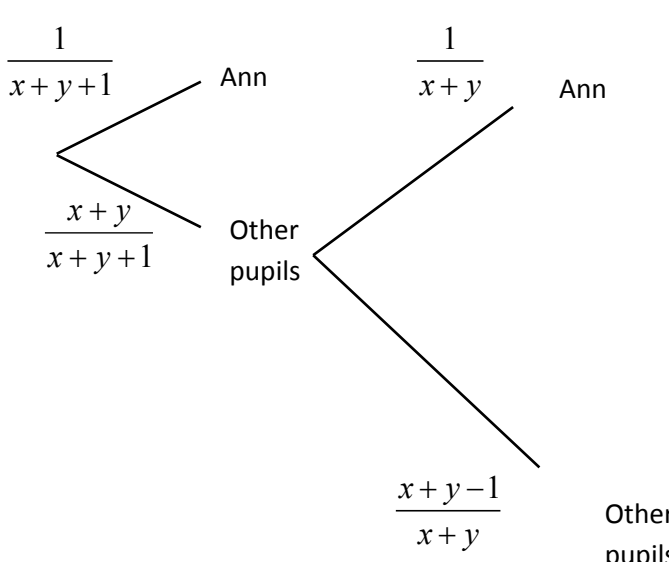


Marking Scheme for Sec 4E/5N EMath Prelim P2 (2025)

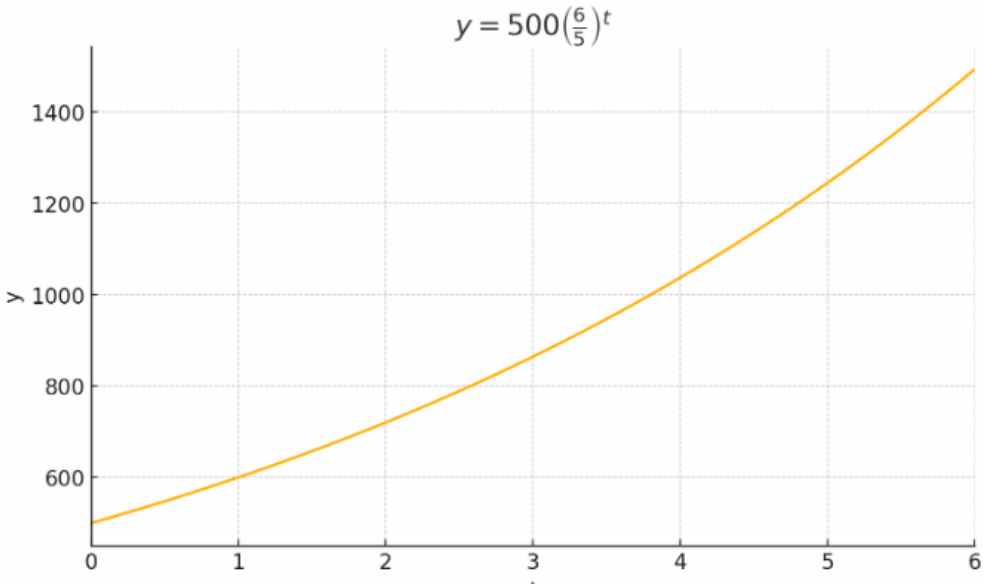
1a	$\frac{5x^2 - 20}{5x^2 + 5x - 10} = \frac{5(x^2 - 4)}{5(x^2 + x - 2)}$ $= \frac{(x-2)(x+2)}{(x+2)(x-1)}$ $= \frac{x-2}{x-1}$	M1 A1
1b	$\frac{4a^2b}{21c^3} \div \frac{12a}{7c}$ $= \frac{4a^2b}{21c^3} \times \frac{7c}{12a}$ $= \frac{ab}{9c^2}$	M1 A1
1c	$\left(\frac{27a^{12}}{b^9} \right)^{-\frac{1}{3}}$ $= \left(\frac{b^9}{27a^{12}} \right)^{\frac{1}{3}}$ $= \frac{b^3}{3a^4}$	M1 A1
1d	$\frac{2y(1-y)+1}{3} = 1 - \left(\frac{8}{3} - y \right)$ $2y - 2y^2 + 1 = 3 \left(-\frac{5}{3} + y \right)$ $2y^2 - 2y - 1 - 5 + 3y = 0$ $2y^2 + y - 6 = 0$ $(2y-3)(y+2) = 0$ $y = \frac{3}{2} \text{ or } -2$	M1 M1 A1 A1
2a	The range of time taken = $64 - 21 = 43$ min	A1
2b	$\text{The median time taken} = \frac{33+34}{2} = 33.5 \text{ min}$	A1
2c	$\text{The mean time taken}$ $= \frac{21+21+22+23+24+25+27+30+33+34+37+38+42+46+47+51+59+64}{18}$	

