NA

TAMPINES SECONDARY SCHOOL

Secondary Four Normal Academic
PRELIMINARY EXAMINATION 2023

NAME **MARKING SCHEME**

CLASS | | | | **REGISTER NUMBER** | | |

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.

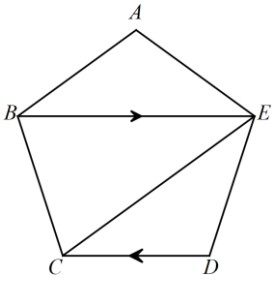
Section A (62 marks)

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 $=1.5\times10^{-5}$	B1
ci	5.45×10^{6}	B1
cii	$\frac{7.3\times10^{8}}{5.45\times10^{6}}$ = 133.945 = 134 m^2/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 cm	B1
c	$\frac{25}{100}\times12=3$ 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 cm^2 : 6.25 km^2 OR 10.24 cm^2 : 64 km^2 Area on the map = $\frac{30}{6.25}$ OR $\frac{30}{64}\times10.24$ = 4.8 cm^2	M1 for squaring both sides A1

4ai	Angle $BAE = \dfrac{(5-2)\times 180°}{5}$ $= 108^o$	M1 for $(5-2)\times 180°$ A1
ii	Angle $DCE = \dfrac{180° - 108°}{2}$ $= 36^o$	B1
iii	Angle BEC $= 108 - 36 - 36$ $= 36^o$ OR Angle BEC = angle ECD $= 36^o$ (alt angles)  	B1
b	$3x + 12 + 4x - 21 = 167 - x$ $8x = 176$ $x = 22$ OR Angle ACB = $180 - (3x + 12) - (4x - 21) = 180 - (167 - x)$ $180 - 3x - 12 - 4x + 21 = 13 + x$ $189x - 7x = 13 + x$ $176 = 8x$ $x = 22$	M1 A1

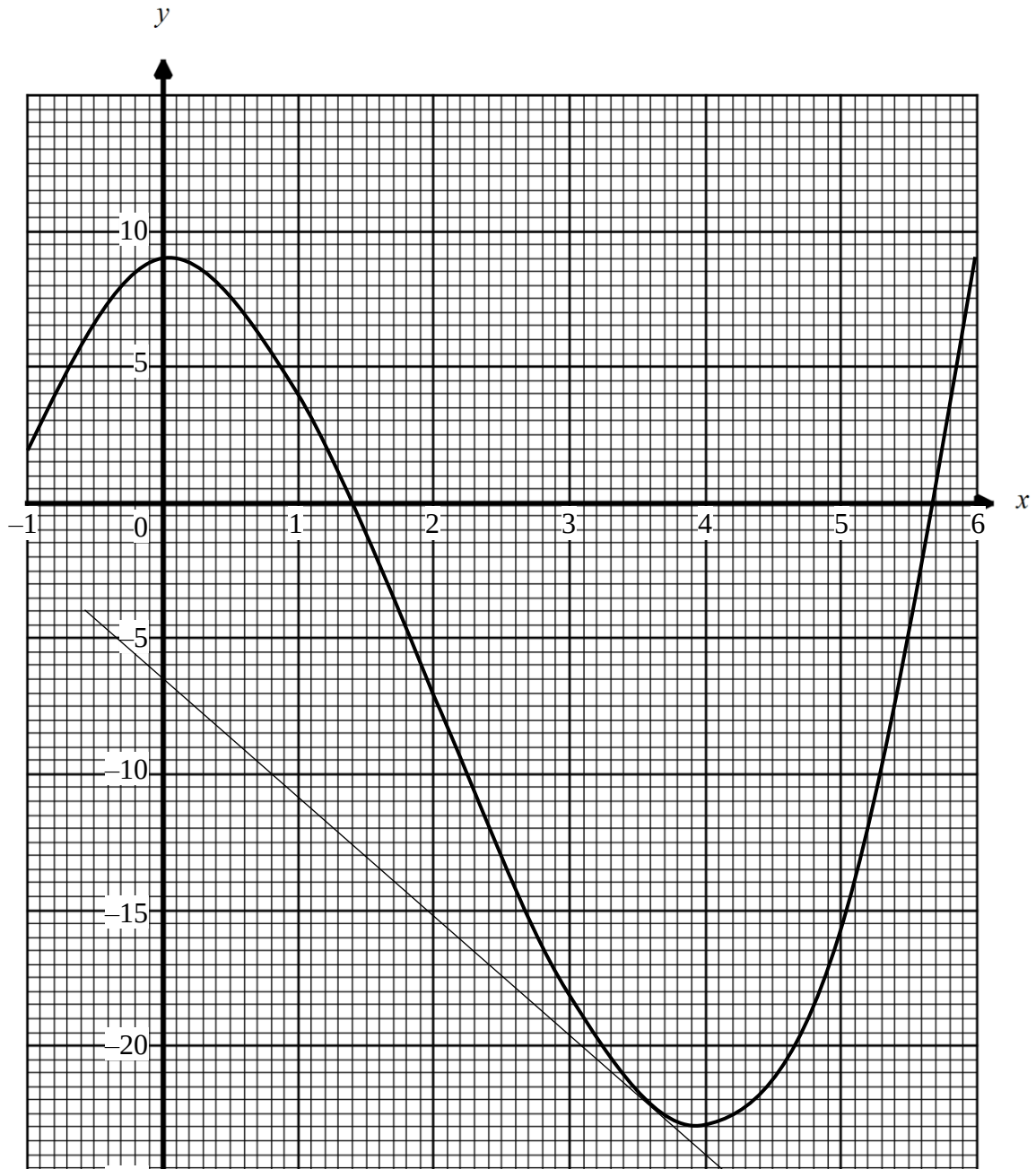
5a	$QS^2 = 200^2 + 210^2$ $QS^2 = 84100$ $QS = 290$ m	M1 A1
b	$\tan \angle SQR = \frac{200}{210}$ $\angle SQR = 43.6°$	M1 A1

