NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 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.

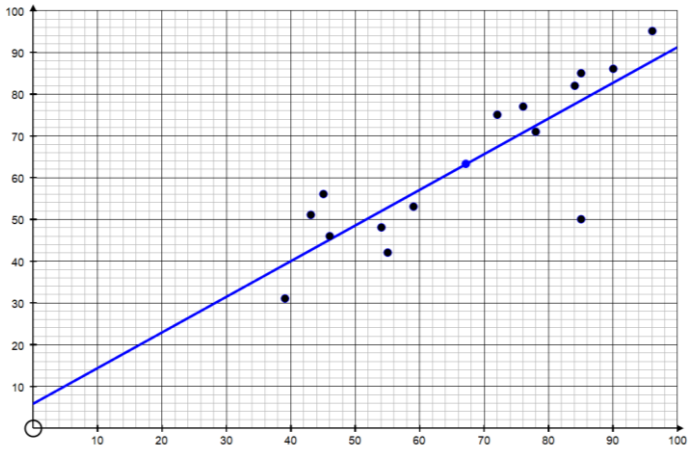
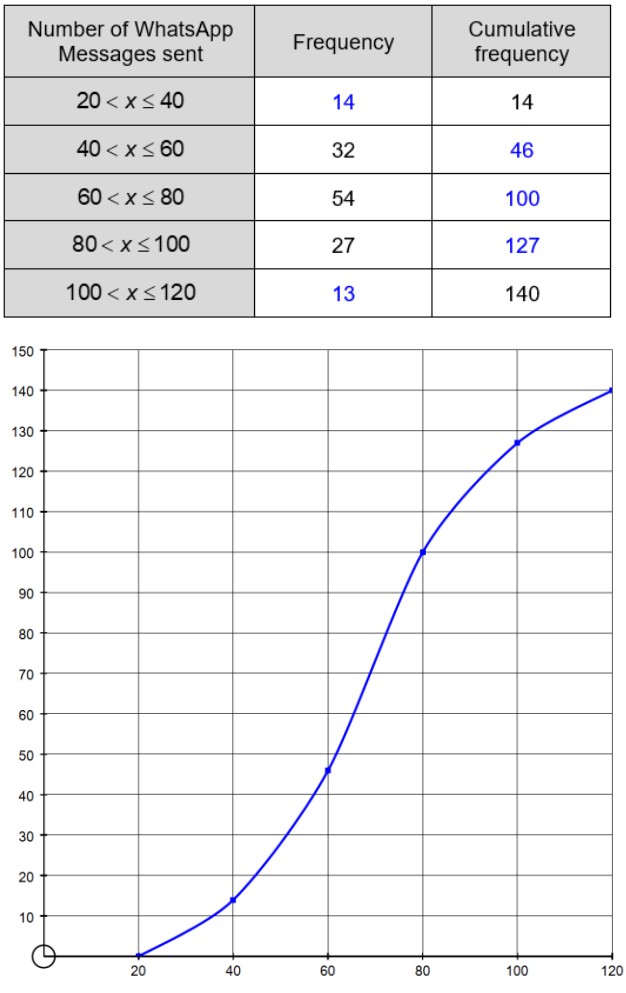
QUESTION 1

(a 1)	$x = -8$ $\tan(180° + \theta)$ $= \tan\theta$ $= -\frac{15}{8}$		*x* $\tan\theta$ *ans*
(a 2)	$\cos(90° + \theta)$ $= -\sin\theta$ $= -\frac{15}{17}$		$-\sin\theta$ *ans*
(b)	$\sin\theta = \frac{15}{17}$ *ref* $\angle = 61{,}93°$ $\therefore \theta = 118{,}07°$		$61{,}93°$ $118{,}07°$

