

(1)

DETAILS OF ASSESSMENT: GRADE 12 TRIAL EXAM PAPER 2 (2012)				
ANALYSIS OF PAPER AND MEMORANDUM				
Mathematics Taxonomy Levels: level 1 Knowledge level 2 Performing Routine Procedures level 3 Performing Complex Procedures level 4 Problem Solving				
QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q1. (a)		$M_{AB} = \frac{y_2 - y_1}{x_2 - x_1} \checkmark^m$ $= \frac{4}{18} \checkmark^a$ $= \frac{2}{9} \checkmark^a$	[2]	1
(b)		$\tan \theta = m \checkmark^m$ $\tan \theta = \frac{2}{9} \checkmark^a$ $\theta = 12,5^\circ \checkmark^{ca}$	[3]	1
(c)		$\text{Midpt IE } \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$ $I(x, y) \quad E(-3; 2) \quad H\left(-\frac{11}{2}; \frac{3}{2}\right)$ $\frac{x-3}{2} = -\frac{11}{2} \quad \text{and} \quad \frac{y+2}{2} = \frac{3}{2}$ $x = -8 \quad \text{and} \quad y = 1$ $\therefore I(-8; 1)$	[4]	2

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QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q1. (d)		$\text{PERIMETER OF } E(-3; 2) \quad F(-11; 5) \quad H\left(-\frac{11}{2}; \frac{3}{2}\right)$ $\text{USE DISTANCE FORMULA}$ $EF = \sqrt{73} \checkmark^a$ $FH = \frac{\sqrt{170}}{2} \checkmark^a$ $HE = \frac{\sqrt{26}}{2} \checkmark^a$ $\text{PERIMETER} = 17,6 \text{ units} \checkmark^{ca}$	[4]	2
(e)		$\text{CENTRE } F(-11; 5)$ $G(-12; \frac{11}{2})$ $m_{FG} = -\frac{1}{2} \checkmark^a$ $\therefore m_{TH} = 2 \checkmark^a$ $\text{EQ TH: } y = 2x + C \checkmark^m$ $\frac{11}{2} = 2(-12) + C$ $\frac{59}{2} = C \checkmark^{ca}$ $\therefore y = 2x + \frac{59}{2} \checkmark^{ca}$ OR $y = 2x + 29,5$ OR $2y = 4x + 59$	[5]	2

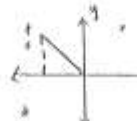
 QUESTION 1 : TOTAL
 [18]

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QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q2. (a)		$A'(12;2) \checkmark^a$ $(1,9) \rightarrow (9;-1) \checkmark^a$	[2]	2
(b)		$B'(-8;8)$ $B''(-8;8)$ $\checkmark^a \checkmark^a$	[2] Full Mks Get 1 mark if B' is correct but B'' is wrong	2
Q3. (a)(i)		$\approx -3,9878 \checkmark^a$		1
(2)		$0,1822355... - 0,185786...$ $\approx -0,0036 \checkmark^a$	IF Mks write calc. ANSWER: $-3,55... \times 10^{-3}$ AWARD 1 MARK [3]	1

TOTAL QUESTION
2 [4]

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QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
3. (b)		$\sin 75^\circ$ $\sin(30^\circ + 45^\circ) \checkmark^a$ $\sin 30^\circ \cos 45^\circ + \cos 30^\circ \sin 45^\circ \checkmark^a$ $\left(\frac{1}{2}\right)\left(\frac{\sqrt{2}}{2}\right) + \left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{2}}{2}\right)$ $\frac{\sqrt{6} + \sqrt{2}}{4} \checkmark^{ca}$	[4]	2
(c) (1)		$\sin \alpha = \frac{8}{17}$ where $90^\circ \leq \alpha \leq 270^\circ$  $y = 8$; $r = 17$ $x = -15 \checkmark^a$ pythag. $\tan \alpha = \frac{8}{-15} \checkmark^{ca}$	[3]	2
(2)		$\sin(90^\circ + \alpha)$ $\cos \alpha \checkmark^a$ $= \frac{-15}{17} \checkmark^{ca}$	[2]	2

