NATIONAL SENIOR CERTIFICATE EXAMINATION
SUPPLEMENTARY 2014

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.

SECTION A

QUESTION 1

(a) 48+35 = 83 (2)

(b) Accept ≃ R350 Girls
R480 Boys (2)

(c) 26 + 38 = 64 or 26 + 37 = 63 (2)

(d) $\frac{9}{35} \times 100 = 25,71$
= 26 (nearest whole number) (2)

(e) Boys 9 Girls 13
Hence more girls
However, there were 48 girls and 35 boys in the groups so one would expect more girls. Hence % better.
$\frac{9}{35}$ compared to $\frac{13}{48}$
26% < 27%

Larger percentage of girls.
∴ claim is true (3)
[11]

QUESTION 2

(a) (1) $(x;y) \rightarrow (-y;x)$
$(x;y) \rightarrow (3x;3y)$ (4)

(2) (i) 9

(ii) 3 (2)

(3) B"(9;–6) (2)

(4) C"(0; 6) (2)

(b) (1) $x = 2$ (1)

(2) f(x) = –2 (1)

(3) f(x) = 3 (1)
[13]

QUESTION 3

(a) (1) (i) $y = \frac{x}{4} + 6$

$m_{AB} = \frac{1}{4}$

$\therefore m_{CD} = \frac{1}{4}$

$\tan\theta = \frac{1}{4} \quad \therefore \theta = 14°$

(ii) $\therefore \beta + \theta = 59°$; opp $\angle$'s of a parallelogram

$\therefore \beta + 14° = 59°$

$\beta = 45°$ (6)

(2) $m_{AC} = \tan(180 - 45°)$

$= \tan(135°) \quad = -1$

Eqn AC $y = -x$ (2)

(3) $B(0;6)$

Eqn BD: $y = -x + 6$ (2)

(4) $y = -x + 6$

D(6; 0) (2)

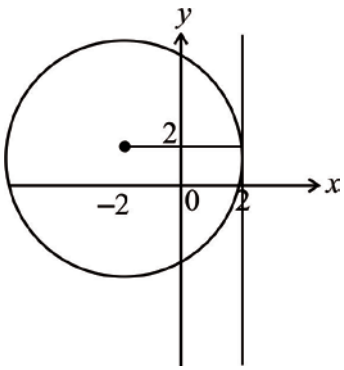
(b) (1) $(x+2)^2 + y^2 - 4y = 12$

$(x+2)^2 + (y-2)^2 - 4 = 12$

$(x+2)^2 + (y-2)^2 = 16$

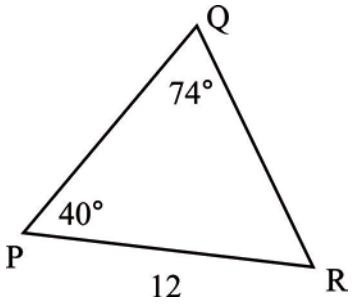
Therefore centre $= (-2;2)$ and radius $= 4$ (4)

(2) $x = 2$ (2)



[18]

QUESTION 4



(a) $$\frac{PR}{\sin 74°} = \frac{QR}{\sin 40°}$$

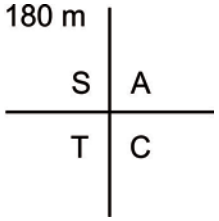
$$\therefore QR = \frac{12 \times \sin\ 40°}{\sin\ 74°}$$

$$= 8,02$$

$$\text{Area} = \frac{1}{2} \times PR \times QR \times \sin 66°$$

$$= \frac{1}{2} \times 12 \times 8,02 \times \sin 66°$$

$$= 43,96\ cm^2 = 44\ cm^2$$ (6)



(b) $$\frac{\cos(180° - 2\theta)}{1 - \tan^2\theta}$$

$$= \frac{(-\cos 2\theta)}{1 - \tan^2\theta}$$

$$= \frac{(-\cos 2\theta)}{1 - \frac{\sin^2\theta}{\cos^2\theta}}$$

$$= \frac{-\cos 2\theta}{\cos^2\theta - \sin^2\theta} \cdot \cos^2\theta$$

$$= \frac{-\left[\cos^2\theta - \sin^2\theta\right]}{\left[\cos^2\theta - \sin^2\theta\right]} \cdot \cos^2\theta$$

$$= -\cos^2\theta$$ (4)

(c) $$\sin\alpha = 6\cos\alpha$$

(1) $$\tan\alpha = \frac{\sin\alpha}{\cos\alpha}$$

$$= 6$$ (1)

