education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS P2

EXEMPLAR 2007

MEMORANDUM

This memorandum consists of 11 pages.

QUESTION 1

1.1	$m_{AB} = \frac{1-4}{3-0} = -1$ $m_{CD} = \frac{-2-(-5)}{-6-(-3)} = -1$ $m_{AD} = \frac{-2-4}{-6-0} = 1$ $m_{BC} = \frac{-5-1}{-3-3} = 1$	✓ substitution into formula ✓ answer m_{AB}. ✓ answer m_{CD}. ✓ answer m_{AD}. ✓ answer m_{BC}.
	$m_{AB} = m_{CD}$ $\therefore$ AB || CD	✓ parallel lines
	$m_{AD} = m_{BC}$ $\therefore$ AD || BC $\therefore$ ABCD is a parallelogram as both pairs of opposite sides are parallel.	✓ parallelogram
	$m_{AB}.m_{AD} = (-1)\times(1) = -1$ AB $\perp$ AD ABCD is a rectangle (internal angles = 90°)	✓ multiply gradients = – 1 ✓ reason (9)
1.2	Midpoint = $\left(\frac{x_1+x_2}{2};\frac{y_1+y_2}{2}\right)$	
	Midpoint AC = $\left(\frac{0-3}{2};\frac{4-5}{2}\right) = \left(-\frac{3}{2};-\frac{1}{2}\right)$	✓ answer x ✓ answer y (2) **[11]**

QUESTION 2

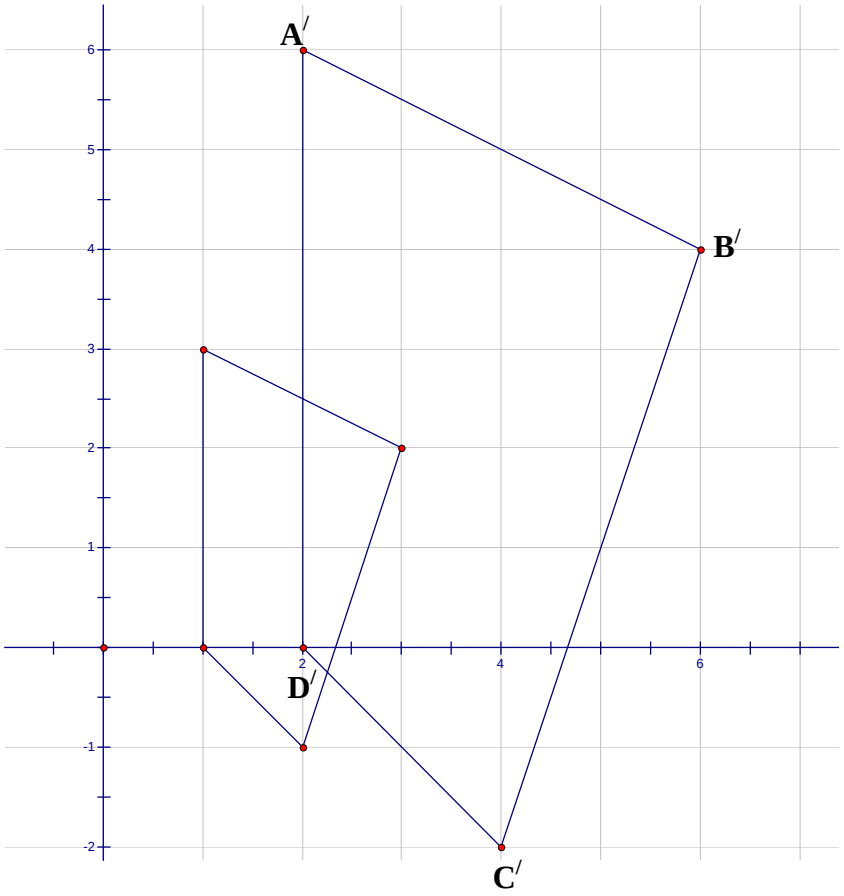
2.1	$m_{PQ} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{2+4}{-4+2}$ $= -3$	✓ formula ✓ substitution ✓ answer
	$m_{PR} = \frac{-4+1}{-2-7}$ $= \frac{1}{3}$	✓ substitution ✓ answer
	$m_{PQ}.m_{PR} = -3 \times \frac{1}{3} = -1$ $\therefore$ ΔPQR is right-angled at $\hat{P}$	✓ multiplication ✓ conclusion (7)
2.2	$PQ = \sqrt{(-4-(-2))^2 + (2-(-4))^2}$ $PQ = \sqrt{4+36}$ $PQ = 2\sqrt{10}$	✓ substitution ✓ answer PQ
	$PR = \sqrt{(7-(-2))^2 + (-1-(-4))^2}$ $PR = \sqrt{81+9}$ $PR = 3\sqrt{10}$	✓ substitution ✓ answer PR
	Area ΔPQR $= \frac{1}{2}$PR.PQ Area ΔPQR $= \frac{1}{2}(3\sqrt{10})(2\sqrt{10})$ Area ΔPQR = 30 units^2	✓ substitution ✓ (6)
2.3	$\tan\theta = -3$ ref angle: $71{,}57° \approx 72°$ $P\hat{Q}R = 180° - 72°$ $P\hat{Q}R = 108°$	✓ statement ✓ reference angle ✓ answer (3)
2.4	$M\left(\frac{-4+7}{2}; \frac{2-1}{2}\right)$ $M\left(\frac{3}{2}; \frac{1}{2}\right)$	✓ *x*-coordinate ✓ *y*-coordinate (2)

