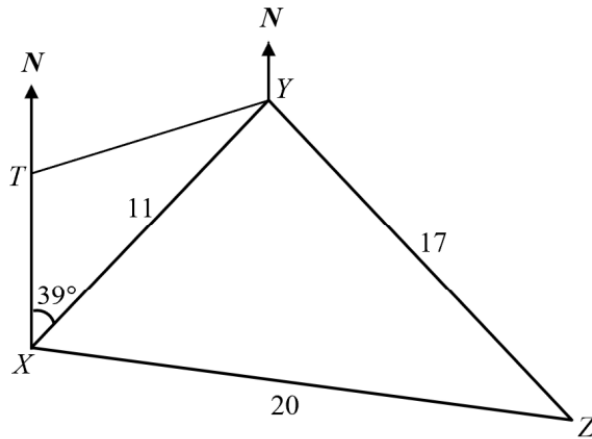
(ii) angle BDG ,

Answer $^\circ$ [2]

(iii) angle ABF .

Answer $^\circ$ [1]

(b)



A ship sails from X to Y to Z and then back to X again.

$XY = 11$ km, $YZ = 17$ km and $XZ = 20$ km.

The bearing of Y from X is 039° .

(i) Calculate angle YXZ ,

Answer $^\circ$ [2]

(ii) The ship then sails North to the point T from X , where the bearing of T from Y is 253° .

Find the distance of TY .

Answer km [2]

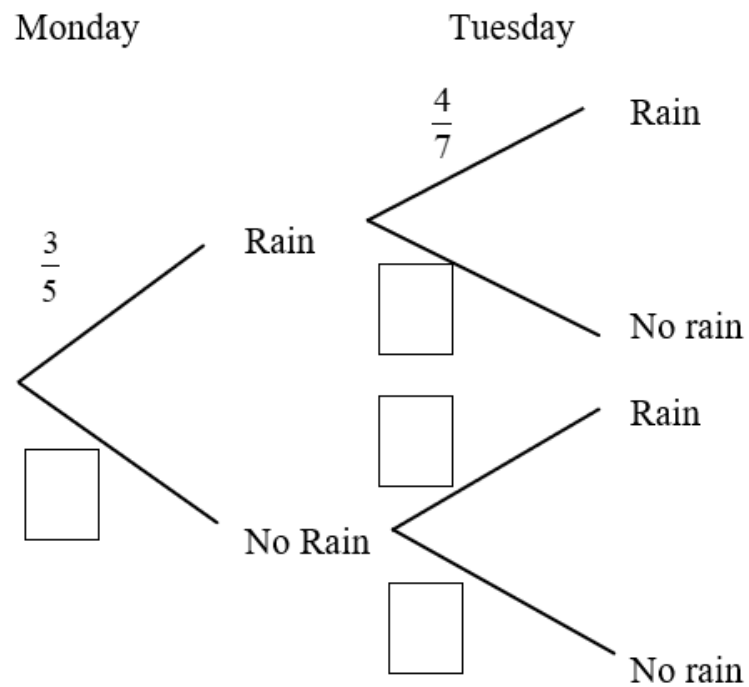
- 14 (a) Sue makes reports for weather forecast for Mondays and Tuesdays.

The probability that it will rain on Monday is $\frac{3}{5}$.

If it rains on Monday, the probability that it rains on Tuesday is $\frac{4}{7}$.

If it does not rain on Monday, the probability that it rains on Tuesday is $\frac{5}{7}$.

- (i) Complete the tree diagram.