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Level 1	Knowledge			
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Level 4	Problem Solving			
QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q3.c (3)		$\cos 2\alpha$ $\cos^2 \alpha - \sin^2 \alpha \quad \checkmark^a$ $\left(-\frac{15}{17}\right)^2 - \left(\frac{8}{17}\right)^2 \quad \checkmark^a$ $= \frac{225}{289} - \frac{64}{289}$ $= \frac{161}{289} \quad \checkmark^a$	[3] NO. CALC. FOR THIS QUESTION - ANSWER AS C.Fraction	2
(d)		$\cos^2 \theta \times \left[\frac{\sin \theta}{\cos \theta} \times \frac{\sin \theta}{\cos \theta} + 1 \right]$ $\cos^2 \theta \times \left[\frac{\sin^2 \theta}{\cos^2 \theta} + \frac{\cos^2 \theta}{\cos^2 \theta} \right]$ $\cos^2 \theta \times \left[\frac{\sin^2 \theta + \cos^2 \theta}{\cos^2 \theta} \right]$ $= \frac{1}{1} \quad \checkmark^a$	[5]	2
(e)		$\tan \theta = \frac{1}{2} \div \frac{1}{2}$ $\tan \theta = 1 \quad \checkmark^a$ $\theta = 45^\circ + k180, k \in \mathbb{Z}$ $\theta = 45^\circ, 225^\circ, -135^\circ; \quad \checkmark^a$	[5]	2

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Level 4	Problem Solving			
QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q3. f.(1)		$\sin 16^\circ = \frac{n}{1}$ $y=n \quad r=1$ $x^2 = r^2 - y^2 \quad \checkmark^a$ $x = \pm \sqrt{1-n^2} \quad \checkmark^a$ $\cos 16^\circ = \frac{\sqrt{1-n^2}}{1} \quad \checkmark^a$	[3]	2
(2)		$\tan 196^\circ$ $\tan (180^\circ + 16^\circ)$ $\tan 16^\circ \quad \checkmark^a$ $= \frac{\sin 16^\circ}{\cos 16^\circ} \quad \checkmark^a$ $= \frac{n}{\sqrt{1-n^2}} \quad \checkmark^a$	[3]	2
(3)		$\sin (-148^\circ)$ $= -\sin (180-32)$ $= -\sin 32^\circ \quad \checkmark$ $= -[\sin 2(16)]$ $= -2 \sin 16 \cos 16 \quad \checkmark$ $= -2n(\sqrt{1-n^2}) \quad \checkmark$	[3]	2

TOTAL QUESTION 3 [34]

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ANALYSIS OF PAPER AND MEMORANDUM				
Mathematics Taxonomy Levels:				
Level 1	Knowledge			
Level 2	Performing Routine Procedures			
Level 3	Performing Complex Procedures			
Level 4	Problem Solving			
QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q4 (a)		$\text{Min} : 8$ $Q_1 : 10$ $MO : 12$ $Q_3 : 16$ $\text{MAX} : 20$	$\checkmark^a$ $[1]$	1
NB, OTHER ACCEPTABLE SOLUTION				
(b)		8 9 10 11 12 12 15 16 20 27		
(1)		$Q_2 = \frac{n+1}{2} = 5,5$ $Q_3 = \frac{3(11)}{4} = 8,25$ $Q_1 = \frac{11}{4} = 2,75$ $\text{Min} = 8$ $Q_1 = 9,5$ $MO = 12$ $Q_3 = 18$ $\text{MAX} = 27$	$[5]$	2
(2)		19 $\checkmark^a$ max-min	[2]	1
(3)		$Q_3 - Q_1 \checkmark^a$ $= 8 \frac{1}{2} \checkmark^a$	[2]	1

TOTAL QUESTION 4 [10]