QUESTION 2

(a 1)	$\tan 300°$ $= -\tan 60$ $= -\sqrt{3}$		$-\tan 60$ Ans
(a 2)	$\cos^2 15° - \sin^2 15°$ $= \cos 30°$ $= \frac{\sqrt{3}}{2}$		$\cos 30°$ Ans
(b)	$4\cos(2\theta + 60°) = -2$ $\cos(2\theta + 60°) = -\frac{1}{2}$ *ref* $\angle = 120°$ $2\theta + 60° = \pm 120° + k.360°$ $2\theta = 60° + k.360°$ *or* $2\theta = -180° + k.360°$ $\theta = 30° + k.180°$ $\theta = -90° + k.180°$ $k \in Z$		$\cos(2\theta + 60°) = -\frac{1}{2}$ *ref* $\angle = 120°$ $2\theta + 60° = \pm 120° + k.360°$ $\theta = 30° + k.180°$ $\theta = -90° + k.180°$

QUESTION 3

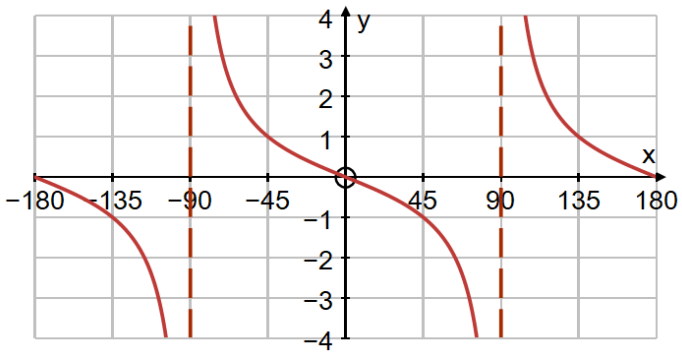
(a 1)	96%		Ans
(a 2)	31%		Ans
(a 3 i)	$y = 5{,}862 + 0{,}8541(67)$ $y = 63{,}0867$ $\therefore 63\%$		Sub 67 in x Ans
(a 3 ii)			y – int $(\bar{x}\,;\bar{y})$ Line
(b)			Table curve Pts $(20\,;0)$ start pt $(120\,;140)$ end pt

Number of WhatsApp Messages sent	Frequency	Cumulative frequency
$20 < x \leq 40$	14	14
$40 < x \leq 60$	32	46
$60 < x \leq 80$	54	100
$80 < x \leq 100$	27	127
$100 < x \leq 120$	13	140

QUESTION 4

(a)	1		ans
(b)	$180°$		ans
(c 1)	$A(45°;1)$		ans
(c 2)	$B\left(210°;\frac{\sqrt{3}}{2}\right)$		Ans
(d)	$x \in [0°] \cup [90°;180°]$		$0°$ $90°;180°$ [brackets]

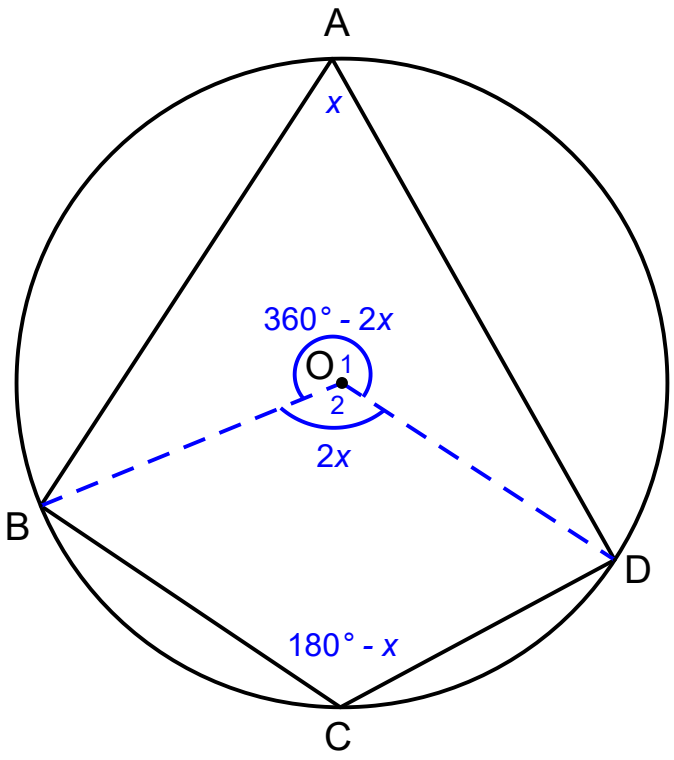
QUESTION 5

(a)			Asymptotes Shape Accuracy
(b)	$y = -\tan x + 2$		*ans*
(c)	$y = -\tan(x + 45°)$ $\therefore p = -45°$		*neg* 45°