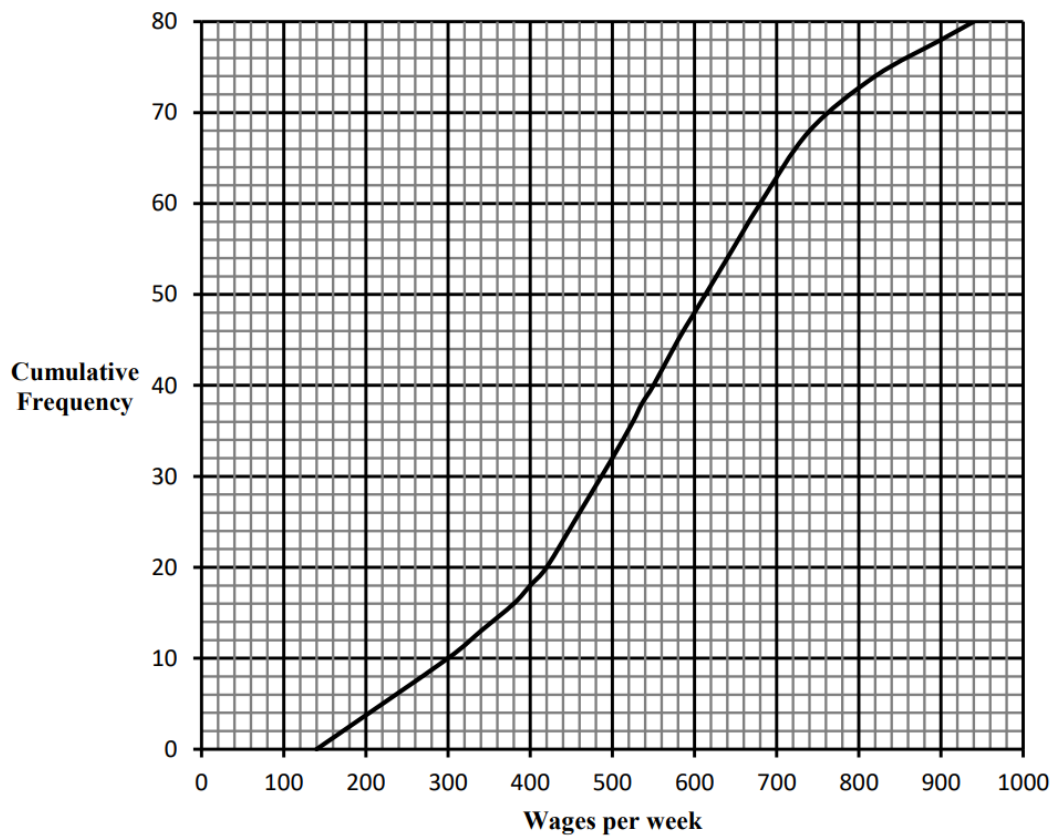


[2]

- (ii) Find the probability that it will rain on only one of the days.

Answer [2]

- (b) Alex recorded the wages per week of 80 workers in a factory.



Use the graph to find

- (i) the median wage,

Answer \$ [1]

- (ii) the interquartile range,

Answer \$ [2]

- (iii) the number of workers who earn more than \$460 a week.

Answer workers [1]

End of Paper

Setter: Mdm Noor Azizah

AISS 2024 Sec 4NA Prelim Math Marking Scheme

Qn		Working	Mark Awarded	Sub-total	Remarks
1		9.962571767 $= 9.963$ (to 4 s.f.)	B1	1	
2		39% , $0.25^{\frac{2}{3}}$, $\sqrt{0.16}$, 0.412 , $\frac{21}{50}$	B2	2	B1 if order is correct if one of the terms is covered.
3		$x < -7.5$ $x = -8$	M1 A1	2	
4	(a)	5 units $\rightarrow$ 1.4 kg 1 unit $\rightarrow$ 0.28 kg 7 units $\rightarrow$ 1.96 kg	B1	1	
	(b)	$2 : 3 = 8 : 12$ $4 : 9 = 12 : 27$ $8 : 12 : 27$	 B1	 1	No marks if ratio is not simplified.
5		$y = \frac{k}{x^2}$ When $x = 3$, $y = 15$. $15 = \frac{k}{3^2}$ $k = 15(3^2)$ $k = 135$ $y = \frac{135}{x^2}$ When $x = 5$, $y = \frac{135}{5^2}$ $y = 5.4$	M1 A1	 2	M1 for finding k .
6	(a)	$24x^6$	B1	1	
	(b)	$9y^4$	B1	1	

