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**NA**

TAMPINES SECONDARY SCHOOL

Secondary Four Normal Academic
PRELIMINARY EXAMINATION 2023

NAME

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CLASS

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REGISTER
NUMBER

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MATHEMATICS SYLLABUS A**4045/01****Paper 1****04 August 2023****2 hours**

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and register 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** the questions.

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 .

At the end of the examination, fasten all your work securely together.

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

The total number of marks for this paper is **70**.

For Examiner's Use

Mathematical Formulae*Compound Interest*

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

Answer all questions.

- 1 (a)** Calculate the exact value of $\frac{11.2 \times 3}{8.2 - 4.7}$.

Answer (a) _____ [1]

- (b)** Calculate $\sqrt{5.1 + 3.75^2}$.
Give your answer correct to 1 decimal place.

Answer (b) _____ [1]

- 2** 0.312 $\frac{5}{7}$ $\frac{\pi}{2}$ 21 $\sqrt{64}$

For the above values, state which

- (a)** is/ are recurring decimal/s?

Answer (a) _____ [1]

- (b)** has/ have a factor of 3?

Answer (b) _____ [1]

- (c)** is/ are rational number/s?

Answer (c) _____ [1]

- 3 Find the largest integer satisfying $-4x \geq 73$.

Answer _____ [2]

- 4 Given that $x^2 + 10x + 21 = (x + a)^2 + b$,

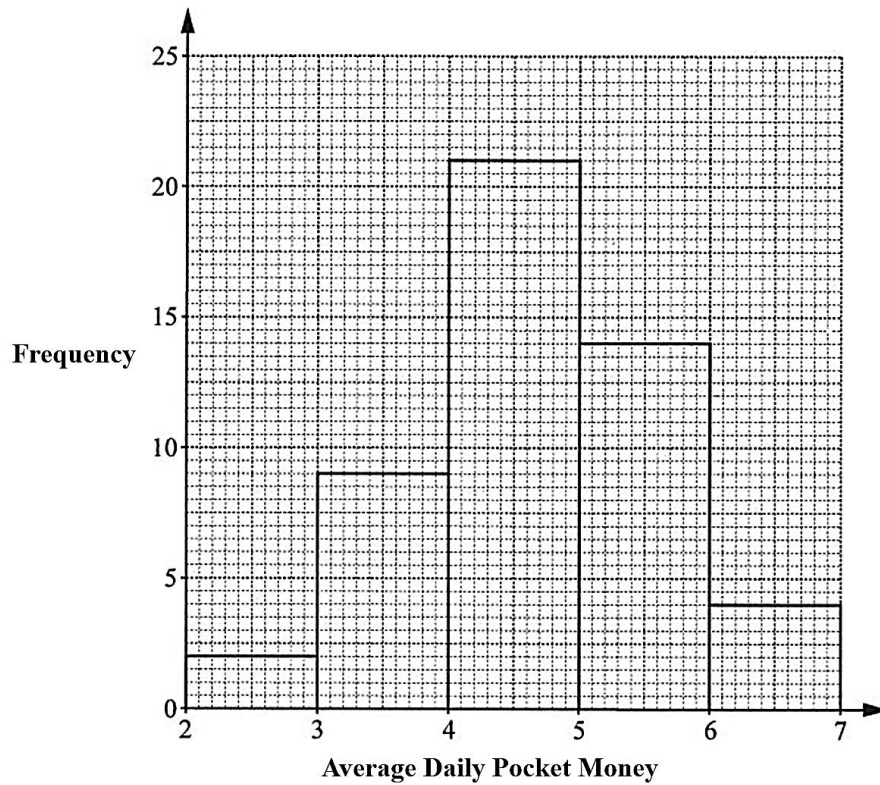
(a) find a and b .

Answer $a =$ _____ $b =$ _____ [3]

(b) Hence, solve $x^2 + 10x + 21 = 0$

Answer $x =$ _____ or _____ [3]

- 5 The following histogram summarises the average daily amount of pocket money from a group of 50 students.



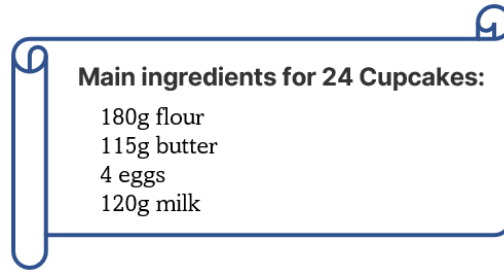
- (a) How many students have an average daily pocket money of \$3 to \$4?

Answer (a) _____ [1]

- (b) Find the probability of a student having at least \$5 of average daily pocket money, leaving your answer in simplest form.

Answer (b) _____ [1]

6



A baker is left with 250 eggs and plenty of other ingredients.

- (a) Using the above recipe, calculate the maximum amount that can be received from selling the cupcakes made with these remaining eggs, given that each cupcake is sold at \$1.80.

Answer (a) \$ _____ [3]

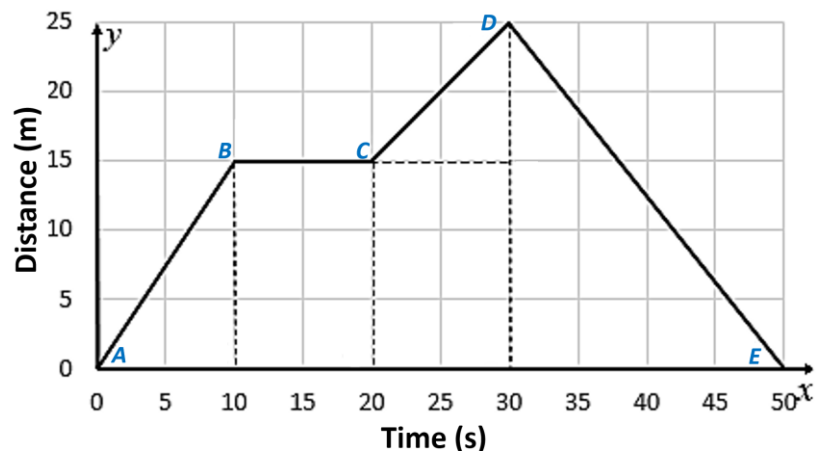
- (b) Calculate the percentage of these 250 eggs which were not used.

Answer (b) _____ % [2]

- (c) Find the ratio of butter: flour **and** milk.

Answer (b) _____ : _____ [2]

- 7 The distance-time graph shows the movement of an electric toy car.



- (a) 'The toy car is travelling at a greater speed at **CD** than at **AB**.'
Justify whether the above statement is correct.

Answer

[2]

- (b) What is the duration when the toy car is at rest?

Answer (b) _____ [1]

- (c) Describe the motion of the electric toy car at **DE**.

Answer

[1]

- (d) Find the average speed of the toy car for the whole journey.

Answer (d) _____ *m/s* [2]

- 8 (a) Written as a product of prime factors, $1050 = 2^x \times 3 \times 5^y \times 7$.
Find the values of x and y .

Answer (a) $x =$ _____ $y =$ _____ [2]

- (b) Find the smallest positive integer k , such that $1050k$ is a perfect square.