(2) $$\frac{\sin(\alpha - 45°)}{\cos\alpha}$$

$$= \frac{\sin\alpha\cos 45 - \cos\alpha\sin 45}{\cos\alpha}$$

$$= \tan\alpha\cos 45° - \sin 45°$$

$$= 6.\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}$$

$$= \frac{5\sqrt{2}}{2}$$ (4)

[15]

QUESTION 5

(a) (1) $d = -3$

$a = 1$

$b = 2$

$c = 0$ (4)

(2) (i) $\theta = 90°$ or $\theta = 270°$ (2)

(ii) $(90°,\ 270°)$ (2)

(3) $(0; -2)$

$y = \tan p\theta + q$

$-2 = \tan 0° + q$

$\therefore\ q = -2$

$(225°; -1)$

$-1 = \tan 225\ p - 2$

$\tan 225\ p = 1$

$\therefore\ p = 1$ or $\frac{1}{5}$

$(180°; -2)$

$-2 = \tan 180\ p - 2$ (5)

$\tan 180\ p = 0$

$\therefore\ p = 1$ only

(b) $\cos\theta = \frac{MN}{TM}$

$\therefore TM = \frac{MN}{\cos\theta}$

$\therefore TM = \frac{4}{\cos\theta}$ (2)

$\longrightarrow$

$\text{Area}_{\triangle} TBC = \frac{1}{2} \cdot 8 \cdot TM$

$= 4 \cdot \frac{4}{\cos\theta} = \frac{16}{\cos\theta}$

$\therefore 4 \cdot \frac{16}{\cos\theta} + 64 = 256$

$\frac{64}{\cos\theta} + 64 = 256$

$\therefore \frac{64}{\cos\theta} = 192$

$\cos\theta = \frac{64}{192}$

$\theta = 70,5°$ (5)

[20]

77 marks

SECTION B

QUESTION 6

(a) (1) $y = \frac{3}{2}x + 6$

$\therefore \text{B}(0;6)$

$\therefore \text{A}(0;3)$

$\therefore$ Equation of smaller $\odot$: $x^2 + (y-3)^2 = 9$

$y = \frac{3}{2}x + 6$

$y = 0: \ 0 = \frac{3}{2}x + 6$

$\frac{3}{2}x = -6$

$x = -4 \qquad \therefore \text{R}(-4;0)$

Larger $\odot$

$x^2 + (y-3)^2 = \text{r}^2$

$(-4;0) \qquad (-4)^2 + (-3)^2 = \text{r}^2$

$\text{r}^2 = 25$

$\therefore \text{r} = +5 \qquad \text{r} = 5 \longrightarrow$

$x^2 + (y-3)^2 = 25$ (6)

(2) $m_{AP} = -\frac{2}{3}$ since AP $\perp$ BR

Eqn BR: $\therefore y - 3 = -\frac{2}{3}(x - 0)$

$y = -\frac{2}{3}x + 3$

$\therefore \frac{3}{2}x + 6 = -\frac{2}{3}x + 3$

$\therefore 9x + 36 = -4x + 18$

$\therefore 13x = -18$

$x = -\frac{18}{13}$

$y = -\frac{2}{3}\left(-\frac{18}{13}\right) + 3$

$= 3\frac{12}{13}$

$\therefore P\left(-\frac{18}{13}; \frac{51}{13}\right)$ (6)

(b) $m_{OE} = \frac{7}{4}$

$\therefore m_{tan} \text{ at } E = -\frac{4}{7}$

$y - 7 = \frac{-4}{7}(x - 4)$

$y = \frac{-4}{7}x + \frac{65}{7}$

$m_{OF} = \frac{1}{8}$

$\therefore m_{tan} \text{ at } F = -8$

$\therefore y - 1 = -8(x - 8)$

$y = -8x + 65$

$-\frac{4}{7}x + \frac{65}{7} = -8x + 65$

$-4x + 65 = -56x + 455$

$52x = 390$

$x = 7,5$ (8)

[20]

QUESTION 7

(a) (i) 25% of 135 = 33,75 ∴ 34 passengers (2)

(ii) 34 (1)

(b)

Midpoint	Number of passengers		
5	23		
15	28		
25	31	Est mean	28,4
35	4	SD	16,9
45	33		
55	16		

(6)

(c) $\text{Mean} = 28,3 \times \frac{94}{100} = 26,60$

$\text{SD} = 16,9 \times \frac{94}{100} = 15,89$ (4)

[13]