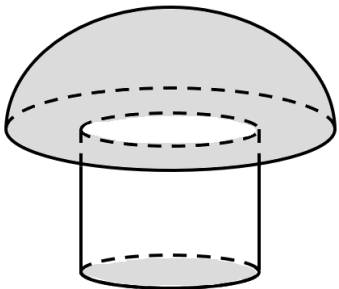
Qn		Working	Mark Awarded	Sub-total	Remarks
7		$2^{-a} \times \frac{1}{8} = 32$ $2^{-a} \times 2^{-3} = 32$ $2^{-a-3} = 2^5$ $-a - 3 = 5$ $-3 - 5 = a$ $a = -8$	M1 A1	2	M1 for 2^{-3} and 2^5 .
8		$60\% \times \frac{7}{10} = \frac{21}{50}$ 21 units $\rightarrow$ 21 marbles 1 unit $\rightarrow$ 1 marble 50 units $\rightarrow$ 50 marbles Or $60\% \times \frac{7}{10} = 0.42$ $\frac{21}{0.42} = 50$	M1 A1 [M1] [A1]	2	M1 for finding the fraction / percentage of marbles that are yellow.
9		Method 1: Substitution $y = x - 5$ ----- (1) $3x + 4y = 29$ ----- (2) Sub (1) into (2) $3x + 4(x - 5) = 29$ $3x + 4x - 20 = 29$ $7x = 49$ $x = 7$ Sub $x = 7$ into (1) $y = 7 - 5$ $y = 2$ $P(7, 2)$ <u>Method 2: Elimination</u> $y = x - 5$ $x - y = 5$ ----- (1) $3x + 4y = 29$ ----- (2) (1) $\times$ 3: $3x - 3y = 15$ ----- (3) (2) $-$ (3): $(3x + 4y) - (3x - 3y) = 29 - 15$	M1 A1 A1 [M1]		M1 for correct substitution / elimination.

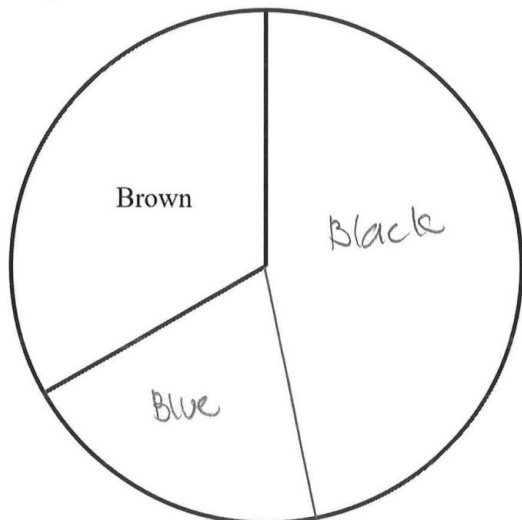
Qn		Working	Mark Awarded	Sub-total	Remarks										
		$3x + 4y - 3x + 3y = 14$ $7y = 14$ $y = 2$ Sub $y = 2$ into (1) $x - 2 = 5$ $x = 7$ $P(7, 2)$	[A1] [A1]	3											
10		$5(x - 4) = 6 - (2 - x)$ $5x - 20 = 6 - 2 + x$ $4x = 24$ $x = 6$	M1 A1	2	M1 for expanding correctly										
11		$\frac{4y^2 - 1}{6y^2 - 13y + 5}$ $= \frac{(2y + 1)(2y - 1)}{(2y - 1)(3y - 5)}$ $= \frac{2y + 1}{3y - 5}$	M1 M1 A1	3	M1 for factorizing numerator M1 for factorizing denominator										
12	(a)	19×0.5 $= 9.5 \text{ km}$	B1	1											
	(b)	<table><tr><th>Map</th><th>Actual</th></tr><tr><td>1 cm</td><td>0.5 km</td></tr><tr><td>1^2 cm^2 $= 1 \text{ cm}^2$</td><td>0.5^2 km^2 $= 0.25 \text{ km}^2$</td></tr><tr><td>4 cm^2</td><td>1 km^2</td></tr><tr><td>140 cm^2</td><td>35 km^2</td></tr></table> $Answer: 140 \text{ cm}^2$	Map	Actual	1 cm	0.5 km	1^2 cm^2 $= 1 \text{ cm}^2$	0.5^2 km^2 $= 0.25 \text{ km}^2$	4 cm^2	1 km^2	140 cm^2	35 km^2	M1 A1	2	M1 for ratio of area (1 : 0.25)
Map	Actual														
1 cm	0.5 km														
1^2 cm^2 $= 1 \text{ cm}^2$	0.5^2 km^2 $= 0.25 \text{ km}^2$														
4 cm^2	1 km^2														
140 cm^2	35 km^2														
13		Area of triangle $= \frac{1}{2} ab \sin C$ $= \frac{1}{2} \times 10 \times 10 \times \sin 60^\circ$ $= 43.30127019 \text{ cm}^2$ Area of the 3 sectors	M1		M1 for finding area of triangle.										