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ANALYSIS OF PAPER AND MEMORANDUM				
Mathematics Taxonomy Levels:				
Level 1	Knowledge			
Level 2	Performing Routine Procedures			
Level 3	Performing Complex Procedures			
Level 4	Problem Solving			
QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q5 (a)(i)		$a = 7 \checkmark^a$	[1]	1
(2)		$b = 30 \checkmark^a$	[1]	
(b)		NEXT PAGE ON GRAPH PAPER	[4]	2
(c)				
(i)		$30 < x \leq 40 \checkmark^a$	[1]	
(2)(i)		$\text{IQR} \approx 41 - 21 \checkmark$ $= 20 \checkmark$	[2]	
(ii)		$8 \checkmark^a$	[1]	

TOTAL QUESTION 5 [10]

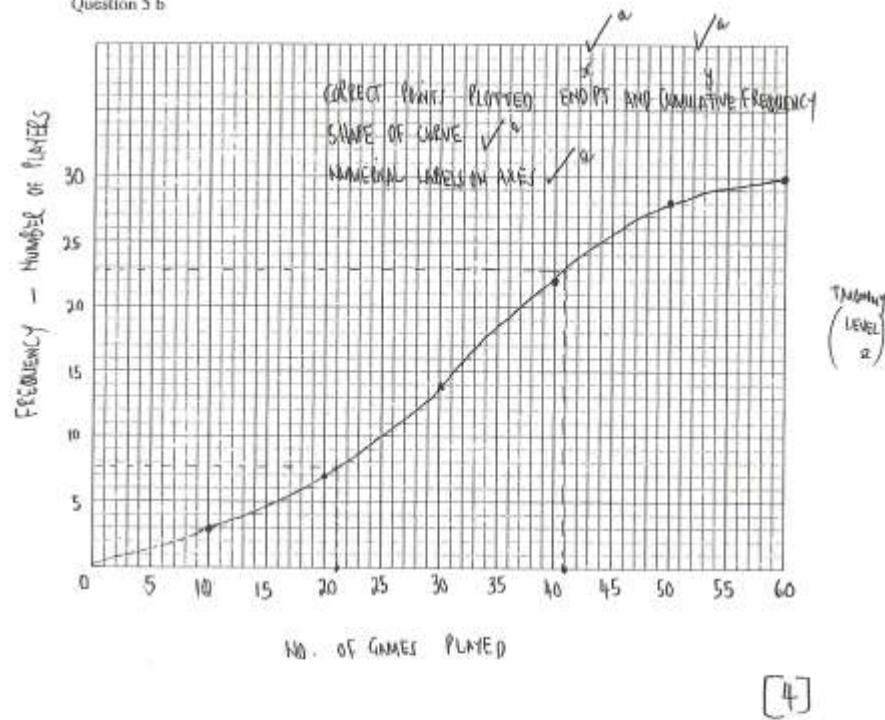
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STUDENT NUMBER

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ANSWER SHEET FOR Q5b, Q6b and Q9

Question 5 b



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DETAILS OF ASSESSMENT:

ANALYSIS OF PAPER AND MEMORANDUM

Mathematics Taxonomy Levels:

Level 1	Knowledge
Level 2	Performing Routine Procedures
Level 3	Performing Complex Procedures
Level 4	Problem Solving

QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY																																																
Q6 (a)		$\frac{5580}{30} = 186$	[2]																																																	
(b)		<table> <tr> <th>Height</th><th>Midpoint (x_i)</th><th>Frequency (f_i)</th><th>$x_i - \bar{x}$</th><th>$(x_i - \bar{x})^2$</th><th>$f_i(x_i - \bar{x})^2$</th></tr> <tr> <td>$160 \leq x < 170$</td><td>165</td><td>3</td><td>-21</td><td>441</td><td>1323</td></tr> <tr> <td>$170 \leq x < 180$</td><td>175</td><td>6</td><td>-11</td><td>121</td><td>726</td></tr> <tr> <td>$180 \leq x < 190$</td><td>185</td><td>10</td><td>-1</td><td>1</td><td>10</td></tr> <tr> <td>$190 \leq x < 200$</td><td>195</td><td>8</td><td>9</td><td>81</td><td>648</td></tr> <tr> <td>$200 \leq x < 210$</td><td>205</td><td>2</td><td>19</td><td>361</td><td>722</td></tr> <tr> <td>$210 \leq x < 220$</td><td>215</td><td>1</td><td>29</td><td>841</td><td>841</td></tr> <tr> <td colspan="2">SD = 11.9</td><td></td><td></td><td></td><td></td></tr> </table>	Height	Midpoint (x_i)	Frequency (f_i)	$x_i - \bar{x}$	$(x_i - \bar{x})^2$	$f_i(x_i - \bar{x})^2$	$160 \leq x < 170$	165	3	-21	441	1323	$170 \leq x < 180$	175	6	-11	121	726	$180 \leq x < 190$	185	10	-1	1	10	$190 \leq x < 200$	195	8	9	81	648	$200 \leq x < 210$	205	2	19	361	722	$210 \leq x < 220$	215	1	29	841	841	SD = 11.9						[6]	
Height	Midpoint (x_i)	Frequency (f_i)	$x_i - \bar{x}$	$(x_i - \bar{x})^2$	$f_i(x_i - \bar{x})^2$																																															
$160 \leq x < 170$	165	3	-21	441	1323																																															
$170 \leq x < 180$	175	6	-11	121	726																																															
$180 \leq x < 190$	185	10	-1	1	10																																															
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QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
6. (c)		$\bar{x} = 182,4 \checkmark^a$ $SD = 14,5 \checkmark^a$	[4]	
(d)		THE SELECTED TEN AS A GROUP (HAVING A GREATER STANDARD DEVIATION) SEEMS TO HAVE A GREATER INCONSISTENCY IN HEIGHTS. $\checkmark^a$	[2]	

TOTAL QUESTIONS [14]

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Level 4	Problem Solving			
QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q7. (a)		$M_{RX} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2}{-1} = -2 \checkmark^a$ $\therefore M_{MR} = \frac{1}{2} \checkmark^a$ $\text{EQ MR: } y = \frac{1}{2}x + C \dots \text{Sub}(3;2)$ $2 = \frac{1}{2}(3) + C$ $\frac{1}{2} = C \checkmark^a$ $\therefore \text{EQ MR: } y = \frac{1}{2}x + \frac{1}{2} \dots \text{①}$ $M_{TX} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1}{-2} = \frac{1}{2} \checkmark^a$ $\therefore M_{TM} = -2 \checkmark^a$ $\text{EQ TM: } y = -2x + C \dots \text{Sub}(2;-1)$ $-1 = -2(2) + C$ $3 = C \checkmark^a$ $\therefore \text{EQ TM: } y = -2x + 3 \dots \text{②}$ $\text{FOR } M(x,y) \text{ SUB. EQ ① IN EQ ②}$ $\frac{1}{2}x + \frac{1}{2} = -2x + 3$ $x + 1 = -4x + 6$ $5x = 5$ $x = 1 \checkmark^a \therefore y = 1 \checkmark^a$	[8]	3

M(1;1)

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QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q7. (b)		$\sqrt{ca} \quad \sqrt{cm}$ $(x-1)^2 + (y-1)^2 = r^2 \text{ sub (3,2)}$ $r^2 = 5 \quad \checkmark \text{cc.}$ $(x-1)^2 + (y-1)^2 = 5$	[3]	
TOTAL QUESTION 7 [11]				
Q8		$\text{LHS} = \frac{1}{\frac{\sin x}{\cos x} \sqrt{a}} - \frac{\sin x}{\cos x} \sqrt{a}$ $= \frac{\cos x}{\sin x} - \frac{\sin x}{\cos x}$ $\text{LCD: } \sin x \cos x$ $= \frac{\cos^2 x - \sin^2 x \sqrt{a}}{\sin x \cos x \sqrt{a}}$ $= \frac{\cos 2x \sqrt{a}}{\sin x \cos x}$ $\text{RHS} = \frac{2 \cos 2x}{\cancel{\sin x \cos x} \sqrt{a}}$ $\therefore \text{LHS} = \text{RHS}$	[6]	3
TOTAL QUESTION 8 [6]				