Answer (b) $k =$ _____ [1]

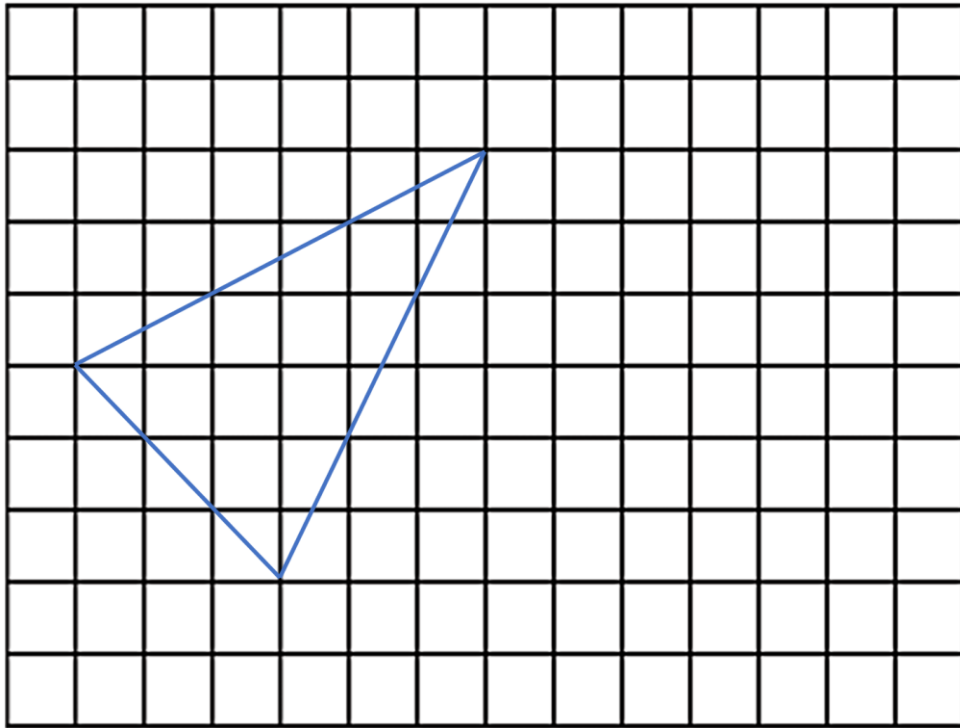
- (c) Given that $700 = 2^2 \times 5^2 \times 7$, find the highest common factor of 700 and 1050.

Answer (c) _____ [2]

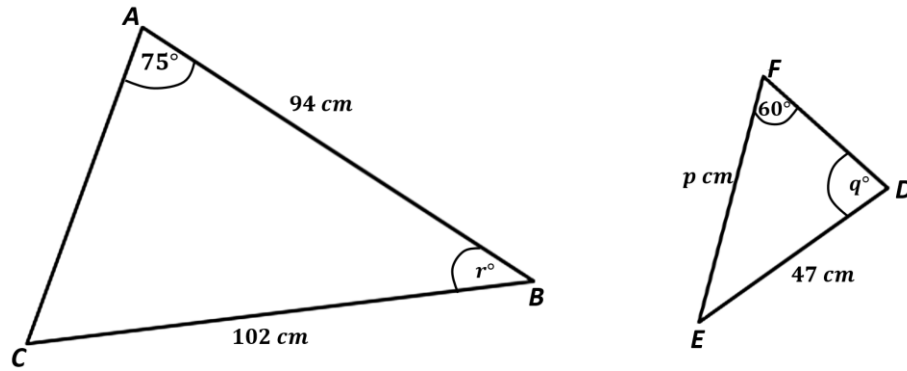
- 9 Draw a reduction of this triangle using a scale factor of $\frac{1}{3}$.

[2]

Answer



10 In the diagram below, triangle ABC is similar to triangle DEF . Find



(a) p ,

Answer **(a)** _____ [1]

(b) q ,

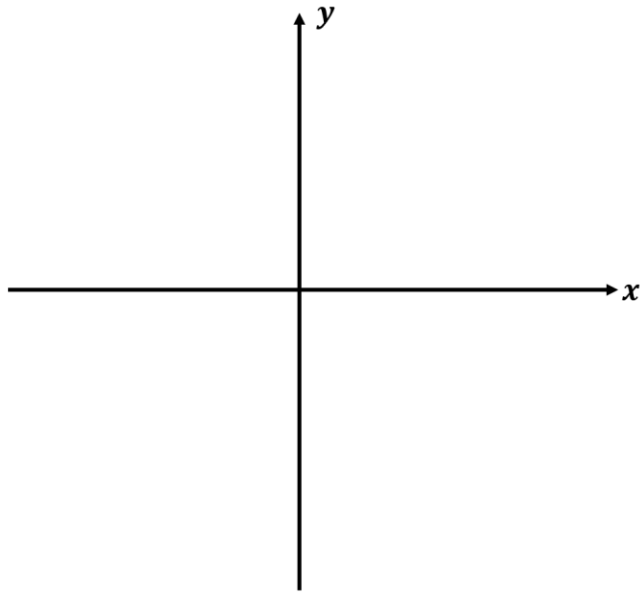
Answer **(b)** _____ [1]

(c) r .

Answer **(c)** _____ [2]

- 11 (a)** Sketch the graph of $y = (x + 2)(x - 4)$.

[2]



- (b)** Write down the equation of the line of symmetry of the graph.

Answer **(b)** _____ [1]

- (c)** State the coordinates of the turning point.

Answer **(c)** _____ [1]

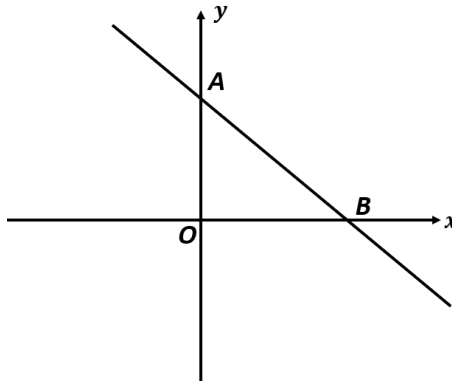
- 12** The cash price of a television is \$6200.
The hire-purchase price of the television is \$7400.
The hire-purchase price is a deposit of 10% of the cash price plus 12 equal monthly payments.
(a) Calculate the deposit amount.

Answer **(a)** \$ _____ [2]

- (b)** Calculate each monthly payment.

Answer **(b)** \$ _____ [2]

- 13 The diagram below shows a graph of $y + 2x = 18$.



- (a) Find the coordinates of A and B.

Answer (a) Coordinates of A = (,) [1]

Coordinates of B = (,) [1]

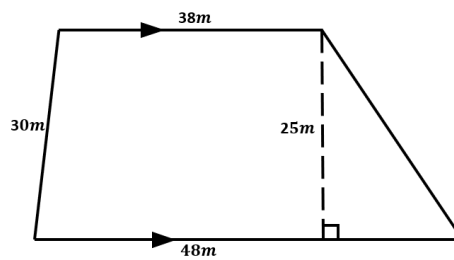
- (b) Find the distance between the origin and the point $M(8, 20)$.

Answer (b) units [2]

- 14 Given that the line formed by points $A(p, 7)$ and $B(-2, 0)$ is parallel to $y = \frac{1}{2}x - 5$, find the value of p .