6a	Area of segment $= \frac{1}{2}(5)^2(2.15) - \frac{1}{2}(5)(5)\sin(2.15)$ $= 26.875 - 10.461235$ $= 16.4$ cm^2	M2 – accepts A1
b	Area of circle = $\pi(5)^2$ $= 78.54$ 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	$2x^2 + 6x - 5 = 0$ $x = \frac{-6 \pm \sqrt{6^2 - 4(2)(-5)}}{2(2)}$ $= \frac{-6 \pm \sqrt{76}}{4}$ $= -3.68$ or 0.68	M2 (M1 for $\sqrt{6^2 - 4(2)(-5)}$) A1
c	$4x + 3y = 4 - - - (1)$ $2x - 5y = -11 - -(2)$ $4x - 10y = -22 - (3)$ $(1) - (3)$ $13y = 26$ $y = 2$ $x = -\frac{1}{2}$	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



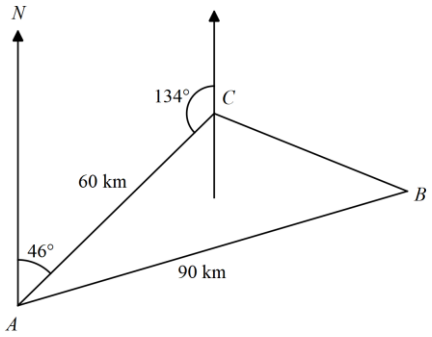
b	5 to 6 points plotted correctly 7 or more points plotted correctly Correct shape and turning points Smooth curve, no multiple line, no crooked lines and curve cuts through all marked points	B1 ecf B1 ecf B1
c	-5.25 ± 1.5	B1 – tangent B1 – Gradient. Accept students' answers if curve, tangent, formula 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

	$= \frac{130.21 - 115}{130.21} \times 100\%$ $= 11.7\%$	A1

10a	$E = kT^2$ $320 = k(4)^2$ $k = \frac{320}{16}$ $= 20$ $E = 20T^2$	M1 or find $k = 20$ A1
b	$E = 20T^2$ $E = 20(10)^2$ $= 2000$	 B1 – ecf
c	$E = 20T^2$ $180 = 20T^2$ $T^2 = \frac{180}{20}$ $T^2 = 9$ $T = 3$	 M1 – ecf A1 – ecf

Section B (8 marks)

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