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QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q9.				
(a)			[6]	
(b)		$\sin 2x = \frac{1}{2} \tan x$ $2 \sin x \cos x = \frac{\sin x}{2 \cos x} \sqrt{a}$ $4 \sin x \cos^2 x - \sin x = 0$ $\sin x (4 \cos^2 x - 1) = 0$ $\sin x = 0 \quad \text{or} \quad \cos^2 x = \frac{1}{4}$ $x = 0 \text{ or } x = 180^\circ \quad \cos x = \pm \frac{1}{2}$ $x = 60^\circ, 120^\circ \text{ or } 240^\circ, 300^\circ$	[6]	3

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QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q9 (c)		$x \in (-60^\circ; 0) \cup (0^\circ; 90^\circ) \cup (120^\circ; 180^\circ)$ OR $-60^\circ < x < 0^\circ \text{ OR } 0^\circ < x < 90^\circ \text{ OR } 120^\circ < x < 180^\circ$	USE ANSWER FROM 9(b) TO ANSWER CA MARKS [3]	3
TOTAL QUESTION 9 [15]				
Q10. (a)		$\sin 18^\circ = \frac{7}{BP} \quad \checkmark^m$ $BP = \frac{7}{\sin 18^\circ}$ DIST FROM WINDMILL TO TOP OF POLE BY IS : $\approx 22,7 \text{ m} \quad \checkmark^a$	[2]	4
(b)		$\cos 23^\circ = \frac{18}{AP} \quad \checkmark^m$ $AP \approx 19,6 \text{ m} \quad \checkmark^a$	[2]	
(c)		$(AB)^2 = (22,7)^2 + (19,6)^2 - 2(22,7)(19,6) \cos 42^\circ$ $AB = 15,4 \text{ m}$	USE OF COSINE RULE $\checkmark^m$ SUBSTITUTION $\checkmark^a$ $(AB)^2 = 237,194 \dots \checkmark^{ca}$ $AB \quad \checkmark^{ca}$	
TOTAL QUESTION 10 [4]				

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Level 4	Problem Solving			
QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q11				
a(1)		$A'(0;0)$ ✓ ^a $B'(0;-3)$ ✓ ^a	[2]	4
(2)		$B''(3;0)$ ✓ ^{ca}	[1]	
(3)		$E(3;6)$ ✓ ^{ca} shift 6 units up.	[1]	
b(1)		8 units ✓ ^a	[1]	4
(2)		Using pathy ✓ ^m : $OP = \sqrt{73}$ ✓ ^a	[2]	
(3)		$POM = 69,4^\circ$ ✓ ^a USE OF TRIG ✓ ^m CORRECT SUBSTITUTION	[2]	
(c)		Use $A'(0;0)$ and $B'(0;-3)$ $B''(x \cos \alpha + y \sin \alpha; y \cos \alpha - x \sin \alpha)$ ✓ ^m $B''(0 \cos 50^\circ - 3 \sin 50^\circ; -3 \cos 50^\circ - 0 \sin 50^\circ)$ $B''(-2,3; -1,9)$ ✓ ^a For $F(x,y)$ shift B'' 6 units up. $F(-2,3; 4,1)$ ✓ ^a NB. CA ONLY GIVEN IF B' WAS WAS IN SUBSTITUTION	[5]	
TOTAL QUESTION 11 [14]				

ANTI-
NB: 90° CLOCKWISE
 $(x;y) \rightarrow (-y;x)$

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QUESTION	LO	POSSIBLE SOLUTION	MARKING NOTES	TAXONOMY
Q12.		$\hat{F} = 180^\circ - (\alpha + \beta) \checkmark^a$ In Δ FAB (use sin rule) $\checkmark^m$ $\frac{\sin 180^\circ - (\alpha + \beta)}{\sin \alpha} = \frac{FB}{x} \checkmark^a$ $FB \sin(\alpha + \beta) = x \sin \alpha$ $FB = \frac{x \sin \alpha}{\sin(\alpha + \beta)} \checkmark^a$ In Δ FBP: $\sin \beta = \frac{FP}{FB} \checkmark^m$ $\sin \beta = \frac{FP}{\frac{x \sin \alpha}{\sin(\alpha + \beta)}} \checkmark^a$ $FP = \frac{x \sin \alpha \sin \beta}{\sin(\alpha + \beta)}$	[6]	4