Answer $p =$ _____ [2]

15



Calculate the area of the above figure.

Answer _____ m^2 [2]

16 Factorise

(a) $x^2 + x - 6$,

Answer (a) _____ [1]

(b) $50y^2 - 18$

Answer (b) _____ [2]

- 17 (a) Make p the subject of the formula $\frac{3p}{q} = 5r$.

Answer (a) $p =$ _____ [1]

- (b) Express as a single fraction, in its simplest form, $\frac{1}{x^2-9} + \frac{2}{x+3}$.

Answer (b) _____ [2]

- 18** Ali chooses a pen from the following options.

Brand
X
Y

Colour
Red (R)
Blue (B)
Green (G)

- (a)** Complete the table to show all his possible choices.

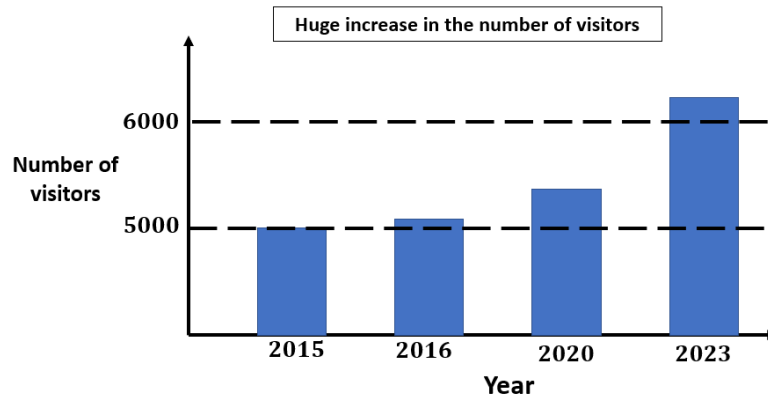
[2]

Brand	Colour
X	R
X	B
X	G
Y	R

- (b)** Find the probability, in its simplest form, that Ali chooses a blue pen.

Answer _____ [1]

- 19** The graph below shows the average number of visitors to a game park over a period.



- (a)** Suggest one reason why the graph is inaccurately represented.

Answer

[1]

- (b)** Explain how your answer in (a) may cause the graph to be misleading.

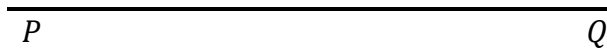
Answer

[1]

20 PQR is a triangle with $PQ = 8\text{ cm}$, $PR = 4\text{ cm}$ and $QR = 6\text{ cm}$.

- (a)** Construct triangle PQR .
 PQ has been drawn for you.

[2]



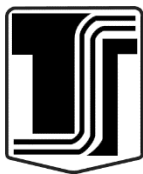
- (b)** Measure angle QPR .

Answer _____ [1]

- (c)** Construct the perpendicular bisector of PQ .

[1]

END OF PAPER



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PRELIMINARY EXAMINATION 2023

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MATHEMATICS SYLLABUS A**4045/02****Paper 2****7 August 2023****2 hours**

Candidates answer on Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and register 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.

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 number of 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.

Mathematical Formulae

Compound Interest

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

Mensuration

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

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

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

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

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

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) By writing each value correct to 1 significant figure, estimate the value of $\frac{245.5 \times 0.5391}{5.49}$.
Show your working.

Answer [2]

- (b) Write 0.000015 in standard form.

Answer [1]

- (c) The population of Singapore is 5.45 million in 2021.
The area of Singapore is $7.3 \times 10^8 \text{ m}^2$.

- (i) Write 5.45 million in standard form.

Answer [1]

- (ii) Find the average area, in square metres per person, in Singapore in 2021.

Answer m^2/person [1]

- 2 The stem-and-leaf diagram shows the heights of 12 students.

Stem	Leaf
11	7 8
12	0 5 5 5 p 9
13	2 2 4
14	2

Key: 11 | 7 means 117 cm

- (a) If the median height is 126 cm, find the value of p .

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

- (b) Find the range of the heights.

Answer $\dots\dots\dots$ cm [1]

- (c) 25% of the students have a height of less than x cm.
Find the largest integer value of x .

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

- 3** A hotel and an airport are 8 km apart.
The distance between the hotel and the airport is 3.2 cm on a map drawn to the scale of 1 : n .

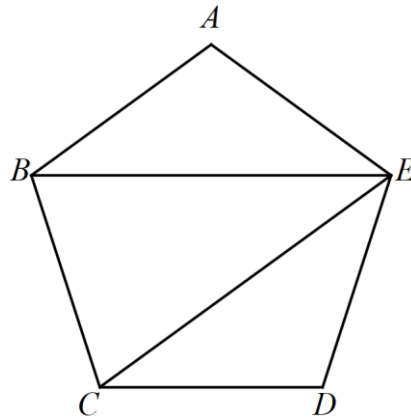
(a) Find the value of n .

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

- (b)** The actual area of the airport is 30 km².
Find the area, in square centimetre, of the airport on the map.

Answer $\dots\dots\dots$ cm² [2]

- 4 (a) $ABCDE$ is a regular pentagon.



Calculate

- (i) angle BAE ,

Answer [2]

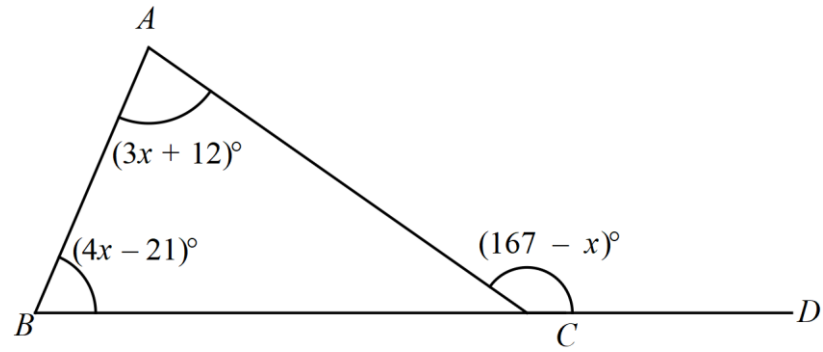
- (ii) angle DCE ,

Answer [1]

- (iii) angle BEC .

Answer [1]

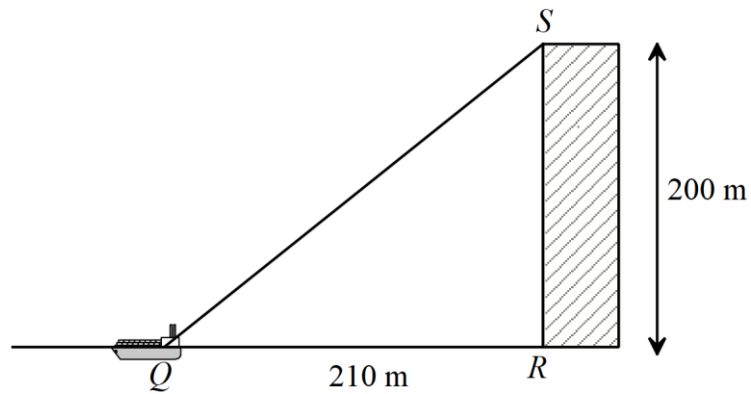
(b)



Angle $ABC = (4x - 21)^\circ$, angle $BAC = (3x + 12)^\circ$ and angle $ACD = (167 - x)^\circ$. BCD is a straight line. Find the value of x .

