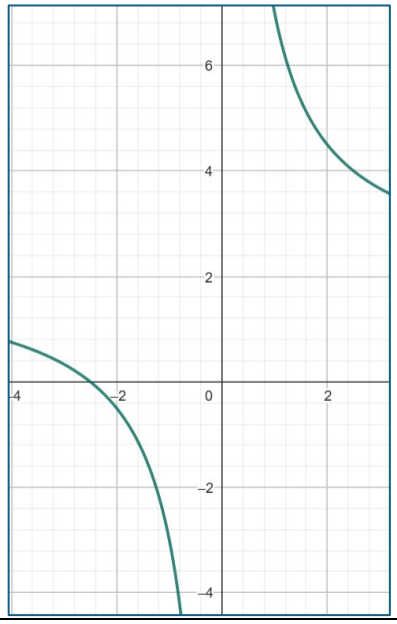
Ngee Ann Secondary School
Secondary 4&5 Elementary Mathematics-O
2025 Prelim paper 2
Marking Scheme

Qn No.	Qn Part	Solutions	Marks (Remarks)	Total
1	(a)(i)	$x=\frac{3h^2(y+b)}{b}-1$ $2=\frac{3h^2(0+5)}{5}-1$ $3=3h^2$ $h^2=1$ $h=\pm 1$	M1: substitution A1: both answers	[2]
	(a)(ii)	$x=\frac{3h^2(y+b)}{b}-1$ $xb=3h^2(y+b)-b$ $xb=3h^2y+3h^2b-b$ $xb+b-3h^2b=3h^2y$ $b(x+1-3h^2)=3h^2y$ $b=\frac{3h^2y}{x+1-3h^2}$	M1: Multiply denominator throughout M1: Grouping and factorising b A1	[3]
	(b)	$6x-3y=16---(1)$ $9x+2y=11---(2)$ $(1)\times 2$ $12x-6y=32$ $(2)\times 3$ $27x+6y=33$ $39x=65$ $x=1\frac{2}{3}$ $6\left(1\frac{2}{3}\right)-3y=16$ $y=-2$	M1: Substitution/ Elimination A1 A1	[3]
	(c)	$\frac{19x+3}{2x^2-5x-3}+\frac{2}{x-3}=7$		

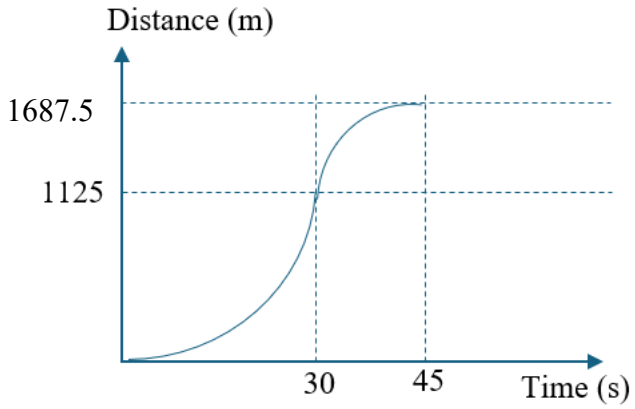
		$\frac{19x+3}{(2x+1)(x-3)}+\frac{2}{x-3}=7$ $19x+3+2(2x+1)=7(2x^2-5x-3)$ $19x+3+4x+2=14x^2-35x-21$ $14x^2-58x-26=0$ $x=\frac{58\pm\sqrt{(-58)^2-4(14)(-26)}}{2(14)}$ $x=-0.41$ or $x=4.55$	M1 M1 A1	[3]
2	**(a)**	5.3	B1	[1]
	(b)	Refer to graph  	B2: correct points plotted B1: any one error B1: Smooth curve	[3]
	(c)	$a = 0.3$; $b = 3.7$	B1, B1	[2]
	(d)	– 1.13 to – 1.39	M1: drawing of correct tangent A1: Within the range	[2]
	(e)	$2+\frac{5}{x}=\frac{5-x}{4}$ $8+\frac{20}{x}=5-x$ $8x+20=5x-x^2$		

		$x^2 + 3x + 20 = 0$ $A = 1$ and $B = -3$	B1, B1	[2]
3	**(a)**	$\frac{1500}{x}$	B1	[1]
	(b)	$\frac{1500}{x-50}$	B1	[1]
	(c)	$\frac{1500}{x-50} - \frac{1500}{x} = 2\frac{1}{2}$ $1500x - 1500(x-50) = \frac{5}{2}(x^2 - 50x)$ $3000x - 3000(x-50) = 5(x^2 - 50x)$ $3000x - 3000x - 150000 = 5x^2 - 250x$ $5x^2 - 250x + 150000 = 0$ $x^2 - 50x + 30000 = 0$ (Shown)	M1: Correct equation AG1	[2]
	(d)	$x^2 - 50x + 30000 = 0$ $(x+150)(x-200) = 0$ $x = 200$ or $x = -150$	M1: factorisation or other method A1, A1	[3]
	(e)	$\frac{200}{\pi} = 63.7$ cm (3 sf)	B1	[1]