	$= 35.777 = 35.8 \text{ min}$	B1
2d	Let time taken that one of the students took to complete the survey be x	
	$\frac{(35.777)(18) + x + x}{20} = \frac{1.4}{100} \times 35.8 + 35.8$ $644 + 2x = 20 \times 36.3012$ $x = 41.012 \text{ min}$ $x = 41 \text{ min}$ (to nearest minutes)	M1 M1 A1
3a	$\frac{450}{x}$	A1
3b	$\frac{450}{x - 20}$	A1
3c	$\frac{450}{x - 20} - \frac{450}{x} = \frac{40}{60}$ $\frac{450x - 450(x - 20)}{x(x - 20)} = \frac{2}{3}$ $27000 = 2x(x - 20)$ $2x^2 - 40x - 27000 = 0$ $x^2 - 20x - 13500 = 0 \text{ (shown)}$	M1 M1 A1
3d	(to 2 dp)	B1 B1 A1 A1
4ai	$\mathbf{A} = \begin{pmatrix} 25 & 33 & 15 \\ 19 & 17 & 37 \end{pmatrix} \begin{pmatrix} 45 \\ 39 \\ 32 \end{pmatrix}$	
	$= \begin{pmatrix} 25 \times 45 + 33 \times 39 + 15 \times 32 \\ 19 \times 45 + 17 \times 39 + 37 \times 32 \end{pmatrix}$	
	$= \begin{pmatrix} 2892 \\ 2702 \end{pmatrix}$	A1

4aii	A represents the total selling prices for all chocolate cakes, strawberry cakes and marble cakes of Store M and Store N respectively.	A1
4aiii	$\text{Matrix } \mathbf{B} = \begin{pmatrix} 25 & 33 & 15 \\ 19 & 17 & 37 \end{pmatrix} \begin{pmatrix} 40 \\ 34 \\ 26 \end{pmatrix} = \begin{pmatrix} 2512 \\ 2300 \end{pmatrix}$	A1
4aiv	$\mathbf{C} = \begin{pmatrix} 1 & 1 \end{pmatrix} \left(\begin{pmatrix} 2892 \\ 2702 \end{pmatrix} - \begin{pmatrix} 2512 \\ 2300 \end{pmatrix} \right)$ $= \begin{pmatrix} 1 & 1 \end{pmatrix} \begin{pmatrix} 380 \\ 402 \end{pmatrix} = \782	A1
4av	C represents the total profit of selling the three cakes by both shops.	A1
4bia	$PS + SR = PQ + OR$ $b + SR = a + 3PS$ $SR = a + 3b - b$ $SR = a + 2b$	A1
4bib	$SM = \frac{1}{2} SR$ $SM = \frac{a + 2b}{2}$	A1
4bic	$PM = PS + SM$ $PM = b + \frac{a}{2} + \frac{2b}{2}$ $PM = \frac{a}{2} + 2b$	A1
4bid	$PT = \frac{2}{5} PM$ $PT = \frac{2}{5} \left(\frac{a}{2} + 2b \right)$ $PT = \frac{1}{5} a + \frac{4}{5} b$	A1
4bii	$PQ + QT = PT$ $QT = PT - PQ$ $QT = \frac{a}{5} + \frac{4}{5} b - a = \frac{4}{5} b - \frac{4}{5} a$ $QT = \frac{4}{5} (b - a)$ $TS + SM = TM$ $TS = TM - SM$ $TS = 2 \left(2 \left(\frac{a}{2} + 2b \right) - \left(\frac{a}{2} + 2b \right) \right) = 2 \left(\frac{a}{2} + 2b \right) = a + 4b$	

		B1
		B1
		A1
5a	1st chosen pupil 2nd chosen pupil 	A1 A1 A1
5b	$\text{P(Ann is the second candidate)} = \frac{1}{x+y+1} + \left(\frac{x+y}{x+y+1} \right) \left(\frac{1}{x+y} \right)$	M1
	$= \frac{2}{x+y+1}$	A1
5c	Given $\frac{1}{x+y+1} = \frac{1}{15}$ Therefore, $x+y+1 = 15$ $x+y = 14$	M1

