GRADE 11

NATIONAL SENIOR CERTIFICATE

MATHEMATICS P2

NOVEMBER 2007

MEMORANDUM

This memorandum consists of 14 pages.

QUESTION 1

1.1	$m_{AB} = \frac{17-5}{12-3}$ $= \frac{12}{9}$ $= \frac{4}{3}$	✓ substitution ✓ value (2)
1.2	$m_{BC} = -\frac{3}{4}$	✓ value (1)
1.3	$\frac{20-17}{x-12} = -\frac{3}{4}$ $\frac{3}{x-12} = -\frac{3}{4}$ $3x-36 = -12$ $3x = 24$ $x = 8$ C(8; 20) OR $\left(\frac{20-17}{x-12}\right).\left(\frac{4}{3}\right) = -1$ $\left(\frac{3}{x-12}\right).\left(\frac{4}{3}\right) = -1$ $x-12 = -4$ $x = 8$	✓ substitution ✓ simplification ✓ $x = 8$ (3)
1.4	AB $= \sqrt{(x_a - x_b)^2 + (y_a - y_b)^2}$ $= \sqrt{(17-5)^2 + (12-3)^2}$ $= \sqrt{225}$ $= 15$ $BC^2 + AB^2 = AC^2$ $25 + 225 = 250$ $AC = 5\sqrt{10}$ Perimeter $= 15 + 5 + 5\sqrt{10}$ $= 20 + 5\sqrt{10}$ units OR $AC^2 = \sqrt{(8-3)^2 + (20-5)^2}$ $= \sqrt{250}$ $= 5\sqrt{10}$	✓ formula ✓ substitution ✓ value ✓ correct use of Pythagoras' Theorem ✓ value AC **OR** ✓ formula and substitution ✓ value AC ✓ value perimeter (6) **[11]**

QUESTION 2

2.1

Midpoint AC $\left(\frac{x_1+x_2}{2};\frac{y_1+y_2}{2}\right)$

Midpoint AC $\left(\frac{6+6}{2};\frac{4+(-2)}{2}\right)$

Midpoint AC (6 ; 1)

✓ substitution into correct formula
✓ *y*–coordinate
✓ *x*–coordinate

(3)

2.2

$m_{BD}=\frac{y_b-y_d}{x_b-x_d}$

$=\frac{2-1}{-2-6}$

$=-\frac{1}{8}$

✓ formula and substitution
✓ value of gradient

equation of BD:

$y=-\frac{1}{8}x+c$

$2=-\frac{1}{8}(-2)+c$

$c=\frac{7}{4}$

OR

$y-y_1=m(x-x_1)$

$y-2=-\frac{1}{8}(x+2)$

$y=-\frac{1}{8}x-\frac{1}{4}+2$

$y=-\frac{1}{8}x+\frac{7}{4}$

✓ formula
✓ substitution
✓ equation of BD (any form accepted)

(5)

equation of BD : $y=-\frac{1}{8}x+\frac{7}{4}$ or $x+8y-14=0$

2.3

$y = –2\,x + 8$

equation :

$y = –2x + c$

$4 = –2(6) + c$

$c = 16$

$y = –2x + 16$

✓ gradient
✓ substitution
✓ value

(3)

2.4

$m_{BC}=\frac{2-(-2)}{-2-6}$

$m_{BC}=\frac{4}{-8}$

$m_{BC}=-\frac{1}{2}$

✓ substitution
✓ $m_{BC}=-\frac{1}{2}$

$\tan\theta=-\frac{1}{2}$

reference angle : 26, 6°

$\theta = 180° – 26{,}6°$ (obtuse angle)