4	**(a)(i)**	29 min	B1	[1]
	(a)(ii)	34 – 23 =11 min	M1 A1	[2]
	(a)(iii)	$\frac{80-44}{80}\times 100\%$ $= 45\%$	M1 A1	[2]
	(b)	The new cumulative frequency curve will meet the given curve at the median. However, the gradient of the new cumulative frequency curve from the lower quartile to upper quartile will be less steep as compared to given curve.	B1	[1]
	(c)(i)	$\frac{26}{80}\times\frac{25}{79}=\frac{65}{632}$	B1	[1]
	(c)(ii)	$\frac{26}{80}\times\frac{14}{79}\times 2$ $=\frac{91}{790}$	M1 A1	[2]
5	**(a)(i)**	$\overrightarrow{DB}=16\mathbf{p}-5\mathbf{q}$	B1	[1]
	(a)(ii)	$\overrightarrow{DP}=\frac{1}{4}(16\mathbf{p}-5\mathbf{q})$ $\overrightarrow{AP}=\overrightarrow{AD}+\overrightarrow{DP}$ $=5\mathbf{q}+\frac{1}{4}(16\mathbf{p}-5\mathbf{q})$ $=\frac{15}{4}\mathbf{q}+4\mathbf{p}$	M1 A1	[2]
	(b)	$\overrightarrow{DC}=\frac{4}{3}\overrightarrow{AB}$ $\overrightarrow{BC}=\overrightarrow{BA}+\overrightarrow{AP}+\overrightarrow{DC}$ $=-16\mathbf{p}+5\mathbf{q}+\frac{64}{3}\mathbf{p}$ $=\frac{16}{3}\mathbf{p}+5\mathbf{q}$ $\overrightarrow{BC}=\frac{4}{3}(\frac{15}{4}\mathbf{q}+4\mathbf{p})$	M1: find $\overrightarrow{BC}$	

		$= \frac{4}{3}\overrightarrow{AP}$ Since $\overrightarrow{BC} = \frac{4}{3}\overrightarrow{AP}$, they are parallel.	 A1	 [2]
	(c)	$\measuredangle APB = \measuredangle CBD$ (alternate $\measuredangle$, $AP//BC$) $\measuredangle ABP = \measuredangle CDB$ (alternate $\measuredangle$, $AB//DC$) Triangle APB is similar to Triangle CBD by AA similarity. Triangle APB : Triangle BCD $3^2 : 4^2$ $9 : 16$ OR $\frac{\text{Area of Triangle } APB}{\text{Area of Triangle } BAD} = \frac{3}{4}$ $\frac{\text{Area of Triangle } BAD}{\text{Area of Triangle } BCD} = \frac{3}{4}$ $\frac{\text{Area of Triangle } APB}{\text{Area of Triangle } BAD} \times \frac{\text{Area of Triangle } APB}{\text{Area of Triangle } BAD}$ $= \frac{3}{4} \times \frac{3}{4}$ $= \frac{9}{16}$	B1: Any correct line B1: All correct A1 M1: Any of the ratio M1 A1	 [3]
	(d)	Since Triangle APD and Triangle APB have common height, Triangle APD : Triangle APB $1 : 3$ Triangle APD : Trapezium $ABCD$ $3 : 28$ (Since 16 + 9 +3 = 28) OR	 M1 A1	

		$\frac{\text{Area of Triangle } APD}{\text{Area of Triangle } BAD} \times \frac{\text{Area of Triangle } BAD}{\text{Area of Trapezium } ABCD}$ $= \frac{1}{4} \times \frac{3}{7}$ $= \frac{3}{28}$	M1 A1	 [2]
(6)	**(a)**	$\measuredangle POS = \measuredangle QOR$ (vertically opposite $\measuredangle$) $OS = OR$ (radii of circle) $\measuredangle OSP = \measuredangle ORQ$ (tangent $\perp$ radius) Triangle PSO is congruent to Triangle QRO (ASA). $\measuredangle ORQ = \measuredangle OSP (\tan \perp rad)$ $OQ = OP$ (radii of circle) $OR = OS$ (radii of circle) Triangle PSO is congruent to Triangle QRO (RHS).	B1: For any line B1: All correct	 [2]
	(b)(i)	$QR = \sqrt{8^2 - 4.36^2}$ $= 6.707488353$ Area of triangle: $\frac{1}{2} \times 4.36 \times 6.707488353$ $= 14.6 \text{ cm}^2$ (3 sf)	M1 M1 A1	 [3]
	(b)(ii)	Shaded circular area: $\pi(8)^2 - \pi(4.36)^2$ $= 141.3415101$ $\measuredangle ROQ = \cos^{-1}\left(\frac{4.36}{8}\right)$ $= 0.9944072121$ Area of sector: $\frac{1}{2}(4.36)^2(0.9944072121)$ $= 9.451641669$ Total shaded area: $141.34151 - 2(14.62232461 - 9.451641669) + 2(9.451641669)$ $= 149.9034 \text{ cm}^2$ $= 150 \text{ cm}^2$ (3 sf)	 M1 M1 M1 A1	 [4]