QUESTION 6

(a)	$m_{AC} = \frac{4-(-3)}{-2-3}$ $m_{AC} = -\frac{7}{5}$		ans
(b)	$\tan\theta = -\frac{7}{5}$ $\theta = -54,46° + 180$ $\theta = 125,54°$ $\hat{C} = 125,54° - 59,0362° \; (vert\ opp)(ext\ \angle\Delta)$ $\hat{C} = 66,51°$		$\tan\theta = -\frac{7}{5}$ $\theta = 125,54°$ $\hat{C} = 66,51°$
(c)	$M\left(\frac{1}{2};\frac{1}{2}\right)$		x y
(d)	$m \perp = \frac{5}{7}$ $y - \frac{1}{2} = \frac{5}{7}\left(x - \frac{1}{2}\right)$ $y = \frac{5}{7}x - \frac{5}{14} + \frac{1}{2}$ $y = \frac{5}{7}x + \frac{1}{7}$		m Sub ans
(e)	$\tan 59,0362° = \frac{p-(-3)}{6-3}$ $p = 2$		$\tan\theta = m$ sub ans
(f)	$D(-5;-1)$ *OR* $M\left(\frac{x+6}{2};\frac{y+2}{2}\right)$ $\therefore \frac{1}{2} = \frac{x+6}{2} \qquad \frac{1}{2} = \frac{y+2}{2}$ $x = -5 \qquad y = -1$ $\therefore D(-5;-1)$		x y

QUESTION 7

(a)	 Construction: radii OB and OD let $\hat{A} = x$ $\hat{O}_2 = 2x\ (\angle @ \text{cent})$ $\hat{O}_1 = 360° - 2x\ (\angle \text{round pt})$ $\hat{C} = 180° - x\ (\angle @ \text{cent})$ $\therefore \hat{A} + \hat{C} = x + 180° - x = 180°$		
(b 1)	$FH^2 = (8)^2 + (6)^2 - 2(8)(6)\cos 114°$ $FH = 11{,}79 \text{ units}$		Cos rule Sub ans
(b 2)	$\hat{E} = 66°\ (\text{opp} \angle \text{cyclic quad})$ $\frac{\sin \hat{H}_2}{12} = \frac{\sin 66°}{11{,}79}$ $\sin \hat{H}_2 = 0{,}9298...$ $\hat{H}_2 = 68{,}41°$		$\hat{E} = 66°$ *reason* sine rule sub *ans*

QUESTION 8

(a 1)	Alt $\angle$ HL $\|\|$ JK		
(a 2)	$\angle$ same seg		
(b)	$15^2 = 12 \times \text{MG}$ (perp from right $\angle$ vertex) $\text{MG} = 18{,}75$ $\therefore \text{GH} = 6{,}75$ units		Stat Reason MG GH
(c)	converse $\angle$ in $\frac{1}{2}$ circle		converse $\angle$ in $\frac{1}{2}$ circle

SECTION B

QUESTION 9

(a)	LHS $= \dfrac{\cos 65x \cos 63x + \sin 65x \sin 63x}{1+\sin 2x}$ $= \dfrac{\cos(65x-63x)}{1+2\sin x\cos x}$ $= \dfrac{\cos 2x}{\cos^2 x+\sin^2 x+2\sin x\cos x}$ $= \dfrac{\cos^2 x-\sin^2 x}{\cos^2 x+2\sin x\cos x+\sin^2 x}$ $= \dfrac{(\cos x+\sin x)(\cos x-\sin x)}{(\cos x+\sin x)(\cos x+\sin x)}$ $= \dfrac{\cos x-\sin x}{\cos x+\sin x}$		$\cos(65x-63x)$ $2\sin x\cos x$ $\cos^2 x+\sin^2 x$ $\cos^2 x-\sin^2 x$ *Fact num* *Fact denom*
(b)	$1+\sin 2x=0$ $\sin 2x=-1$ *ref* $\angle = -90°$ $2x=-90+k.360$ $x=-45+k.180 \quad k\in Z$ $\therefore x=-45°;45°;135°$		$1+\sin 2\theta=0$ *ref* $\angle$ *GS* $2x=\ldots$ *GS* $x=\ldots$ *ans*