2.5	$y-\frac{1}{2}=\frac{1}{3}\left(x-\frac{3}{2}\right)$ $y=\frac{1}{3}x$	✓ gradient = $\frac{1}{3}$ ✓ substitution x ✓ substitution y ✓ ✓ answer (5)
2.6	Midpoint PQ $\left(\frac{-4-2}{2};\frac{2-4}{2}\right)$ Midpoint PQ $(-3;-1)$ $y=\frac{1}{3}(-3)$ $y=-1$ $\therefore$ Midpoint PQ does lie on the line MN	✓ x-coordinate ✓ y-coordinate ✓ substitution of x ✓ conclusion (4) **[27]**

QUESTION 3

3.1	$(x\,;y)\rightarrow(-x\,;y)$	✓ x-coordinate ✓ y-coordinate (2)
3.2	Transformation 1: Rotation around the origin through 180° Transformation 2: Reflection about the y-axis and a reflection about the x-axis	✓rotation ✓ 180° ✓ Reflection ✓ y-axis ✓ Reflection ✓ x-axis (6)
3.3	$D'(2;-2)$	✓ x-coordinate ✓ y-coordinate (2) **[10]**

QUESTION 4

4.1.1		✓ correct vertex A' ✓ correct vertex B' ✓ correct vertex C' ✓ correct vertex D' ✓ accuracy of drawing (5)
4.1.2	$A'(2;6)$ $C'(4;-2)$	✓ coordinate A' ✓coordinate C' (2)
4.1.3	$A'B'C'D' = 4x$ square units	✓ ✓ answer (2)
4.2.1	$(x;y) \rightarrow (-y;x)$	✓interchanging ✓correct signs (2)
4.2.2	$A''(-3\ ;\ 1)$ $B''(-2\ ;\ 3)$ $C''(1\ ;\ 2)$ $D''(0\ ;\ 1)$	✓ coordinate A'' ✓ coordinate B'' ✓ coordinate C'' ✓ coordinate D'' (4)
		[15]

QUESTION 5

5.1.1

$$\frac{\cos 150^\circ \tan 225^\circ}{\sin(-60^\circ).\cos 480^\circ}$$

$$= \frac{-\frac{\sqrt{3}}{2}.1}{-\frac{\sqrt{3}}{2}.-\frac{1}{2}}$$

$$= -2$$

✓ $\tan 225^\circ = \tan 45^\circ = 1$
✓ $\cos 150^\circ = -\cos 30^\circ = -\frac{\sqrt{3}}{2}$
✓ $\sin(-60^\circ) = -\sin 60^\circ = -\frac{\sqrt{3}}{2}$
✓ $\cos 480^\circ = -\cos 60 = -\frac{1}{2}$
✓answer

(5)

5.1.2

$$\frac{\cos(90^\circ + x)}{\cos(360^\circ - x).\tan(180^\circ - x)}$$

$$= \frac{(-\sin x)}{(\cos x).(-\tan x)}$$

$$= \frac{\sin x}{\cos x} \div \frac{\sin x}{\cos x} \quad \text{OR} \quad -\tan x \times \frac{1}{-\tan x}$$

$$= 1$$

✓ $-\sin x$
✓ $\cos x$
✓ $-\tan x$
✓ $\tan x = \frac{\sin x}{\cos x}$
✓ answer

(5)

