NATIONAL SENIOR CERTIFICATE EXAMINATION
MAY 2025

MATHEMATICS: PAPER II

MARKING GUIDELINES

Time: 3 hours | 150 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

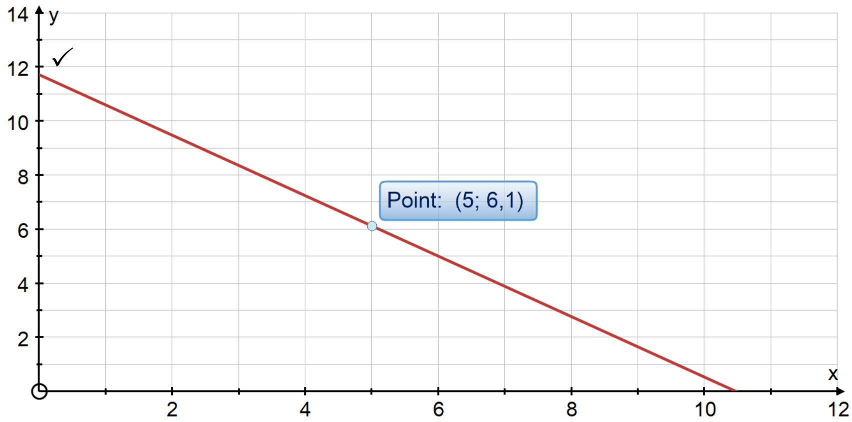
The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

NOTE:

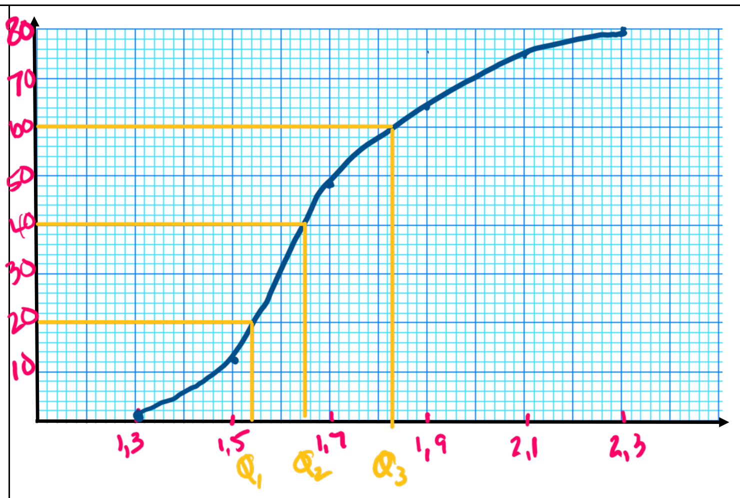
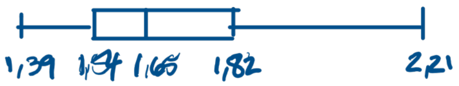
- If a candidate answers the question more than once, only mark the first attempt.
- Continued accuracy applies to all questions.

SECTION A

QUESTION 1

(a)	$y = 11{,}713 - 1{,}118x$	a-value b-value rounding
(b)	$\bar{x} = 5$ $\bar{y} = 6{,}1$  	Line $(5; 6{,}1)$ Y-intercept
(c)	$r = -0{,}946$ very strong negative correlation	r-value comment
(d)	$y = 11{,}713 - 1{,}118(15)$ $= -5{,}0$ Extrapolation/cannot have negative number of people	Value Comment

QUESTION 2

(a)		(1,3; 0) Use of end of interval and not midpoint Correctly plotted points Shape
(b)	 $Q_1 = \pm 1{,}54$; $Q_2 = \pm 1{,}65$; $Q_3 = \pm 1{,}82$	Lowest Highest Quartiles
(c)	Skewed positively/to the right	
(d)	Mean would decrease Median interval would remain the same	