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

5



A man is standing at point S , on top of a vertical cliff SR .
 The cliff is 200 m above sea level.
 A boat Q is 210 m away from the base of the cliff.

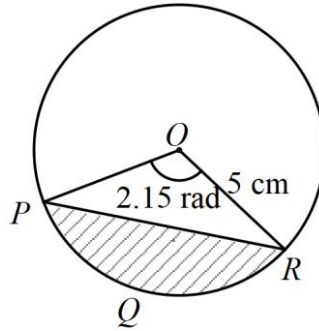
(a) Find the length QS .

Answer m [2]

(b) Find the angle of depression of Q from S .

Answer [2]

6 (a)



P , Q and R are three points on the circumference of the circle.
 O is the centre of the circle. Angle $POR = 2.15$ radians and $OR = 5$ cm.
 Find the area of the shaded segment PQR .

Answer cm^2 [3]

(b) Find the percentage of the circle that is shaded.

Answer % [3]

7 (a) $2p - 1$ is an odd number, where p is an integer.

(i) Find, in terms of p , the next odd number after $2p - 1$.

Answer [1]

(ii) Find, in terms of p , the sum of these two odd numbers.

Answer [1]

(iii) Hence, explain why the sum of two odd numbers is always even.

Answer

[1]

- (b) Solve $2x^2 + 6x - 5 = 0$, giving your answers correct to 2 decimal places.

Answer $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

- (c) Solve the simultaneous equations.

$$4x + 3y = 4$$

$$2x - 5y = -11$$

Show your working.

Answer $x = \dots\dots\dots$

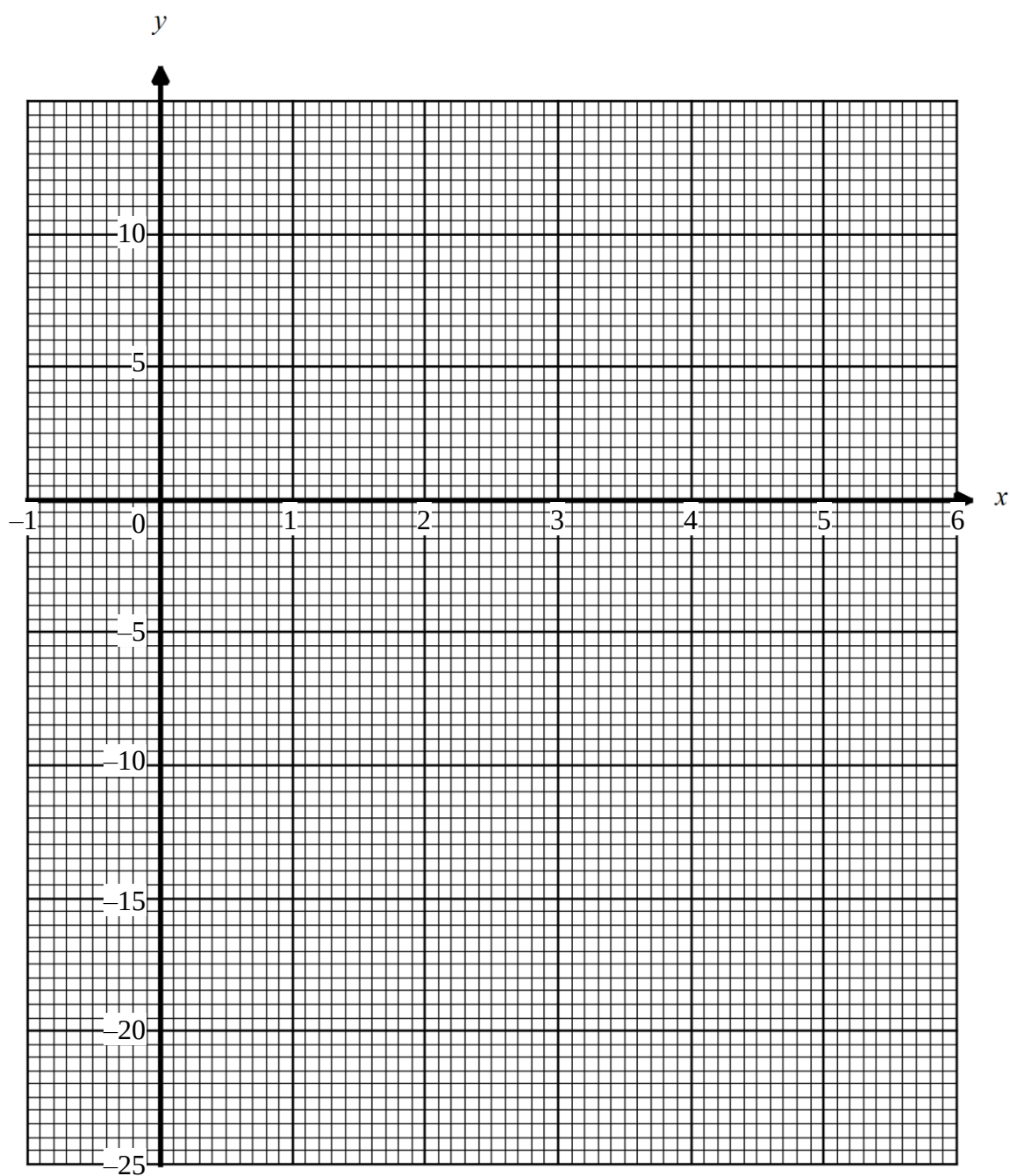
$y = \dots\dots\dots$ [3]

- 8 (a) Complete the table of values for $y = x^3 - 6x^2 + 9$.

x	-1	0	1	2	3	4	5	6
y		9	4	-7	-18	-23		9

[2]

- (b) On the grid, plot the graph of $y = x^3 - 6x^2 + 9$ for $-1 \leq x \leq 6$.



[3]

- (c) By drawing a tangent, find the gradient of the curve $y = x^3 - 6x^2 + 9$ when $x = 3.5$.

Answer [2]

- (d) Write down the minimum point of the curve $y = x^3 - 6x^2 + 9$.

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

- (e) The line $y = k$ intersects with the curve at three points.
Find a possible value of k .

Answer $k =$ [1]

- 9 Two mobile plans for a mobile phone from a particular service provider are shown in the tables below.

	2-year plan	SIM only 1-year plan
Device cost	\$881	\$2253
Voice calls	800 mins	1000 mins
Number of SMS	800	1000
Monthly subscription	\$130.21	\$45.42
Mobile data	140 gigabytes	140 gigabytes

Excess charges	2-Year plan and SIM only 1-year plan
Voice calls	16.20 cents per minute
Number of SMS	5.40 cents per SMS
Mobile data	\$10.80 / gigabytes capped at \$240.22 / month

- (a) Sally bought the mobile phone using the 2-year plan.
The device cost is 62.5% of her monthly salary.
Calculate her monthly salary.

Answer \$..... [2]

- (b) Sally claims that signing up for the 2-year plan is more value-for-money than signing up for two years of the SIM only 1-year plan.
Do you agree with her? Explain your answer with clear working.
Answer

- (c) In July, Sally's home Wi-Fi system was down and she used 162 gigabytes of mobile data under the 2-year plan. How much was her monthly subscription for that month?