QUESTION 8

(a) $(x;y) \rightarrow (x\cos\theta - y\sin\theta; x\sin\theta + y\cos\theta)$

$$\left(1-\sqrt{2};1+\sqrt{2}\right) \rightarrow \left(\left(1-\sqrt{2}\right)\left(\frac{1}{\sqrt{2}}\right)-\left(1+\sqrt{2}\right)\left(\frac{1}{\sqrt{2}}\right); \left(1-\sqrt{2}\right)\left(\frac{1}{\sqrt{2}}\right)+\left(1+\sqrt{2}\right)\left(\frac{1}{\sqrt{2}}\right)\right)$$

$$\rightarrow \left(\frac{1}{\sqrt{2}}-1-\frac{1}{\sqrt{2}}-1;\frac{1}{\sqrt{2}}-1+\frac{1}{\sqrt{2}}+1\right)$$

$$\rightarrow \left(-2;\frac{2}{\sqrt{2}}\right)$$

OR $\rightarrow \left(-2;\frac{2\sqrt{2}}{2}\right)$

$$\rightarrow \left(-2;\sqrt{2}\right)$$

(6)

(b) $(x;y) \rightarrow (y;-x)$

$-3a = 6b$ …

$a = -2b$ … (1)

and

$5b = b - 8$

$4b = -8$

$b = -2$ … (2)

$\therefore$ subs (1) into (2):

$2 = -2(-2)$

$a = 4$ (5)

[11]

QUESTION 9

(a)

$\cos 2\theta = \cos(\theta + 60°)$	
$2\theta = \theta + 60 + k360°$	$2\theta = 360 - (\theta + 60°) + k360°$
$\theta = 60 + k360°$	$3\theta = 300 + k360°$
	$\theta = 100 + k120° \quad ; k \in \mathbb{Z}$
$\theta = -300°$	$-20°; -140°$
	$-260°$

(6)

(b) $\dfrac{\tan 156°.\cos 114°}{\cos 744°} - \dfrac{1}{\sin^2(-66°)}$

$= \dfrac{(-\tan 24°).(-\cos 66°)}{(\cos 24°)} - \dfrac{1}{(\sin 66°)^2}$

$= \dfrac{(\tan 24°)(\cos 66°)}{\sin 66°} - \dfrac{1}{\sin^2 66}$

$= \dfrac{\tan 24 \cdot \cos 66 \cdot \sin 66 - 1}{\sin^2 66}$

$= \dfrac{\dfrac{\sin 24}{\cos 24}.\cos 66.\cancel{\sin 66} - 1}{\sin^2 66}$

$= \dfrac{\cos^2 66 - 1}{\sin^2 66}$

$= \dfrac{-\sin^2 66}{\sin^2 66} = -1$ (8)

[14]

QUESTION 10

(1) $\hat{C} = 90°$

$\therefore \frac{BC}{1000} = \cos 60°$

$\therefore BC = 500m$

$BK = 500\cos 30$ $\qquad$ $\frac{CK}{BC} = \sin 30°$

$= 500\frac{\sqrt{3}}{2}$ $\qquad$ $\therefore \frac{CK}{500} = \frac{1}{2}$

$= 250\sqrt{3}$ $\qquad$ $\therefore CK = 250m$ (6)

(2) $PC^2 = 1000^2 + 500^2 - 2(1000)(500).\cos 60°$

$\therefore PC^2 = 750\ 000$

$\therefore PC = \sqrt{750\ 000}$

OR $PC^2 = PB^2 - BC^2$

$= 1\ 000^2 - 500^2$

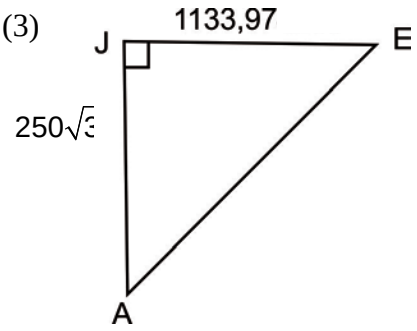
$\therefore PC^2 = 750\ 000$

$\therefore PC = \sqrt{750\ 000}$

OR $PC = 1\ 000 \sin 60°$

$= 500\sqrt{3}$ (2)

(3)



$EK = PC = 866,03$

$JE = 2\ 000 - 866,03$

$= 1\ 133,97$

$AJ = BK = 250\sqrt{3} = 433,02$

$\therefore AE^2 = JE^2 + AJ^2$

$\therefore AE = 1213,83$

$AT^2 = ET^2 + AE^2$

$= (300)^2 + 1213,836...^2$

$AT^2 = 1563398,385$

$AT = 1\ 250\ m$ (nearest m) (7)

[15]

75 marks

Total: 150 marks