	Given $x = 6$, $6 + y = 14$ $y = 14 - 6 = 8$ The total number of girls = $1 + 8 = 9$.	M1 A1
6ai	Vol of cylinder = $\pi r^2 h = \pi(12)^2(35) = 15833.62697 \text{ cm}^3$	B1
	Vol of cone = $\frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(12)^2 h = 150.7964474h \text{ cm}^3$	
	$15833.62697 + 150.7964474 h = 18850$	
	$h = 20 \text{ cm}$	B1
	Surface area of cylinder = $\pi r^2 + 2\pi rh = \pi(12)^2 + 2\pi(12)(35)$ $= 3091.327 \text{ cm}^2$	M1
	Surface area of cone = $\pi rl = \pi(12)(\sqrt{12^2 + 20^2}) = 879.2868305 \text{ cm}^2$	B1
	Total surface area of the container = $3091.327 + 879.2868 \text{ cm}^2$ $= 3970 \text{ cm}^2$ (3 sig fig)	A1
6aii	Total volume of water in the container when water reaches 30 cm from the vertex of the cone $= (18850 - 15833.62697) + (\pi)(12)^2(30 - 20)$ $= 7540.266451 \text{ cm}^3$	M1 B1
	Time taken = $\frac{7540.266451}{250} = 30.161 = 30.2 \text{ s}$	A1
6bi	I disagree that the area of triangle EBA to the area of triangle ECA is 16 : 25. Because $\frac{\text{area of } \triangle EBA}{\text{area of } \triangle ECA} = \frac{0.5 \times BA \times h}{0.5 \times CA \times h} = \frac{1}{5}$.	M1 A1
6bii	$\frac{\text{area of } \triangle EBA}{\text{area of } \triangle ECA} = \frac{1}{5}$ $\text{area of } \triangle ECA = 15 \text{ cm}^2$	B1
	Since $ACDE$ is a parallelogram, area of $ACDE$ = area of $\triangle ECA \times 2$ $= 15 \times 2 = 30 \text{ cm}^2$	A1
7a	$\cos \angle BAC = \frac{240^2 + 278.9^2 - 380.4^2}{2 \times 240 \times 278.9}$ $\cos \angle BAC = -0.06961$ $\angle BAC = 93.99^\circ = 94.0^\circ$	M1 M1 A1

7b		M1
	$area\ of\ \Delta ABC = \frac{1}{2}(240)(278.9)\sin\angle 93.99^\circ$	M1
	$area\ of\ \Delta ABC = 33386.88 = 33400\ m^2\ (3\ sig\ fig)$	A1
7c	$area\ of\ \Delta ABC = (0.5)(BC)(shortest\ distance\ from\ A\ to\ BC)$	M1
	$Shortest\ distance\ from\ A\ to\ BC = \frac{33386.88 \times 2}{380.4} = 175.5356 = 176\ m$	B1
	$\tan(\text{greatest angle of depression}) = \frac{24}{175.5356}$	M1
	Greatest angle of depression = $7.785^\circ = 7.79^\circ$	A1
8a	$p = 500$	A1
8b		
	All points plotted correctly	B2
	OR 4 points plotted correctly	B1
	Smooth curve	B1
8ci	946 (accept 940-960)	A1
8cii	5.03h (accept 4.9 to 5.1)	A1
8di		

	Correct tangent	B1
	Gradient is 189	A1
8dii	The gradient represents the rate of bacteria growth after 4 hours.	A1
8e	$y = 500\left(\frac{6}{5}\right)^t$ $\left(\frac{6}{5}\right)^t = \frac{y}{500} \dots\dots\dots(1)$ $t - 10\left(\frac{6}{5}\right)^t + 20 = 0$ $\left(\frac{6}{5}\right)^t = \frac{t+20}{10} \dots\dots\dots(2)$ $(1) = (2)$ $\frac{y}{500} = \frac{t+20}{10}$ $y = 50t + 1000$	M1 B1

	Correct straight line drawn.	B1
	$t = 5.03\text{h}$ (accept 4.9 to 5.1)	A1
9a	Cost for 40 paper plates $= \$ \frac{7.52 \times 4}{3.32} = \9.06	B1
9b	Minimum Total Cost in RM $= RM(7.52 \times 4 + 4.50 \times 4 + 3.98 + 10)$ $= RM62.06$	B1
	Minimum Total Cost in S\$ $= \$ \frac{62.06}{3.32} = 18.69$	A1
9c	<u>Pizza Hut</u>	
	Total cost before discount $= \$34.30 \times 14(B1) + \$1.80 \times 40 + 3.50 = \555.70	B1
	Total cost after discount $= \$555.70 \times 0.95 = \$527.915 = \$527.92$	B1
	<u>Domino's Pizza</u>	
	Total cost	B1
	<u>GoPizza</u>	
	Total cost	B1
	Total cost including disposable items	B1
	The most cost-effective option is to purchase pizza from Pizza Hut and disposable items from Malaysian website with a total cost of \$546.61	A1