Qn		Working	Mark Awarded	Sub-total	Remarks
		= area of semicircle $= \frac{\pi r^2}{2}$ $= \frac{\pi \times 5^2}{2}$ $= 39.26990817 \text{ cm}^2$ Area of shaded region $= 43.30127019 - 39.26990817$ $= 4.031362019$ $= 4.03 \text{ cm}^2 \text{ (to 3 s.f.)}$	M1 A1	 3	M1 for finding area of 3 sectors
14		$A = P \left(1 + \frac{r}{100} \right)^n$ $5000 + 800 = 5000 \left(1 + \frac{r}{100} \right)^3$ $5800 = 5000 \left(1 + \frac{r}{100} \right)^3$ $\frac{5800}{5000} = \left(1 + \frac{r}{100} \right)^3$ $\sqrt[3]{\frac{5800}{5000}} = 1 + \frac{r}{100}$ $\sqrt[3]{\frac{5800}{5000}} - 1 = \frac{r}{100}$ $100 \left[\sqrt[3]{\frac{5800}{5000}} - 1 \right] = r$ $r = 100 \left[\sqrt[3]{\frac{5800}{5000}} - 1 \right]$ $r = 5.07175745$ $r = 5.07 \text{ (to 3 s.f.)}$	M1 M1 A1	 3	M1 for formula of compound interest, with correct components substituted. M1 for cube root.
15	(a)	$x^2 - 18x + 19$ $= (x - 9)^2 - 9^2 + 19$ $= (x - 9)^2 - 62$ $n = -62$	B1	1	
	(b)	$(x - 9)^2 - 62 = 0$ $(x - 9)^2 = 62$	M1		M1 for $\pm$ and square root.

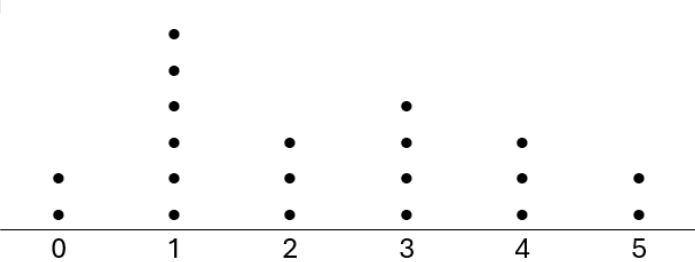
Qn		Working	Mark Awarded	Sub-total	Remarks
		$x - 9 = \pm\sqrt{62}$ $x = 9 \pm \sqrt{62}$ $x = 16.87400787$ or $x = 1.125992126$ $x = 16.9$ (3 s.f.) $x = 1.13$ (3 s.f.)	A1	2	
16	(a)	$a = \frac{13bc+1}{2b+c}$ $a = \frac{13(1.5)(-1.2)+1}{2(1.5)+(-1.2)}$ $a = -12\frac{4}{9}$	B1	1	Accept $-\frac{112}{9}$ too.
	(b)	$a = \frac{13bc+1}{2b+c}$ $a(2b+c) = 13bc+1$ $2ab+ac = 13bc+1$ $2ab-13bc = 1-ac$ $b(2a-13c) = 1-ac$ $b = \frac{1-ac}{2a-13c}$	M1 A1	 2	M1 for correct expansion
17	(a)	$\frac{2}{x+7} - \frac{1}{x} = 5$ $\frac{2x}{x(x+7)} - \frac{1(x+7)}{x(x+7)} = 5$ $\frac{2x-1(x+7)}{x(x+7)} = 5$ $2x-1(x+7) = 5x(x+7)$ $2x-x-7 = 5x^2+35x$ $0 = 5x^2+34x+7$ $5x^2+34x+7 = 0$ $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ $x = \frac{-34 \pm \sqrt{34^2-4(5)(7)}}{2(5)}$ $x = \frac{-34 \pm \sqrt{1016}}{10}$ $x = -0.2125245099$ or $x = -6.58747549$ $x = -0.21$ (to 2 d.p.) $x = -6.59$ (to 2 d.p.)	M1 M1 A1	 4	M1 for combining into a single fraction correctly. M1 for getting the equation. M1 for quadratic formula A1 for both answers, correct to 2 d.p.