QUESTION 3

(a)	$(t+8)^2+(-4)^2=20$ $(t+8)^2=4$ $t+8=\pm 2$ $t=-6$ of $t\neq -12$	Substitution Simplification Answer
(b) (1) (2)	$A(-8;0)$ $m_{AB}=\frac{0+4}{-8+6}$ $=-2$ $\tan A=-2$ $C\hat{A}B=63,4°$	Co-ordinates of center Gradient Inclination Answer
(c)	$m_{BD}=\frac{1}{2}$ $y=\frac{1}{2}x+c$ $-4=-3+c$ $y=\frac{1}{2}x-1$	Gradient Substitution Answer
(d)	$E(20;\ 0)$ $0=\frac{1}{2}x-1$ $x=2$ $CE=18$ units	Coordinate x-intercept Answer
(e)	area $\Delta ABC=\frac{1}{2}.AC.AB\sin A$ $=\frac{1}{2}.10.\sqrt{20}\sin 63,4°$ $=19,993...$ $=20$ units^2 OR $BC=\sqrt{(2+6)^2+4^2}$ $=\sqrt{80}$ area $\Delta ABC=\frac{1}{2}.b.h$ $=\frac{1}{2}.\sqrt{80}.\sqrt{20}$ $=20$ units^2	Sin-rule (or other) Substitution AC = 10 Answer Area for triangle (or other) Substitution BC = $\sqrt{80}$ Answer

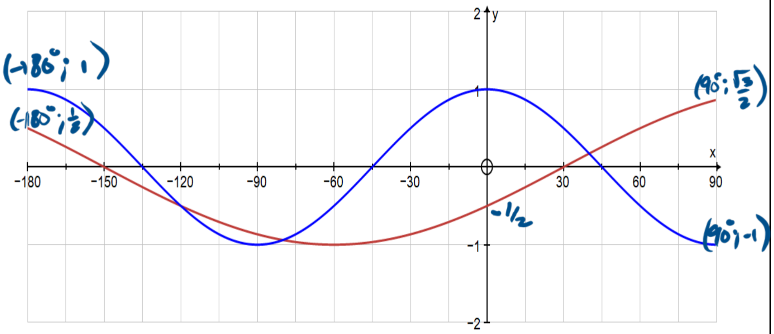
QUESTION 4

(a)(1)	$\hat{B}_1 = x$ OA = OB	Statement and reason
(a)(2)	$\hat{O}_1 = 180° - 2x$ $\angle$s in Δ	Statement and reason
(a)(3)	$\hat{D}_1 = 90° - x$ $\angle$ at centre = 2 x $\angle$ at circ.	Statement Reason
(a)(4)	$\hat{C} = 180° - 2x$ opp $\angle$s cyclic quad	Statement Reason
(b)(1)	$\hat{D}_1 = 55°$ tan– chrd theorem	Statement Reason
(b)(2)	$\hat{C}_2 = 80°$ $\angle$s in Δ $\hat{A} = 100°$ opp $\angle$s in cyclic quad	Statement Statement Reason

QUESTION 5

(a)(1)	$\Delta ADE \equiv \Delta PQR$ SAS	
(a)(2)	$\hat{D} = \hat{Q}$ $\hat{B} = \hat{D}$ DE || BC corr $\angle$s equal $\frac{AB}{AD} = \frac{AC}{AE}$ line parallel one side Δ $\frac{AB}{PQ} = \frac{AC}{PR}$ Δs $\equiv$	Equal angles Parallel lines Reason Ratio Reason
(b)	In ΔDBC and ΔEFC: $\hat{B} = \hat{F} = 90°$ given $\hat{C}$ is common $\Delta DBC \parallel\!\mid \Delta EFC$ 3$\angle$s $\therefore \frac{BC}{DC} = \frac{FC}{EC}$ $BC \cdot EC = FC \cdot DC$	Right angles Common angle Similarity Statement