QUESTION 10

(a)

Hours completed	Frequency (f)	Midpoint of class interval (x)	$f.x$
$0 \le h < 6$	5	3	15
$6 \le h < 12$	p	9	$9p$
$12 \le h < 18$	28	15	420
$18 \le h \le 24$	4	21	84

$$12 = \frac{519 + 9p}{37 + p}$$

$$p = 25$$

$\therefore$ 30 learners

midpts
f.x
sub in est mean
p
ans

(b 1)

$$\sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \mu)^2}{n}$$

$$2^2 = \frac{32}{n}$$

$$n = 8$$

σ *formula*
sub 2 and 32
n

(b 2)

Values will each be the same as the mean

$$\therefore \sum_{i=1}^{18}(x_i - \mu)^2 = 32$$

$$\sigma^2 = \frac{32}{18}$$

$$\sigma = 1{,}33$$

$$\sigma^2 = \frac{32}{18}$$

$$\sigma = 1{,}33$$

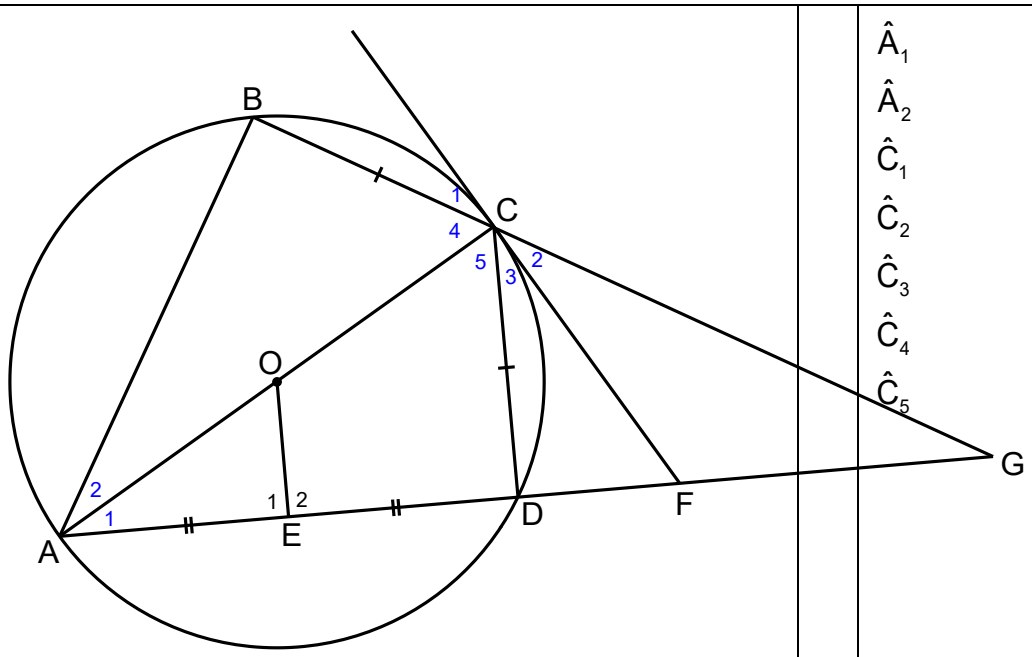
QUESTION 11

(a)	$AB = BD$ and $AC = CE$ (radii) $\therefore BC \parallel DE$ (midpt th)		$AC = CE$ midpt th
(b)	$DE = \sqrt{(-4-8)^2 + (-1-3)^2}$ $DE = 4\sqrt{10}$ $\therefore BC = 2\sqrt{10}$ (midpt th) OR (converse midpt th)		DE BC reason
(c)	$m_{DE} = \frac{1}{3}$ $\therefore m_{BC} = \frac{1}{3}$ $\therefore BC \rightarrow y = \frac{1}{3}x + 6$ $\therefore \frac{1}{3}x + 6 = -\frac{4}{5}x + \frac{47}{5}$ $x = 3$ $C(3;7)$ $\therefore (x-3)^2 + (x-7)^2 = 41$		m_{DE} m_{BC} $y = \frac{1}{3}x + 6$ *equating* $x = 3$ $y = 7$ *circle equ*
(d)	$A(-2;11)$ $\therefore B(-3;5)$		x_A y_A x_B y_B