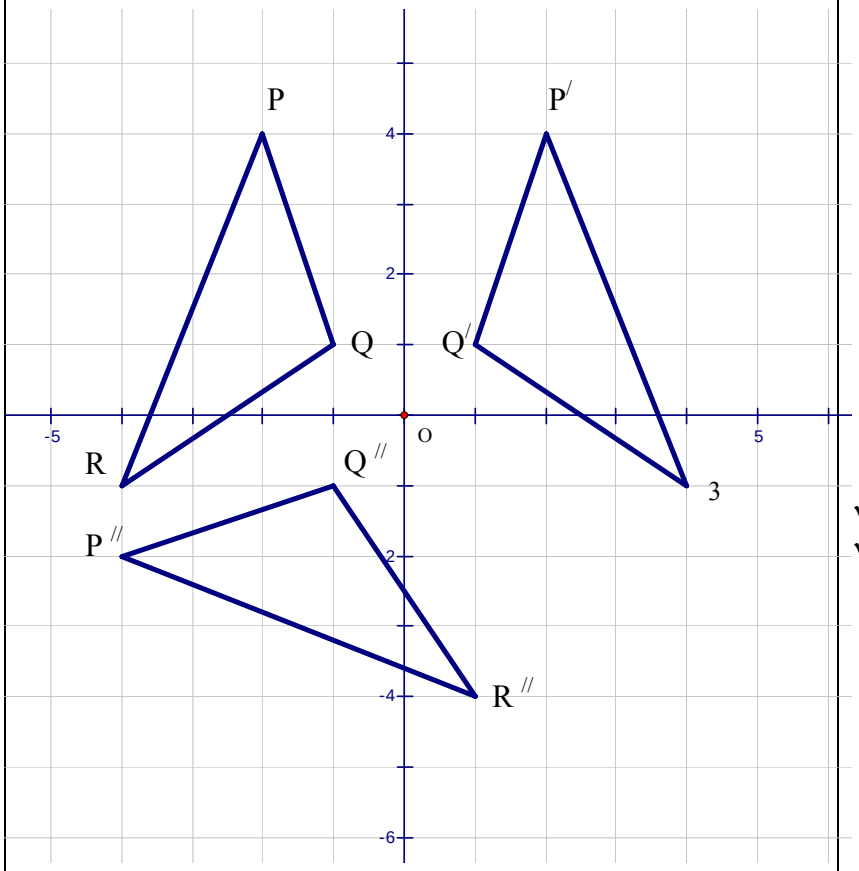
$\theta = 153{,}4°$

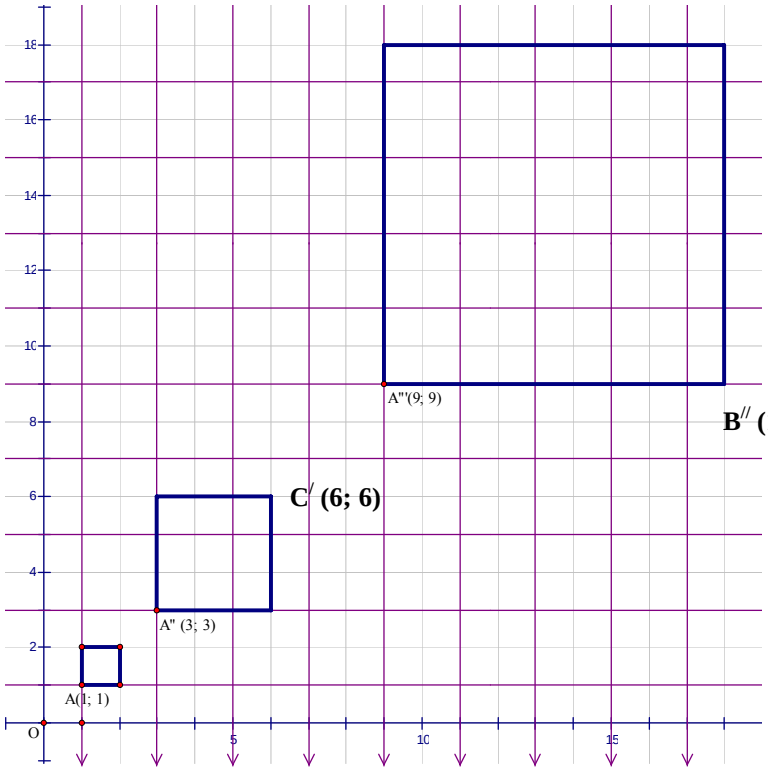
✓ tan θ
✓ ref angle
✓ value

(5)