Answer \$..... [2]

- (d) Sally can recontract the 2-year plan at \$115 per month.
Find the percentage decrease in monthly subscription charges if she recontracts.

Answer % [2]

- 10** The potential energy in a spring, E Joule, is directly proportional to the square of tension applied to the spring, T Newton. The potential energy in the spring is 320 Joules when the tension applied is 4 Newtons.

(a) Find the formula connecting E and T .

Answer [2]

(b) Find the potential energy in the spring when the tension applied is 10 Newtons.

Answer Joules [1]

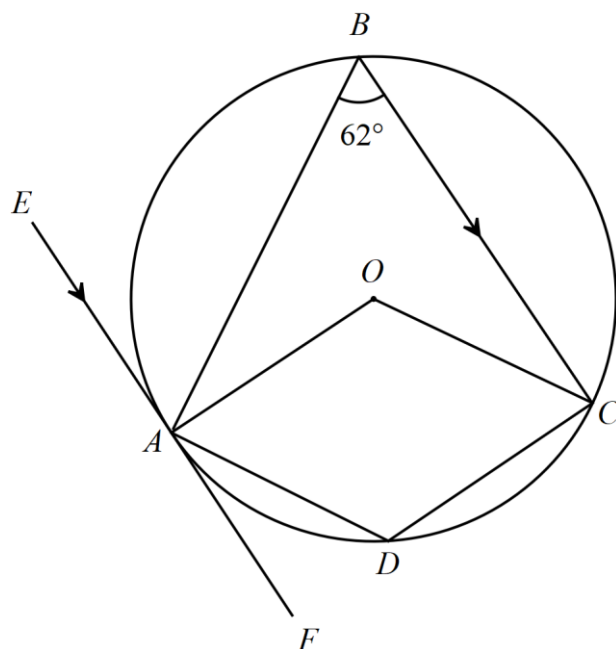
(c) Find the tension applied to the spring, when the potential energy is 180 Joules.

Answer Newtons [2]

Section B (8 marks)

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

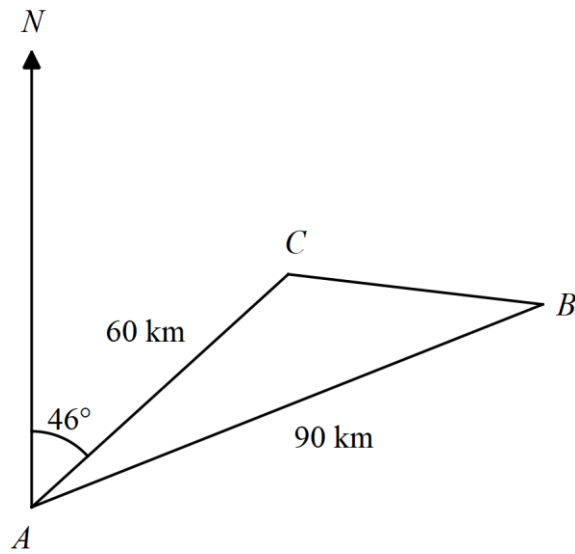
- 11 (a)** A, B, C and D are points on the circumference of the circle.
 O is the centre of the circle and EF is a tangent to the circle at A .
 Angle $ABC = 62^\circ$ and EF is parallel to BC .



Complete these statements by calculating the size of each angle. Give a reason for each statement.

	Reason
Angle $AOC =$	
	
Angle $ADC =$	
	
Angle $BAO =$	
	

(b)



A boat travels along the path ABC .

The bearing of C from A is 046° and the bearing of B from A is 074° .
 $AB = 90$ km and $AC = 60$ km.

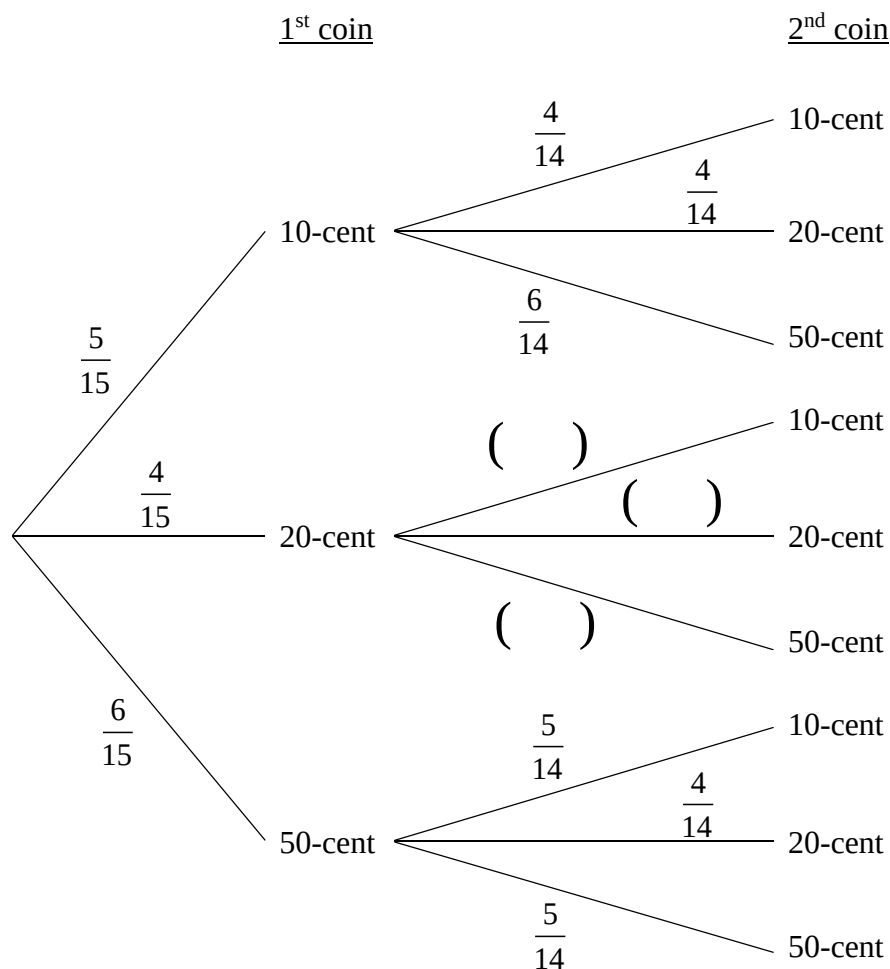
(i) Find the distance BC .

Answer km [3]

(ii) Find the bearing of A from C .