QUESTION 6

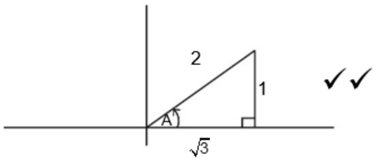
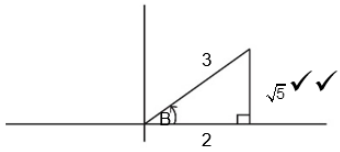
(a)	$\sin(x-30^\circ)=\sin(90^\circ-2x)$ $x-30^\circ=90^\circ-2x+k\cdot 360^\circ$ $3x=120^\circ+k\cdot 360^\circ$ $x=40^\circ+k\cdot 120;\ k\in\mathbb{Z}$ or $x-30^\circ=180^\circ-(90^\circ-2x)+k\cdot 360^\circ$ $-x=120^\circ+k\cdot 360^\circ$ $x=-120^\circ+k\cdot 360^\circ;\ k\in\mathbb{Z}$ $x=-120^\circ;\ -80^\circ;\ 40^\circ$	Co-ratio First solution and period Second solution and period Final answer
(b)		End-points y-intercepts Shape x-intercepts
(c)	$x\in(-180^\circ;-150^\circ)\cup(-135^\circ;-45^\circ)\cup(30^\circ;45^\circ)$ End points of intervals excluded	Intervals with brackets

SECTION B

QUESTION 7

(a)	$\dfrac{\sin(90°-\beta)\cdot\sin(-\beta)}{\cos(360°-\beta)\cdot\tan(-180°-\beta)}$ $=\dfrac{\cos\beta\cdot-\sin\beta}{\cos\beta\cdot-\tan(\beta)}$ $=\sin\beta\div-\dfrac{\sin\beta}{\cos\beta}$ $=-\cos\beta$	$\sin(90°-\beta)$ $\sin(-\beta)$ $\cos(360°-\beta)$ $\tan(-180°-\beta)$ $\tan\beta=\dfrac{\sin\beta}{\cos\beta}$ Answer ✓
(b)(1)	$\text{LHS}=\dfrac{\cos A+\sin A}{\cos A-\sin A}-\dfrac{\cos A-\sin A}{\cos A+\sin A}$ $=\dfrac{(\cos A+\sin A)^2-(\cos A-\sin A)^2}{(\cos A+\sin A)(\cos A-\sin A)}$ $=\dfrac{\sin^2 A+\cos^2 A+2\sin A\cos A-(\sin^2 A+\cos^2 A-2\sin A\cos A)}{\cos^2 A-\sin^2 A}$ $=\dfrac{1+2\sin A\cos A-(1-2\sin A\cos A)}{\cos^2 A-\sin^2 A}$ $=\dfrac{4\sin A\cos A}{\cos 2A}$ $=\dfrac{2\sin 2A}{\cos 2A}$ $=\text{RHS}$	LCD Numerator Expansion $\sin^2 A+\cos^2 A$ Cos2A Sin2A
(b)(2)	$\cos A=\pm\sin A$ $\tan A=\pm 1$ Denominators $\hat{A}=\pm 45°+k\cdot 180°;\ k\in\mathbb{Z}$	Denominator = 0 tan A Answer

QUESTION 8

(a)(1)	$\cos 2\theta = 2\cos^2\theta - 1$ $\frac{3}{5} = 2\cos^2\theta - 1$ $\frac{8}{5} = 2\cos^2\theta$ $\frac{4}{5} = \cos^2\theta$ $\cos\theta = +\frac{2}{\sqrt{5}}$	Substitution Simplification Answer Discard negative
(c)	$\cos\hat{A} = \frac{\sqrt{3}}{2}$ $\cos\hat{B} = \frac{2}{3}$  $\cos\hat{C} = \cos[180 - (A + B)]$ $= -\cos(A + B)$ $= -[\cos A \cos B - \sin A \sin B]$ $= -\left[\frac{\sqrt{3}}{2} \cdot \frac{2}{3} - \frac{1}{2} \cdot \frac{\sqrt{5}}{3}\right]$ $= -\frac{2\sqrt{3} - \sqrt{5}}{6}$	$y = 1$ Quadrant 1 $y = \sqrt{5}$ Quadrant 1 $180 - (A + B)$ Reduction Expansion Answer