2.5	AC $\perp$ x-axis $\hat{C} = \theta - 90°$ (exterior angle of triangle) $= 153{,}4° - 90°$ $= 63{,}4°$	✓ AC $\perp$ x-axis ✓ substitution ✓ value (3) **[19]**

QUESTION 3

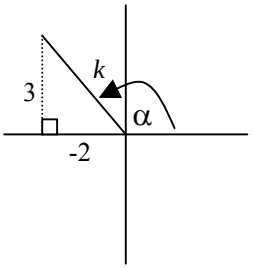
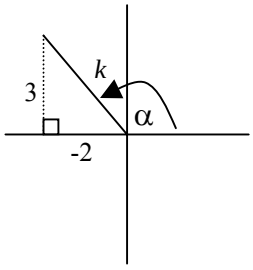
3.1.1	Reflection in the y-axis	✓reflection ✓y-axis (2)
3.1.2		✓ image ✓✓ correct coordinates (3)
3.1.3	R″ (1; – 4)	✓ coordinates (1)
3.1.4	$(x; y) \rightarrow (-y; x)$	✓ x-coordinate ✓ y-coordinate (2)

3.2.1 & 3.2.2	 	✓ first enlargement ✓ second enlargement ✓✓ enlarged figures centred at the origin (4) ✓ C / coordinates ✓ B// coordinates (2)
3.3	$\frac{40}{20} = 2$ and $\frac{80}{40} = 2$ $\therefore\ k = 2$	✓✓ value (2) **[16]**

QUESTION 4

4.1	$\frac{3\cos 150°.\sin 270°}{\tan(-45°)+\cos 600°}$ $=\frac{3\left(-\frac{\sqrt{3}}{2}\right)(-1)}{(-1)+\left(-\frac{1}{2}\right)}$ $=\frac{\frac{3\sqrt{3}}{2}}{-\frac{3}{2}}$ $=-\sqrt{3}$	✓ $\cos 150° = -\frac{\sqrt{3}}{2}$ ✓ $\sin 270° = -1$ ✓ $\tan(-45°) = -1$ ✓ $\cos 600° = -\frac{1}{2}$ ✓ simplification (5)
4.2	$\frac{\tan(180°-x).\sin(90°+x)}{\sin(-x)} - \sin y.\cos(90°-y)$ $=\frac{(-\tan x).(\cos x)}{(-\sin x)} - \sin y.\sin y$ $=\frac{\sin x}{\cos x}.\frac{\cos x}{\sin x} - \sin^2 y$ $=1-\sin^2 y$ $=\cos^2 y$	✓ $\sin y$ ✓ $-\tan x$ ✓ $\cos x$ ✓ $-\sin x$ ✓ $\frac{\sin x}{\cos x}$ identity ✓ 1 ✓ identity (7)
		[12]