Answer [2]

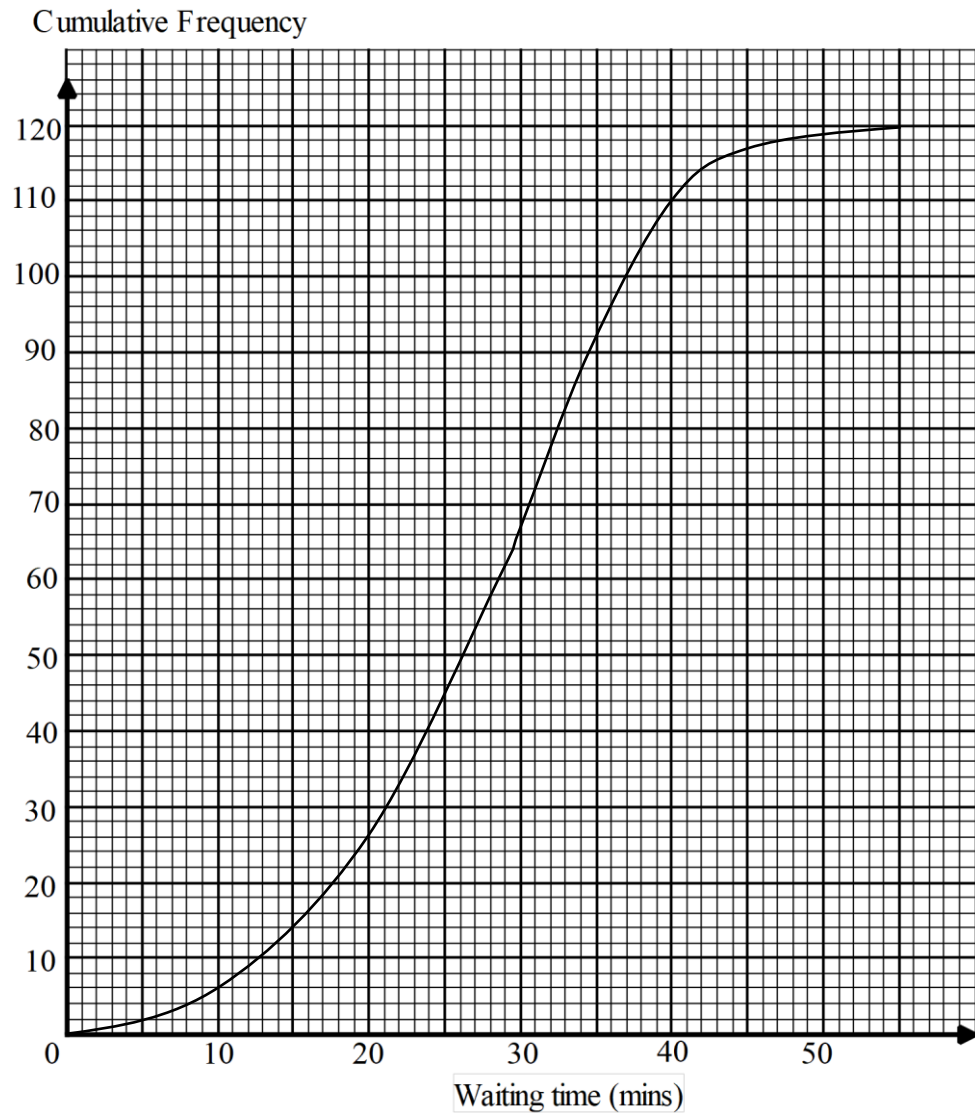
- 12 (a)** Alex has five 10-cent coins, four 20-cent coins, and six 50-cent coins. He picks 2 coins one after another without replacement. The following tree diagram shows the possible outcomes.



- (i) Complete the tree diagram. [1]
- (ii) Find the probability that the two coins add up to \$0.60.

Answer [2]

- (b) 120 customers were queuing at a restaurant and their waiting time were recorded. The results are shown in the cumulative frequency diagram.



- (i) Use the diagram to estimate the median waiting time.

Answer mins [1]

- (ii) Use the diagram to estimate the interquartile range.

Answer mins [1]

- (iii) 28 customers waited more than p minutes.
Find the value of p .

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

- (c) The waiting time of 50 customers at a different restaurant is recorded in the table below.

Waiting time (x mins)	$30 < x \leq 35$	$35 < x \leq 40$	$40 < x \leq 45$	$45 < x \leq 50$	$50 < x \leq 55$
Number of customers	10	16	13	7	4

- (i) Find the estimated mean waiting time.

Answer $\dots\dots\dots$ mins [1]

- (ii) Find the estimated standard deviation.

Answer $\dots\dots\dots$ mins [1]

Mark scheme

2023 4N Prelim Paper 1

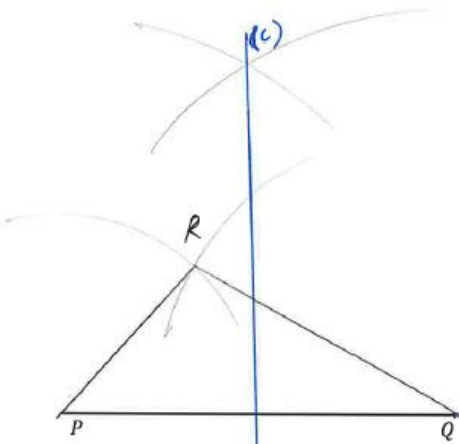
Qn	Answer	Marks
1a)	$\frac{11.2 \times 3}{8.2 - 4.7}$ $= 9.6$ (Accept $\frac{48}{5}$)	B1
1b)	$\sqrt{5.1 + 3.75^2}$ $= 4.4$	B1
2a)	0.31 $\dot{2}$	B1
2b)	21	B1
2c)	$\frac{5}{7}, 21, \sqrt{64}, 0.31\dot{2}$	B1 (all correct)
3)	$-4x \geq 73$ $x \geq \frac{-73}{4}$ $x \leq -18.25$ The largest integer is -19 .	M1 A1
4a)	$x^2 + 10x + 21$ $= x^2 + 10x + \left(\frac{10}{2}\right)^2 - \left(\frac{10}{2}\right)^2 + 21$ $= (x + 5)^2 - 4$ $a = 5$ $b = -4$	M1 A1 A1
4b)	$x^2 + 10x + 21 = 0$ $(x + 5)^2 - 4 = 0$ $(x + 5)^2 = 4$ $(x + 5) = 2 \quad \text{or} \quad (x + 5) = -2$ $x = -3 \quad \text{or} \quad x = -7$	M1 A1, A1
5a)	9 students	B1
5b)	Number of students with at least \$5 of average daily pocket money = 18 Required probability = $\frac{18}{50}$ $= \frac{9}{25}$	B1

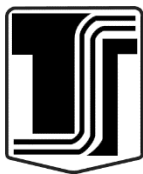
6a)	$\frac{250}{4} = 62.5$ $Maximum\ number\ of\ cupcakes = 62 \times 24$ $= 1488$ $Amount = 1488 \times 1.80$ $= 2678.40$	M1 M1 A1												
6b)	Amount of eggs used = 62×4 $= 248$ Percentage of eggs not used = $\frac{2}{250} \times 100$ $= 0.8\%$	M1 A1												
6c)	Butter: Flour and Milk $= 115: 180 + 120$ $= 115: 300$ $= 23: 60$	M1 A1												
7a)	Speed at AB $\frac{15}{10}$ $= 1.5m/s$ Speed at CD $\frac{10}{10}$ $= 1m/s$ Hence, the statement is incorrect. It is travelling faster at AB .	M1 A1												
7b)	During BC . Duration = 10s.	B1												
7c)	The electric toy car is making a u-turn to return back to the original position.	B1												
7d)	Average speed $= \frac{total\ distance}{total\ time}$ $= \frac{50}{50}m/s$ $= 1m/s$	M1 A1												
8a)	<table><tr><td>2</td><td>1050</td></tr><tr><td>3</td><td>525</td></tr><tr><td>5</td><td>175</td></tr><tr><td>5</td><td>35</td></tr><tr><td>7</td><td>7</td></tr><tr><td>1</td><td></td></tr></table> $1050 = 2 \times 3 \times 5 \times 5 \times 7$ $x = 1$ $y = 2$	2	1050	3	525	5	175	5	35	7	7	1		 B1 B1
2	1050													
3	525													
5	175													
5	35													
7	7													
1														