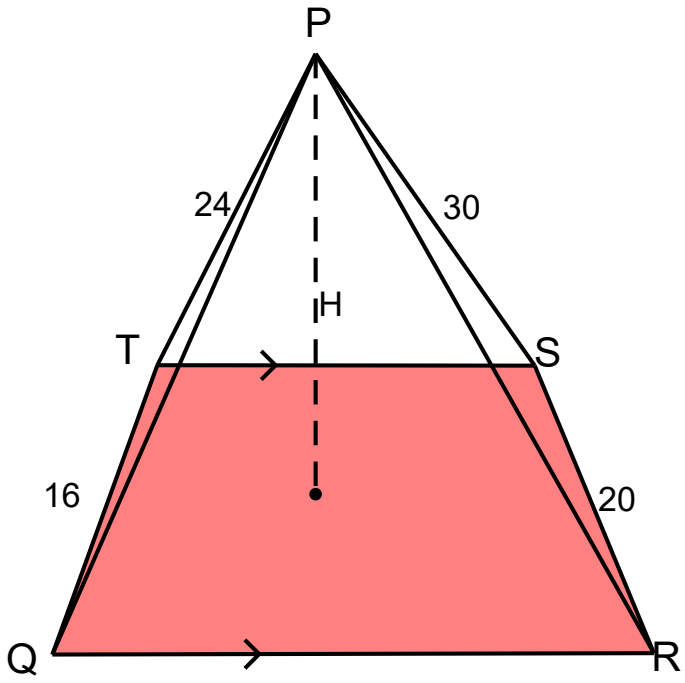
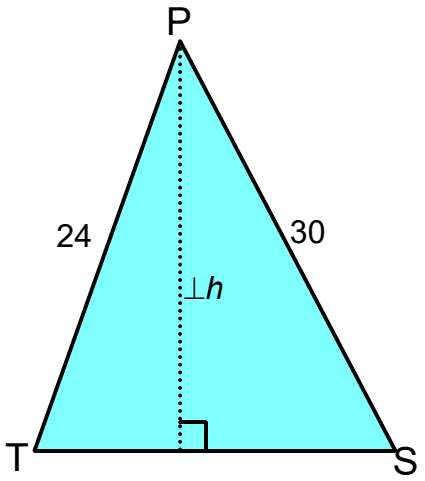
QUESTION 12

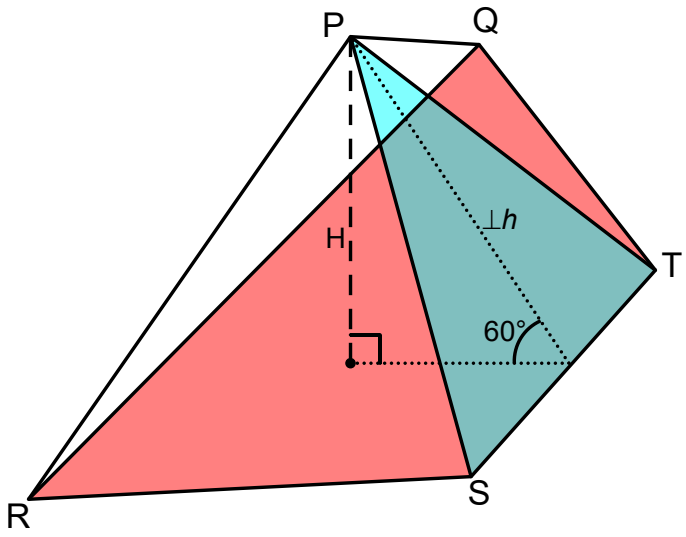
(a)	$x^2-12x+y^2-8y=-16$ $x^2-12x+36+y^2-8y+16=-16+36+16$ $(x-6)^2+(y-4)^2=36$ $\therefore \text{B}(6;4)$ *and* $r=6$ $\therefore \text{C}(6;-2)$ $\therefore y=-2$		Comp square Equ circle B r C $y=-2$
(b)	$28\pi=\pi r_A^2-\pi(6)^2$ $\pi r_A^2=64\pi$ $r_A=8$ $\therefore \text{A}(6;6)$ $\therefore (x-6)^2+(y-6)^2=64$		SR formula sub r_A A Cir equ