Qn		Working	Mark Awarded	Sub-total	Remarks																		
18	(a)	$1 + 3n$	B1	1																			
	(b)	46	B1	1																			
	(c)	$1 + 3n = 547$ $3n = 546$ $n = 182$, which is an integer. Hence, 547 is a term of the sequence. Yes, Chye Joo is correct.	B1	1	B1 for finding n and stating that it is an integer / whole number.																		
	(d)	Analyse the relationship between the two sequences. <table border="1"> <tr> <td>First sequence</td><td>4</td><td>7</td><td>10</td><td>13</td><td>16</td></tr> <tr> <td></td><td>+ 1</td><td>+ 4</td><td>+ 9</td><td>+ 16</td><td>+ 25</td></tr> <tr> <td>Second sequence</td><td>5</td><td>11</td><td>19</td><td>29</td><td>41</td></tr> </table> Note that $1 = 1^2$, $4 = 2^2$, $9 = 3^2$, $16 = 4^2$ and $25 = 5^2$. Hence, using (b), $1 + 3n + n^2$.	First sequence	4	7	10	13	16		+ 1	+ 4	+ 9	+ 16	+ 25	Second sequence	5	11	19	29	41	B1	1	
First sequence	4	7	10	13	16																		
	+ 1	+ 4	+ 9	+ 16	+ 25																		
Second sequence	5	11	19	29	41																		
19	(a)	angle $PSU = 180^\circ - 65^\circ$ (interior angles, $PQ \parallel SR$) $= 115^\circ$ reflex angle $PSU = 360^\circ - 115^\circ$ (angles at a point) $= 245^\circ$	M1 A1	 2	Deduct marks for missing angle properties.																		
	(b)	angle $PTU = 121^\circ$ (alternate angles, $PQ \parallel SR$)	B1	1																			
	(c)	angle $PTS = 180^\circ - 65^\circ - 65^\circ$ (base angle of an isosceles triangle) $= 50^\circ$ angle $STU = \text{angle } PTU - \text{angle } PTS$ $= 121^\circ - 50^\circ$ $= 71^\circ$	M1 A1	 2																			
20	(a)	Volume of hemisphere $= 170 \text{ cm}^3$ $\frac{2}{3}\pi r^3 = 170$ $r^3 = 170 \div \frac{2}{3}\pi$ $r = \sqrt[3]{170 \div \frac{2}{3}\pi}$	M1		M1 for formula involving volume of hemisphere.																		

Qn		Working	Mark Awarded	Sub-total	Remarks
		$r = 4.329756132$ $r = 4.33 \text{ cm (to 3 s.f.)}$	A1	2	
	(b)	Volume of cylinder = $190 - 170 = 20 \text{ cm}^3$ $\pi r^2 h = 20$ $\pi \times 1.5^2 \times h = 20$ $h = 20 \div \pi \div 1.5^2$ $h = 2.829421211$ $h = 2.83 \text{ cm (to 3 s.f.)}$	M1 A1	2	M1 for $\pi r^2 h = 20$
	(c)	 Surface area of hemisphere and base of cylinder $= 2\pi r^2 + \pi r^2$ $= 3\pi r^2$ $= 3\pi(4.329756132)^2$ $= 176.6843159 \text{ cm}^2$ Surface area of curved surface of cylinder $= 2\pi rh$ $= 2\pi \times 1.5 \times 2.829421211$ $= 26.6666666667 \text{ cm}^2$ Total surface area $= 176.6843159 + 26.6666666667$ $= 203 \text{ cm}^2 \text{ (to 3 s.f.)}$	M1 M1 A1	3	
21	(a)	By Pythagoras' Theorem, $20^2 = AB^2 + 13^2$ $AB^2 = 20^2 - 13^2$ $AB = \pm\sqrt{20^2 - 13^2}$ $AB = \sqrt{20^2 - 13^2}$ (reject negative, length > 0) $AB = 15.19868415$ $AB = 15.2 \text{ m (to 3 s.f.)}$	M1 A1	2	Minus one mark if "By Pythagoras' Theorem" is missing.
	(b)	$BC^2 = 29^2 = 841$ $BE^2 + CE^2 = 20^2 + 21^2 = 841$	M1		M1 for finding both BC^2 and $BE^2 + CE^2$