QUESTION 9

	$\hat{O} = 2\theta$	$\angle$ at centre = 2 $\angle$ at circ	Angle $\hat{O}$ Reason Angle $X\hat{Z}O$ Sine-rule Expansion Co-ratio
	$X\hat{Z}O = 90^\circ - \theta$	$\angle$s in Δ	
	$\frac{\sin 2\theta}{p} = \frac{\sin(90^\circ - \theta)}{r}$ $\frac{2\sin\theta\cos\theta}{p} = \frac{\cos\theta}{r}$ $2\sin\theta = \frac{p}{r}$ $\sin\theta = \frac{p}{2r}$		

QUESTION 10

	Join BC		Construction Statement-reason Statement-reason Statement Statement
	$S\hat{B}C = A\hat{C}S$	tan– chrd theorem	
	$B\hat{C}S = A\hat{B}S$	tan– chrd theorem	
	$C\hat{B}S + S\hat{C}B = 60^\circ$	$\angle$s in ΔBCS	
	$\hat{A} = 60^\circ$	$\angle$s in ΔABC	

QUESTION 11

	$P(0;1)$ and $Q(5;4)$ $m_{PQ} = \frac{4-1}{5-0}$ $= \frac{3}{5}$		Centre of circles Gradient PQ Gradient DC Coordinate of D Substitution Equation
	$CD \perp PQ$;	line from centre bisects chord	
	$m_{DC} = -\frac{5}{3}$		
	$D(5;1)$	rad $\perp$ tan	
	$y = -\frac{5}{3}x + c$ $1 = -\frac{5}{3}(5) + c$ $y = -\frac{5}{3}x + \frac{28}{3}$		

QUESTION 12

(a)	$(x+3)^2+(y-2)^2=12+9+4$ $=25$ $C(-3;\ 2)$ $y^2-4y=12$ $y^2-4y-12=0$ $(y-6)(y+2)=0$ $y=6$ at A $m_{AC}=\frac{6-2}{0+3}$ $=\frac{4}{3}$ $m_{AD}=-\frac{3}{4}$ $\tan A\hat{D}O=-\frac{3}{4}$ $A\hat{D}O=36{,}9°$ $\theta=143{,}1°$ ext $\angle$ of Δ	Complete square Centre *y*-intercept answer gradient radius gradient tangent inclination answer
(b)	A(0; 6) we need D $y=-\frac{3}{4}x+6$ $0=-\frac{3}{4}x+6$ $x=8$ $D(8;\ 0)$ $x^2+(y-6)^2=r^2$ $64+36=r^2$ $r=10$ $x^2+(y-6)^2=100$ To touch internally the distance between centres must be the difference of the radii. $CA=R-r$ $=10-5$ $=5$ and CA is the radius; therefore, the circles touch internally	Let y = 0 D (8;0) $x^2+(y-6)^2=r^2$ r = 10 equation of circle R – r = 5 CA = 5 CA = R – r

QUESTION 13

(a)	In Δ RQT and RQS (1) $\hat{R} = \hat{R}$; common (2) $R\hat{Q}S = Q\hat{T}R$; tangent / chord theorem $\therefore \Delta RQT \,\vert\vert\vert\, \Delta RSQ$ (AAA) $\therefore \frac{RQ}{RS} = \frac{RT}{RQ}$ $\therefore RQ^2 = RS \times RT$	
(b)	In Δ RUP and RPT (1) $\hat{R}$ is common (2) $R\hat{P}T = R\hat{U}P$; tangent / chord theorem $\therefore \Delta RUP \,\vert\vert\vert\, \Delta RPT$ (AAA) $\therefore \frac{RU}{RP} = \frac{RP}{RT}$ $\therefore RP^2 = RU \times RT$ But PQ = QR $\therefore (2RQ)^2 = RU \times RT$ $\therefore 4RQ^2 = RU \times RT$ but $RQ^2 = RS \times RT$ $\therefore 4(RS \times RT) = RU \times RT$ $\therefore 4RS = RU$	

Total: 150 marks