7	**(a)(i)**	$75 \div 30 = 2\frac{1}{2}\ \text{m/s}^2$	B1	[1]
	(a)(ii)	$75 \div 5 = 15$ s	B1	[1]
	(a)(iii)		B1: correct shape for both sections B1: correct values on both axes	[2]
	(b)(i)	For 70 m/s, Time for acceleration: $70 \div 2\frac{1}{2} = 28$ min Time for deceleration: $70 \div 5 = 14$ min Distance covered by 70 m/s $\frac{1}{2} \times 28 \times 70 + \frac{1}{2} \times 70 \times 14 = 1470$ m The <u>plane will be able to decelerate safely</u> if the speed of the aircraft is 70m/s <u>as the distance covered would be less than 1600 m.</u>	M1 M1 M1 A1: Must include comparison with 1600 m	[4]
	(b)(ii)	V_1 would be <u>lower</u> as there are less friction, and the runway is of a fixed length.	B1	[1]
8	**(a)**	Angle *ABD*: $180° - 76° - 50° = 54°$ Bearing of *D* from *B*: $360° - 54° - 76° = 230°$	M1 A1	[2]
	(b)	Let *AX* be the shortest distance.		

		$AX = 55\sin 54°$ $= 44.49593469$ $\tan\theta = \dfrac{10}{44.49593469}$ $\theta = 12.66618°$ $= 12.7°$	M1 M1 A1	[3]
	(c)	$\dfrac{BD}{\sin 76°} = \dfrac{55}{\sin 50°}$ $BD = \dfrac{55\sin 76°}{\sin 50°}$ $= 69.664711$ m Area of park: $\dfrac{1}{2}\times 55\times 69.664711\times\sin 54° + \dfrac{1}{2}\times 30\times 69.664711\times\sin 130$ $= 2350.392187$ $= 2350$ m^2	M1 M1,M1: Area of each triangle A1	[4]
	(d)	$BC = \sqrt{30^2 + 69.664711^2 - 2(30)(69.664711)\cos 130°}$ $= 91.86919365$ m $\dfrac{AD}{\sin 54°} = \dfrac{55}{\sin 50°}$ $AD = \dfrac{55\sin 54°}{\sin 50°}$ $= 58.08531749$ m Perimeter: 55 +30 +91.86919365 +58.08531749 $= 234.9545111$ <u>I disagree with Tony</u> as the perimeter is less than 240m.	M1: Find BC M1: Find AD A1: Need concluding statement with comparsion with 240 m	[3]
9	**(a)**	9880 – 1480 – 10 – 5 = \$8385	B1	[1]

	(b)	Based on lowest rate, 54 000 × 1.280108 = SGD 69 125.83 OR Based on highest rate, 54 000 × 1.31154 = SGD 70 823.16 OR Based on average rate, 54 000 × ((1.280108+1.31154)/2) = SGD 69 974.50	M1 A1	[2]
	(c)	Only Cash Components: Buyer Stamp Duty: 1800 + 180 000×0.02+ 640 000×0.03+ 300 000×0.04 = $36 600 Booking Fee: 0.05 × 1 300 000 = $65 000 Total: 3000 + 500 + 36 600 + 65 000 = $105 100	M1: BSD M1: Booking Fee A1	[3]
	(d)	Assumption: Mr Sim used current account and matured fixed deposit to pay for the condominium. Outstanding amount: 0.95×1 300 000 = $1 235 000 Assuming that the contribution from his June pay is negligible Remaining amount to be covered by Bank loan 1 235 000 – 350 000 – (69 974.50 – 5100) = $820 125.50 Interest over 20 years: $\frac{820125.50\times3.3\times20}{100}$ = $541 282.83	M1: Find loan amount M1: Interest	

		Suggested condo instalment: $\frac{541282.83+820125.50}{20\times12}$ $= \$5672.53$ Loan limit: $0.75\times1\,300\,000 = \$\,975\,000 > \$820\,125.50$ Salary limit: $0.55 \times 9880 = \$5434 < \$5672.53 + 550$ Mr Sim will not secure a bank loan as he does not meet the salary limit.	M1: Instalment M1 M1 A1: correct conclusion with correct LL and SL	[6]