QUESTION 5

5.1.1	$k.\cos\alpha = -2$ and $k.\sin\alpha = 3$ $\therefore \cos\alpha < 0$ and $\sin\alpha > 0$ $\therefore$ quadrant II $\therefore \alpha \in (90°; 180°)$	✓ $\cos\alpha < 0$ ✓ $\sin\alpha > 0$ ✓conclusion of quadrant (3)
5.1.2	$\tan\alpha$ $= \dfrac{\sin\alpha}{\cos\alpha}$ $= \dfrac{\frac{3}{k}}{-\frac{2}{k}}$ $= \dfrac{3}{-2}$	✓ use correct ratio ✓ value (2)
	OR $\tan\alpha = -\dfrac{3}{2}$ 	✓ sketch ✓ value (2)
5.1.3	$\cos^2\alpha + \sin^2\alpha = 1$ $\left(\dfrac{-2}{k}\right)^2 + \left(\dfrac{3}{k}\right)^2 = 1$ $4 + 9 = k^2$ $k^2 = 13$ $k = \sqrt{13}$	✓ identity ✓ substitution ✓ multiplication by LCD ✓ $k^2 = 13$
	OR  $k^2 = 3^2 + (-2)^2$ $= 9 + 4$ $= 13$ $k = \sqrt{13}$	✓✓ sketch ✓ use of Pythagoras statement ✓ $k^2 = 13$ (4)

5.2	$5^{\tan x} = 125$ $5^{\tan x} = 5^3$ $\tan x = 3$ reference angle = 71,6° $x = 71{,}6°$ or $x = 180° + 71{,}6°$ $= 251{,}6°$	✓ 5^3 ✓ $\tan x = 3$ ✓ ref angle = 71,6° ✓ $x = 71{,}6°$ ✓ $x = 251{,}6°$ (5)
5.3	$\sin x(2\cos x - 1) = 0$ $\sin x = 0$ or $\cos x = \frac{1}{2}$ $x = 0° + k.360°$ or $x = 180° + k.360°$ or $x = 60° + k360°$ or $x = 300° + k.360°$ $\therefore x = k.180°$ $k \in Z$	✓ $\sin x = 0$ en $\cos x = \frac{1}{2}$ ✓✓ $x = k.180$ ✓ $x = 60° + k360°$ ✓ $x = 300° + k.360°$ ✓ $k \in Z$ ✓ general solution notation (7) **[21]**

QUESTION 6

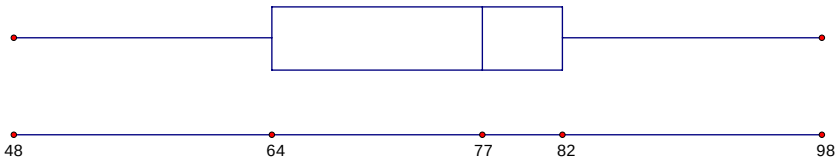
6.1.1	$C\hat{G}S = 64°$ $\sin 64° = \frac{15}{SG}$ $SG = \frac{15}{\sin 64°}$ SG = 16,69 m	✓definition ✓ substitution ✓SG (3)
6.1.2	$SH^2 = (16{,}69)^2 + (7{,}32)^2 - 2(16{,}69)(7{,}32).\cos 116°$ $= 439{,}2508074…$ SH = 20,96 m OR $CG = \sqrt{16{,}69^2 - 15^2} = 7{,}32$ $SH = \sqrt{15^2 + 14{,}64^2} = 20{,}96$	✓ cos rule or pythagoras ✓ substitution ✓ value (3)

6.1.3	$\frac{\sin G\hat{S}H}{7,32} = \frac{\sin 116°}{20,96}$ $\sin G\hat{S}H = 0,3138918139…$ $G\hat{S}H = 18,3°$	✓ sine rule ✓✓ substitution ✓ value (4)
6.2.1	$5a = 360°$ $a = 72°$	✓ $5a = 360°$ ✓ value (2)
6.2.2	$DE^2 = OD^2 + OE^2 - 2OD.OE.\cos a$ $= (7)^2 + (7)^2 - 2(7)(7).\cos 72°$ $= 67,71633455$ $DE = 8,23$ cm **OR** OD = OE (radii) $O\hat{E}D = O\hat{D}E$ (angles opp = sides of isosceles triangle) $O\hat{E}D = \frac{180° - 72°}{2}$ (sum angles in a triangle) $O\hat{E}D = 54°$ $\frac{DE}{\sin 72°} = \frac{OD}{\sin 54°}$ $DE = \frac{7.\sin 72°}{\sin 54°}$ $= 8,23$ cm	✓ cos rule ✓ substitution ✓ $CD^2 = 67,71633455$ ✓ value ✓ $O\hat{E}D = 54°$ ✓ sine rule ✓ substitution ✓ value (4)
6.2.3	area OED $= \frac{1}{2}.OE.OD.\sin E\hat{O}D$ $= \frac{1}{2}.(7)(7).\sin 72°$ $= 23,30$ cm^2	✓ area rule ✓ substitution ✓ value (3) **[19]**