Qn		Working	Mark Awarded	Sub-total	Remarks																				
		Hence, $BC^2 = BE^2 + CE^2$ and by the Converse of Pythagoras' Theorem, triangle BCE is a right-angled triangle (proven).	A1	2	A1 for stating Converse of Pythagoras' Theorem.																				
	(c)	TOA CAH SOH angle CBE = $\sin^{-1}\left(\frac{21}{29}\right)$ = 46.39718103 = 46.4° (to 1 d.p.)	M1 A1	2																					
	(d)	$\cos 50^\circ = \frac{CD}{21}$ $CD = 21\cos 50^\circ$ = 13.4985398 = 13.5 m (to 3 s.f.)	M1 A1	2																					
22	(a)	<table><tr><td></td><td>Brown</td><td>Black</td><td>Blue</td><td>Total</td></tr><tr><td>Male</td><td>12</td><td>17</td><td>8</td><td>37</td></tr><tr><td>Female</td><td>13</td><td>18</td><td>7</td><td>38</td></tr><tr><td>Total</td><td>25</td><td>35</td><td>15</td><td>75</td></tr></table>		Brown	Black	Blue	Total	Male	12	17	8	37	Female	13	18	7	38	Total	25	35	15	75	B2	2	B1 for any 2 correct answers. B2 for all 4 correct answers.
	Brown	Black	Blue	Total																					
Male	12	17	8	37																					
Female	13	18	7	38																					
Total	25	35	15	75																					
	(b)	75 students $\rightarrow 360^\circ$ 1 student $\rightarrow 4.8^\circ$ 35 students $\rightarrow 168^\circ$	B1	1																					
	(c)	Black eyes $\rightarrow 168^\circ$ Blue eyes $\rightarrow 72^\circ$ 	B1	1																					

2024 4NA Prelim P2 Marking Scheme

Qn	Solutions	Marks														
	SECTION A															
1a	$\frac{82.98 \times \sqrt{8.93}}{4.45}$ $= \frac{80 \times \sqrt{9}}{4}$ $= 60$	M1 A1														
1b	$\frac{1397074}{548 \times 10^6} \times 100$ $= 2.55 \times 10^{-1}$	M1 A1														
2a		0(more than 1 error) M1 (1 error) M2(0 error)														
2b	$\frac{2 + 2}{2}$ $= 2$	B1														
2c	$\frac{6}{20}$ $= \frac{3}{10}$	B1														
3a	$\frac{(n - 2) \times 180}{n}$ $= \frac{(15 - 2) \times 180}{15}$ $= 156^\circ$	M1 A1														
3b	$\angle EFD = 180 - 156$ (base angle of an isosceles triangle) $= 12$ $\angle DCF = 360 - 156 - 156 - 20 - 12$ (sum of angle in a quadrilateral) $= 16$	M1 M1 A1														
4a	<table border="1"><tr><td>2</td><td>240</td></tr><tr><td>2</td><td>120</td></tr><tr><td>2</td><td>60</td></tr><tr><td>2</td><td>30</td></tr><tr><td>3</td><td>15</td></tr><tr><td>5</td><td>5</td></tr><tr><td></td><td>1</td></tr></table> $2^4 \times 3 \times 5$	2	240	2	120	2	60	2	30	3	15	5	5		1	B1
2	240															
2	120															
2	60															
2	30															
3	15															
5	5															
	1															