8b)	$1050k = 2 \times 3 \times 5 \times 5 \times 7 \times k$ $k = 2 \times 3 \times 7$ $= 42$	B1
8c)	$H.C.F = 2 \times 5 \times 5 \times 7$ $= 350$	M1 A1
9)		B2 (shape, size)
10a)	$p = \frac{102}{2}$ $= 51 \text{ cm}$	B1
10b)	$q = 75^\circ$	B1
10c)	$r = 180 - 60 - 75$ $= 45^\circ \quad (\text{sum of angles in a triangle})$	M1 A1
11a)		B1-Shape B1-Points
11b)	Line of symmetry is $x = 1$.	B1
11c)	Coordinates = $(1, -9)$	B1
12a)	$\text{Deposit} = \frac{10}{100} \times 6200$ $= \$620$	M1 A1
12b)	Let the monthly payment be x . $620 + 12x = 7400$ $x = 565$ Each monthly payment is \$565.	M1 A1

13a)	$y + 2x = 18$ $y = -2x + 18$ Let $x = 0$ Coordinates of $A = (0, 18)$ Let $y = 0$ Coordinates of $B = (9, 0)$	B1 B1														
13b)	Distance = $\sqrt{(8 - 0)^2 + (20 - 0)^2}$ = 21.5units	M1 A1														
14)	Gradient of $AB = \frac{1}{2}$ $\frac{7-0}{p+2} = \frac{1}{2}$ $14 = p + 2$ $p = 12$	M1 A1														
15)	Area = $\frac{1}{2}(38 + 48)(25)$ = $1075m^2$	M1 A1														
16a)	$x^2 + x - 6$ = $(x - 2)(x + 3)$	B1														
16b)	$50y^2 - 18$ = $2(25y^2 - 9)$ = $2(5y - 3)(5y + 3)$	M1 A1														
17a)	$\frac{3p}{q} = 5r + 1$ $3p = 5rq + q$ $p = \frac{5rq+q}{3}$	B1														
17b)	$\frac{1}{x^2-9} + \frac{2}{x+3}$ = $\frac{1}{x^2-9} + \frac{2x-6}{x^2-9}$ = $\frac{2x-5}{x^2-9}$	M1 A1														
18a)	<table border="1"><thead><tr><th>Brand</th><th>Colour</th></tr></thead><tbody><tr><td>X</td><td>R</td></tr><tr><td>X</td><td>B</td></tr><tr><td>X</td><td>G</td></tr><tr><td>Y</td><td>R</td></tr><tr><td>Y</td><td>B</td></tr><tr><td>Y</td><td>G</td></tr></tbody></table>	Brand	Colour	X	R	X	B	X	G	Y	R	Y	B	Y	G	A1 A1
Brand	Colour															
X	R															
X	B															
X	G															
Y	R															
Y	B															
Y	G															

18b)	$P(\text{Ali chooses a blue pen}) = \frac{2}{6}$ $= \frac{1}{3}$	B1
19a)	- Inconsistent scale on vertical axis. - Missing years represented. - Inaccurate title description.	B1 (any of these)
19b)	- The inconsistency may have caused viewers to have the perception that the number of visitors have doubled. - The difference between the years. Not all the years are shown. Attendance in the missing years could have been higher. - The title is biased and does not allow reader to make their own judgement.	B1 (any of these)

20a)	 (b) Measure angle QPR. (c) Construct the perpendicular bisector of PQ. Answer _____	B1 [PR], B1 [QR]
20b)	Angle $QPR = 48^\circ$	B1
20c)	As above diagram	B1



TAMPINES SECONDARY SCHOOL

Secondary Four Normal Academic
PRELIMINARY EXAMINATION 2023

NAME

MARKING SCHEME

CLASS

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REGISTER
NUMBER

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MATHEMATICS SYLLABUS A**4045/02****Paper 2****7 August 2023****2 hours**

Candidates answer on Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and register 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.

Section AAnswer **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 number of 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.

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

1a	$\frac{245.5 \times 0.5391}{5.49}$ $= \frac{200 \times 0.5}{5}$ $= \frac{100}{5}$ $= 20$	M1 A1 – no mark if no/wrong working
b	0.000015 $= 1.5 \times 10^{-5}$	B1
ci	5.45×10^6	B1
cii	$\frac{7.3 \times 10^8}{5.45 \times 10^6}$ $= 133.945$ $= 134 \text{ m}^2/\text{person}$	B1 – no ecf. Accept 1.34×10^2

2a	$\frac{125 + x}{2} = 126$ $125 + x = 252$ $x = 127$ $p = 7$	M1 A1. Don't accept 127
b	$142 - 117 = 25 \text{ cm}$	B1
c	$\frac{25}{100} \times 12 = 3$ 3 students has height less than x cm $x = 125$	M1 A1