QUESTION 7

7.1	surface area of cylinder $= 2\pi rh$ $= 2\pi(10)(65)$ $= 4084{,}07\ m^2$ surface area of dome $= \frac{1}{2}(4\pi r^2)$ $= 2.(10)^2.\pi$ $= 628{,}32\ m^2$ Total surface area $= 4712{,}39\ m^2$	✓ substitution ✓ radius = 10 *m* ✓ value ✓ $\frac{1}{2}$ ✓ value ✓ value (6)
7.2	Volume of rectangular prism $= lbh$ $= 0{,}6 \times 0{,}5 \times 2$ $= 0{,}6\ m^3$ Volume of pyramid $= \frac{1}{3}lbh$ $= \frac{1}{3}(0{,}6)(0{,}5)(0{,}8)$ $= 0{,}08\ m^3$ Total Volume of 2 pillars $= 2(0{,}6 + 0{,}08)$ $= 1{,}36\ m^3$	✓ substitution ✓ value ✓ substitution ✓ value ✓ multiplication by 2 ✓ value (6) **[12]**

QUESTION 8

8.1	48, 50, 52, 59, 60, 68, 73, 76, 76, 76, 78, 79, 80, 81, 82, 82, 84, 91, 92, 98 $\text{median} = \frac{76 + 78}{2}$ $= 77$	✓ ordered data ✓ value (2)
8.2	$\text{lower quartile} = \frac{60 + 68}{2} = 64$ $\text{upper quartile} = \frac{82 + 82}{2} = 82$	✓ lower quartile value ✓ upper quartile value (2)
8.3		✓quartiles ✓ box ✓ whiskers (3)
8.4	The data is skewed to the left.	✓ statement (1) **[8]**

QUESTION 9

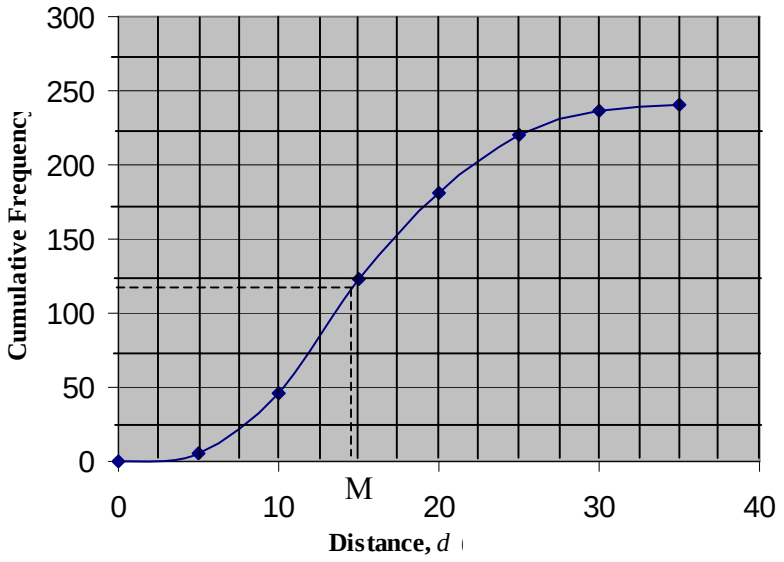
9.1

Distance, d	Frequency	Cumulative Frequency
$0 < d \leq 5$	5	5
$5 < d \leq 10$	41	46
$10 < d \leq 15$	77	123
$15 < d \leq 20$	58	181
$20 < d \leq 25$	39	220
$25 < d \leq 30$	17	237
$30 < d \leq 35$	3	240