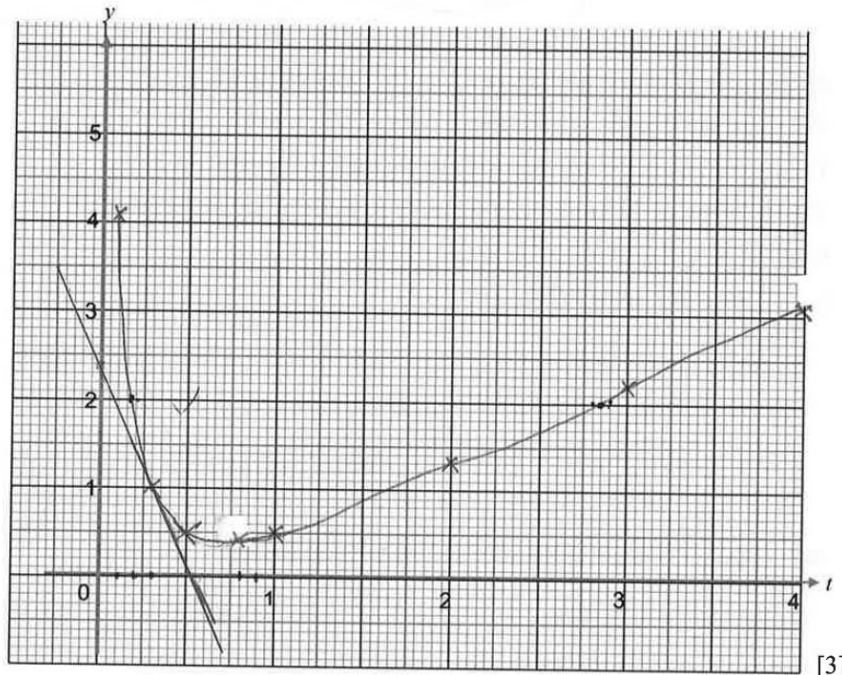
2024 4NA Prelim P2 Marking Scheme

Qn	Solutions	Marks															
4b	$240a = 2^4 \times 3^1 \times 5^1 \times a$ $240a = 2^4 \times 3^1 \times 5^1 \times (3^1 \times 5^1)$ $a = 3 \times 5$ $= 15$	B1															
4c	<table border="1"> <thead> <tr> <th></th><th>Green</th><th>Black</th></tr> </thead> <tbody> <tr> <td>2</td><td>240</td><td>210</td></tr> <tr> <td>3</td><td>120</td><td>105</td></tr> <tr> <td>5</td><td>40</td><td>35</td></tr> <tr> <td></td><td>8</td><td>7</td></tr> </tbody> </table> LCM of 210 and 240 $= 2 \times 3 \times 5 \times 7 \times 8$ $= 1680$ $blue = \frac{1680}{240} = 7$ $red = \frac{1680}{210} = 8$		Green	Black	2	240	210	3	120	105	5	40	35		8	7	M1 B1 B1
	Green	Black															
2	240	210															
3	120	105															
5	40	35															
	8	7															
5a	Price of the car at a 10% discount $= 22500 \times 90\%$ $= \$20\,250$ Percentage profit $= \frac{28\,888 - 20\,250}{20\,250} \times 100\%$ $= 42.7\%$	M1 A1															
5b	Amount of deposit+ Instalment (Mary) $= (20\% \times 28888) + (58 \times 510)$ $= \$35\,357.80$ Amount of deposit+ Instalment (Jane) $= (15\% \times 28888) + (60 \times 520)$ $= \$35\,533.20$ He should accept the offer from Jane as Jane will pay a higher amount of money (\$35533.20) as compared to Mary(\$35357.80)	M1 M1 A1															
6a	$\sqrt{(2-5)^2 + (5-9)^2}$ $= 5 \text{ units}$	M1 A1															

2024 4NA Prelim P2 Marking Scheme

Qn	Solutions	Marks									
6b	$\text{gradient} = \frac{9-5}{5-2}$ $= \frac{4}{3}$ $y = \frac{4}{3}x + c$ $9 = \frac{4}{3}(5) + c$ $9 = \frac{20}{3} + c$ $c = 9 - \frac{20}{3}$ $c = \frac{7}{3}$ $y = \frac{4}{3}x + \frac{7}{3}$	M1 for either m or c A1									
6c	AB and BC has the same gradient. $x = 5 + 3 = 8$ $y = 9 + 4 = 13$ $(8, 13)$	B1,B1									
7a(i)	$3uv + 2v - 12u - 8$ $= v(3u + 2) - 4(3u + 2)$ $= (3u + 2)(v - 4)$	M1 A1									
7a(ii)	$2x^2 - 11x + 5$ <table border="1"> <tr> <td>$2x$</td> <td>-1</td> <td>$-x$</td> </tr> <tr> <td>x</td> <td>-5</td> <td>$-10x$</td> </tr> <tr> <td></td> <td></td> <td>$-11x$</td> </tr> </table> $(2x - 1)(x - 5)$	$2x$	-1	$-x$	x	-5	$-10x$			$-11x$	M1 A1
$2x$	-1	$-x$									
x	-5	$-10x$									
		$-11x$									
7b	$\frac{9x^3}{4} \div \frac{3x^2}{8}$ $= \frac{9x^3}{4} \times \frac{8}{3x^2}$ $= \frac{72x^3}{12x^2}$ $= 6x$	M1 A1									
8a	$\frac{20}{t} = 2.5$ $t = \frac{20}{2.5}$ $t = 8s$	B1									

2024 4NA Prelim P2 Marking Scheme

Qn	Solutions	Marks
8b	$\frac{speed}{20} = \frac{14}{20}$ $speed = \frac{14}{20} \times 20$ $= 14 \text{ m/s}$	M1 A1
8c	Distance = Area under the graph $\frac{1}{2} \times (22 + 50) \times 20$ $= 720 \text{ m}$	M1 A1
9a	$y = 3 + \frac{1}{2(3)} - 1 = 2.2 \text{ or } 2\frac{1}{6} \text{ or } 2.17$	B1
9b,		B2 : all points correctly plotted B1: 4-7 points correctly plotted B1 points joined smoothly.
9c	0.17, 2.82	B1,B1 (FT)
9d	Tangent drawn -4.56 Range -5 to -4.33	B1 B1
10a	$360 - 85$ $= 275^\circ$	M1 A1
10b	The total length of wire $= 5.2 + 3.9 + \left(\frac{275}{360} \times 2\pi(3) \right)$ $= 23.5 \text{ cm}$	M1 for $\left(\frac{275}{360} \times 2\pi(3) \right)$ A1
11a	Angles and length plot correctly. 75° , 122° or 6.2cm drawn correctly	B2 B1
11b	Perpendicular bisector with construction lines seen.	B1
11c	Accurate measurement of QX. (FT)	B1