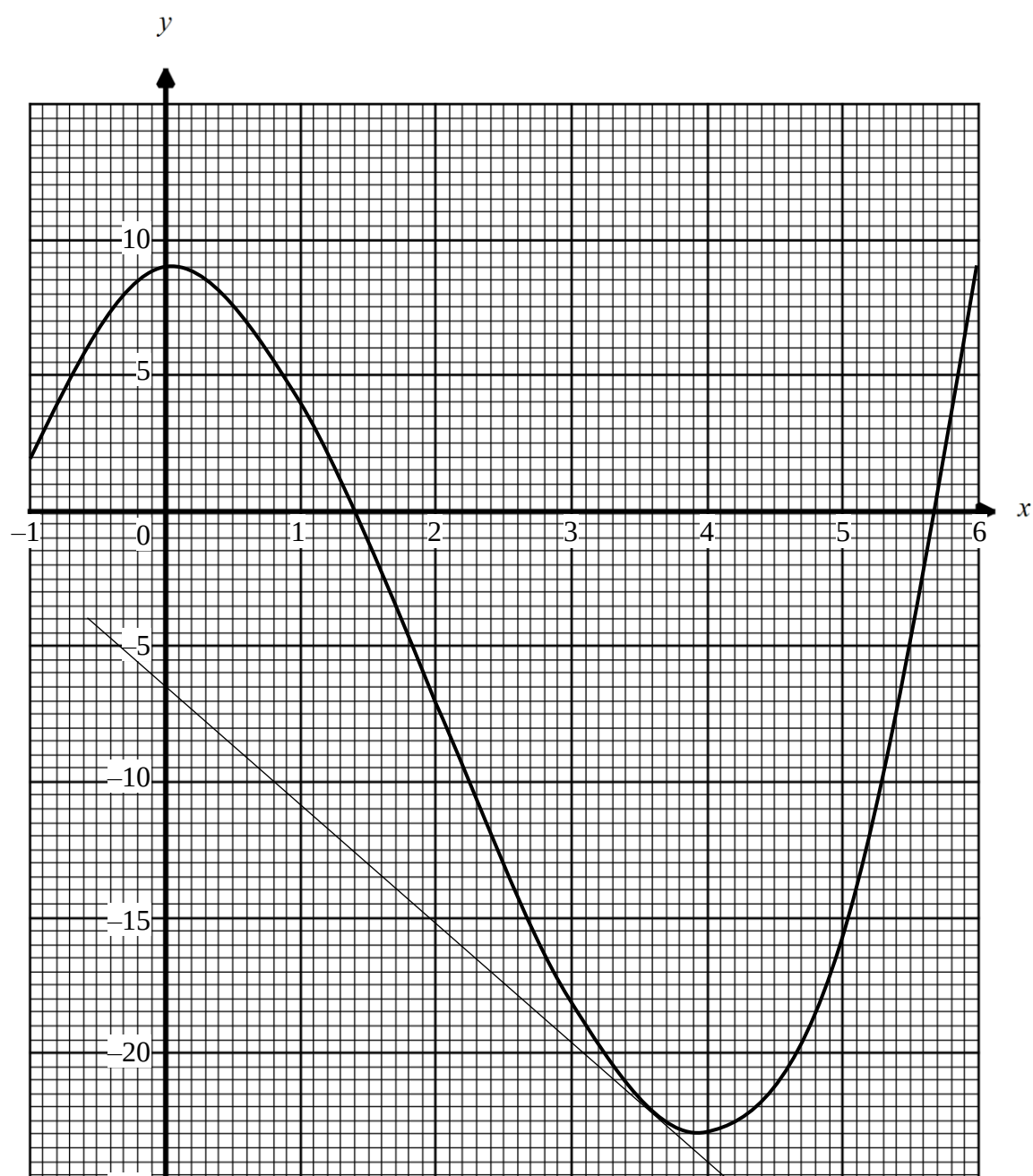
3a	3.2 cm : 8 km 1 cm : 2.5 km 1 : 250 000	M1 A1
b	$1 \text{ cm}^2 : 6.25 \text{ km}^2 \text{ OR } 10.24 \text{ cm}^2 : 64 \text{ km}^2$ $\text{Area on the map} = \frac{30}{6.25} \text{ OR } \frac{30}{64} \times 10.24$ $= 4.8 \text{ cm}^2$	M1 for squaring both sides A1

5a	$QS^2 = 200^2 + 210^2$ $QS^2 = 84100$ $QS = 290 \text{ m}$	M1 A1
b	$\tan \angle SQR = \frac{200}{210}$ $\angle SQR = 43.6^\circ$	M1 A1

6a	Area of segment $= \frac{1}{2}(5)^2(2.15) - \frac{1}{2}(5)(5)\sin(2.15)$ $= 26.875 - 10.461235$ $= 16.4 \text{ cm}^2$	M2 – accepts A1
b	Area of circle $= \pi(5)^2$ $= 78.54 \text{ cm}^2$ $\% = \frac{(a)}{78.54} \times 100\%$ $= 20.9\%$	M1 M1 ecf – allows using rounded of 16.4 A1 no ecf

7ai	$2p + 1$	B1
ii	$2p - 1 + 2p + 1$ $= 4p$	B1 ecf
iii	$4p$ is a multiple of two OR $4p$ can be divided by 2. Hence, even.	B1
b	$2x^2 + 6x - 5 = 0$ $x = \frac{-6 \pm \sqrt{6^2 - 4(2)(-5)}}{2(2)}$ $= \frac{-6 \pm \sqrt{76}}{4}$ $= -3.68 \text{ or } 0.68$	M2 (M1 for $\sqrt{6^2 - 4(2)(-5)}$) A1
c	$4x + 3y = 4 \dots (1)$ $2x - 5y = -11 \dots (2)$ $4x - 10y = -22 \dots (3)$ $(1) - (3)$ $13y = 26$ $y = 2$ $x = -\frac{1}{2}$	M1 – showing any suitable substitution or elimination method A2

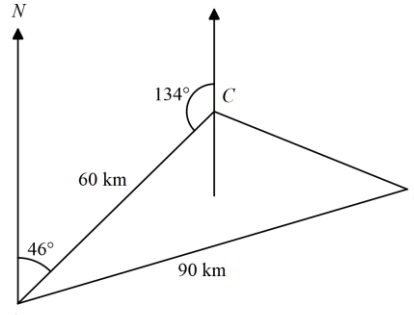
8	a	x	-1	0	1	2	3	4	5	6	
		y	2 B1	9	4	-7	-18	-23	-16 B1	9	



b	5 to 6 points plotted correctly 7 or more points plotted correctly Correct shape and turning points Smooth curve, no multiple line, no crooked lines and curve cuts through all marked points	B1 ecf B1 ecf B1
c	-5.25 ± 1.5	B1 – tangent B1 – Gradient. Accept students' answers if curve, tangent, formula are accurate.
d	(4, –23)	B1 – no range, exact answer
e	Accepts any $k = 2$ to 10, including decimals	B1

9a	62.5% - \$881 $100\% - \frac{100}{62.5} \times 881$ = \$1409.60	M1 A1
b	2-year plan $881 + 130.12 \times 24$ = \$4003.88 SIM only 1-year plan $2253 + 45.42 \times 24$ = \$3343.08 Disagree. Sim-only plan is cheaper and have more voice call time and SMS	workings (must be for 24 months) M1 M1 A1 – Disagree as Sim only cheaper
c	Excess charge $22 \times \$10.80 = \237.60 Total monthly subscription = $130.21 + 237.60$ = \$367.81	M1 A1
d	Percentage decrease	M1

Section B (8 marks)

11a	Angle $AOC = 124^\circ$ $\angle$ at centre = $2 \angle$ s at circumf Angle $ADC = 118^\circ$ $\angle$ s in opp seg OR angles at a point + $\angle$ at centre = $2 \angle$ s at circumf Angle $BAO = 28^\circ$ Tan perp rad + alt angle	B1 B1 B1 for either tan perp rad or alt angle
bi	Angle $CAB = 74 - 46$ $= 28^\circ$ $BC^2 = 60^2 + 90^2 - 2(60)(90)\cos 28^\circ$ $BC^2 = 2164.166$ $BC = 46.5 \text{ km}$	M1 M1 – ecf A1
ii	 Angle $ACB = 180 - 46$ $= 134^\circ$ Bearing of A from C = $360 - 134$ $= 226^\circ$	M1 A1

12ai	$\frac{5}{14}, \frac{3}{14}, \frac{6}{14}$	B1
ii	$\left(\frac{5}{15} \times \frac{6}{14}\right) + \left(\frac{6}{15} \times \frac{5}{14}\right)$ $= \frac{2}{7}$	M1 A1
bi	28.5 mins	B1 – do not accept whole numbers
ii	$34.5 - 21$ $= 13.5$ mins	B1 – do not accept whole numbers
iii	$120 - 28 = 92$ customers waited less than p min $p = 35$ mins	B1
ci	40.4 mins	B1
ii	5.92	B1

--- End of Paper ---