✓✓ correct totals
✓ 240

(3)

9.2



✓ shape
✓ axes (correctly labeled)
✓✓plotting points correctly

(4)

9.3

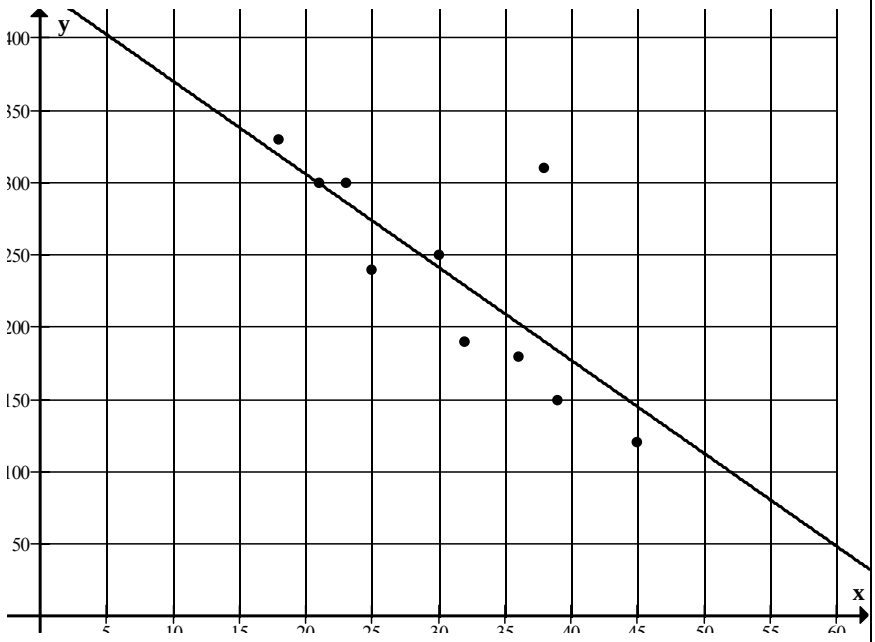
Median ≈ 14 kms

✓ value
✓✓ indication on graph

(3)

[10]

QUESTION 10

10.1	(38; 310)	✓ value (1)
10.2		✓✓ plotting the points ✓ axes (correctly labeled) (3)
10.3	Line of best fit is a straight line with a negative slope	✓ straight line ✓ negative slope (2)
10.4	As women get older, the trend is that they spend less money on clothing items.	✓ value (1)
10.5	R140	✓ value ✓ reading from the graph (2) **[9]**

QUESTION 11

11.1

$$\text{Mean} = \frac{847}{11}$$

Mean = 77 cm

✓ sum
✓ value

(2)

11.2

DATA	$(x_i - \bar{x})$	$(x_i - \bar{x})^2$
72	– 5	25
77	0	0
75	– 2	4
78	1	1
76	– 1	1
93	16	256
64	– 13	169
100	23	529
62	– 15	225
81	4	16
69	– 8	64
	$\sum_{i=1}^{n}(x_i - \bar{x})^2$ =	1290

✓✓ calculating differences
✓ calculating squares

✓ sum

(4)

11.3

$$Var = \frac{1290}{11}$$

$Var = 117{,}27$

✓ dividing by 11
✓ value

(2)

11.4

$$\partial = \sqrt{Var}$$
$$= \sqrt{117{,}27}$$
$$= 10{,}83 \text{ cm}$$

✓ value

(1)

11.5

7 of the players' have a waistline that is within the standard deviation distance from the mean.
Or any suitable interpretation

✓✓ interpretation

(2)

[11]