2024 4NA Prelim P2 Marking Scheme

Qn	Solutions	Marks															
12a	$mean = \frac{50}{10} = 5$	B1															
12b	There is an <u>extreme data of 23</u> and it is observed that 8 of the data are less than the mean of 5. <u>Median will be a better measure</u> of central tendency.	B1 B1															
12c	<table border="1"> <tr> <td>Fogging of chemicals (20 units)</td><td>$(220 \times 3) + (38 \times 2)$</td><td>=736</td></tr> <tr> <td>Larvicide treatment(4 units)</td><td>$50 + 18$</td><td>=68</td></tr> <tr> <td>External mosquito trap</td><td>75×10</td><td>=750</td></tr> <tr> <td>Labour</td><td>$40 \times [(3 \times 2) + (0.5 \times 20)]$</td><td>=640</td></tr> <tr> <td>TOTAL</td><td></td><td>=\$2194</td></tr> </table> \$2500-\$2194 = \$306 Yes, it is a reasonable quote as the company will <u>make a profit of \$306.</u>	Fogging of chemicals (20 units)	$(220 \times 3) + (38 \times 2)$	=736	Larvicide treatment(4 units)	$50 + 18$	=68	External mosquito trap	75×10	=750	Labour	$40 \times [(3 \times 2) + (0.5 \times 20)]$	=640	TOTAL		=\$2194	M3: all workings are correct M2: 1 error M1: 2 errors A1
Fogging of chemicals (20 units)	$(220 \times 3) + (38 \times 2)$	=736															
Larvicide treatment(4 units)	$50 + 18$	=68															
External mosquito trap	75×10	=750															
Labour	$40 \times [(3 \times 2) + (0.5 \times 20)]$	=640															
TOTAL		=\$2194															
SECTION B																	
13a(i)	$\angle GDE = 43^\circ$ (Angle in the same segment)	B1															
13a(ii)	$\angle BDE = 90^\circ$ (Angle in a semicircle) $\angle BDG = 90 - 43$ $= 47^\circ$	M1 A1															
13a(iii)	$\angle ABF = 90 - 43(\tan \perp \text{ radius})$ $= 47^\circ$	B1															
13b(i)	cosine rule $\cos \angle YXZ = \frac{11^2 + 20^2 - 17^2}{2(11)(20)}$ $\angle YXZ = \cos^{-1} \left(\frac{11^2 + 20^2 - 17^2}{2(11)(20)} \right)$ $= 58.178$ $= 58.2^\circ$	M1 A1															

2024 4NA Prelim P2 Marking Scheme

Qn	Solutions	Marks
13b(ii)	$\angle TYX = 253 - 180 - 39$ $= 34^\circ$ $\angle XTY = 180 - 39 - 34$ (sum of angle in a triangle) $= 107^\circ$ $\frac{TY}{\sin 39} = \frac{11}{\sin 107}$ $TY = \frac{11}{\sin 107} \times \sin 39$ $= 7.24 \text{ km}$	M1 A1
14a(i)	Monday Tuesday <pre> graph LR M1[3/5] -- Rain --> T1[4/7] M1 -- Rain --> T2[3/7] M2[2/5] -- No Rain --> T3[5/7] M2 -- No Rain --> T4[2/7] T1 -- Rain T2 -- No rain T3 -- Rain T4 -- No rain </pre>	B2=all correct B1=2 to 3 correct answers
14a(ii)	$\left(\frac{3}{5}\right)\left(\frac{3}{7}\right) + \left(\frac{2}{5}\right)\left(\frac{5}{7}\right)$ $= \frac{19}{35}$	M1 A1
14b(i)	\$550	B1
14b(ii)	$680 - 420$ $= \$260$	M1 A1
14b(iii)	$80 - 26$ $= 54 \text{ workers}$	B1
	TOTAL	78 MARKS