QUESTION 13

(a)			$\hat{A}_1$ $\hat{A}_2$ $\hat{C}_1$ $\hat{C}_2$ $\hat{C}_3$ $\hat{C}_4$ $\hat{C}_5$
(b)	$\hat{E}_1 = 90°$ (line from cent bisects chord) $\therefore \hat{E}_1 = \hat{C}_3 + \hat{C}_5 = 90°$ $\therefore$ OEFC is a cyclic quad(converse ext $\angle$ cyclic quad) *OR* $\hat{E}_2 = 90°$ (line from cent bisects chord) $\therefore \hat{E}_1 + \hat{C}_3 + \hat{C}_5 = 180°$ $\therefore$ OEFC is a cyclic quad(converse opp $\angle$ cyclic quad)		$\hat{E}_1 = 90°$ *reason* $\therefore \hat{E}_1 = \hat{C}_3 + \hat{C}_5 = 90°$ converse reason
(c)	*In* ΔACG *and* ΔCFG 1) $\hat{G}$ is common 2) $\hat{C}_2 = \hat{A}_1$ (both $= x$) 3) $C\hat{F}G = A\hat{C}G$ (3rd $\angle$) $\therefore \Delta ACG \,\|\|\| \, CFG$ (AAA) $\therefore \frac{AC}{CF} = \frac{CG}{FG} = \frac{AG}{CG}$ $CG^2 = AG \times FG$		*selecting correct* Δ $\hat{G}$ is common $\hat{C}_2 = \hat{A}_1$ *stat*(*order*) + *reas* *ratios*

QUESTION 14

(a)	$\frac{x}{16}=\frac{x+6}{20}$ (prop th TS||QR) $x=24$ cm $258{,}96=\frac{1}{2}(24)(30)\sin\theta$ $\theta=45{,}9994°$ $\theta=46°$ Area ΔPQR $=\frac{1}{2}(40)(50)\sin 46°$ $=719{,}34\,\text{cm}^2$ $\therefore$ Area TQRS $=719{,}34-258{,}96$ $=460{,}38\,\text{cm}^2$		*x* *reason* *sub* into area rule θ Area ΔPQR *ans*
(b)	 		TS $\perp$ *h* *H* *sub in for* *ans*



$$TS^2 = (24)^2 + (30)^2 - 2(24)(30)\cos 46°$$
$$TS = 21{,}81$$

$$258{,}96 = \frac{1}{2}(21{,}81)(\perp h)$$
$$\perp h = 23{,}75$$

$$\sin 60° = \frac{H}{23{,}75}$$
$$H = 20{,}57$$

$$\text{Vol}_{pyramid} = \frac{1}{3}\text{area of base} \times \text{H}$$
$$= \frac{1}{3}(460{,}38)(20{,}57)$$
$$= 3156{,}67\text{cm}^3$$

OR

$$TS^2 = (24)^2 + (30)^2 - 2(24)(30)\cos 46°$$
$$TS = 21{,}81$$

$$\cos P\hat{S}T = \frac{24^2 - 30^2 - 2(24)(30)}{-2(30)(21{,}81)}$$
$$P\hat{S}T = 52{,}33°$$

$$\sin 52{,}33° = \frac{\perp h}{30}$$
$$\perp h = 23{,}75$$

$$\sin 60° = \frac{H}{23{,}75}$$
$$H = 20{,}57$$

$$\text{Vol}_{pyramid} = \frac{1}{3}\text{area of base} \times \text{H}$$
$$= \frac{1}{3}(460{,}38)(20{,}57)$$
$$= 3156{,}67\text{cm}^3$$

Total: 150 marks