5.1.3

$$\cos^2 x\left[\frac{1}{\sin x - 1} + \frac{1}{\sin x + 1}\right]$$

$$= \cos^2 x\left[\frac{\sin x + 1 + \sin x - 1}{(\sin x + 1)(\sin x - 1)}\right]$$

$$= \cos^2 x\left[\frac{2\sin x}{\sin^2 x - 1}\right]$$

$$= \cos^2 x\left[\frac{2\sin x}{\cos^2 x}\right]$$

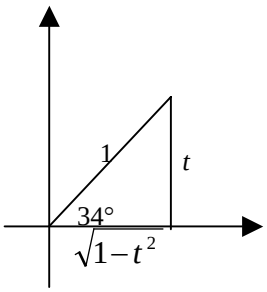
$$= 2\sin x$$

✓ denominator
✓ numerator
✓ $2\sin x$
✓ $\sin^2 x - 1$
✓ $\cos^2 x$
✓ answer

(6)

5.2.1

cos 56 °
= cos (90° – 34°)
= sin 34 °
= t



✓ sin 34°
✓ answer

(2)

5.2.2

$$\tan(-34^\circ)$$

$$= (-\tan 34^\circ)$$

$$= \left(-\frac{t}{\sqrt{1-t^2}}\right)$$

✓ – tan 34°
✓✓ trig ratio

(3)

5.3.1	$7\cos 2x = -2$ $\cos 2x = -\frac{2}{7}$ ref angle : 73,3984504…° $\approx$ 73,4° $2x = 180° - 73,4°$ or $2x = 180° + 73,4°$ $x = 53,3°$ $x = 126,7°$	✓ $\cos 2x = -\frac{2}{7}$ ✓ ref. angle ✓ ✓ correct quadrants ✓✓ answers (6)
5.3.2	$\cos x(\sin x - 1) = 0$ $\cos x = 0$ or $\sin x = 1$ $x = 90° + k.360°$ $k \in Z$ or $x = 90° + k.360°$ $k \in Z$ $x = 270° + k.360°$ $k \in Z$ which is the same as $\therefore x = 90° + k.180°$ $k \in Z$	✓ $\sin x = 1$ ✓ $\cos x = 0$ ✓ $x = 90° + k.360°$ $k \in Z$ ✓ $x = 270° + k.360°$ $k \in Z$ ✓ $x = 90° + k.360°$ $k \in Z$ (5) **[32]**

QUESTION 6

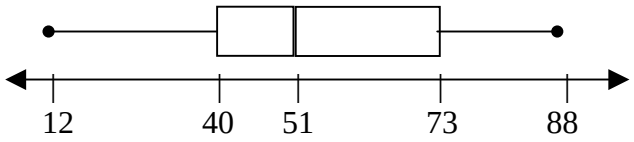
6.1.1	$\hat{L} = 10°$	✓ answer (1)
6.1.2	$\frac{25}{KT} = \sin 17°$ $KT.\sin 17° = 25$ $KT = \frac{25}{\sin 17°}$ $KT = 85,51m$	✓ sin 17° ✓ $\frac{25}{KT}$ ✓answer (3)
6.1.3	$\frac{KL}{\sin 7°} = \frac{85,51}{\sin 10°}$ $KL = \frac{85,51.\sin 7°}{\sin 10°}$ $KL = 60,01\,m$	✓sine rule ✓✓substitution ✓answer (4)
6.2.1	$\hat{C}_1 = 36°$ $G\hat{C}A = 41°$ $GA^2 = (8,3)^2 + (4,8)^2 - 2(8,3)(4,8).\cos 41°$ $GA^2 = 31,79474065…$ GA = 5,6 kms	✓ $G\hat{C}A = 41°$ ✓ cos rule ✓ substitution ✓ answer (4)

6.2.2	Area $\Delta GCA = \frac{1}{2}.(8,3)(4,8).\sin 41°$ Area $\Delta GCA = 13,07\ kms^2$	✓ area rule ✓ substitution ✓ answer (3) **[15]**

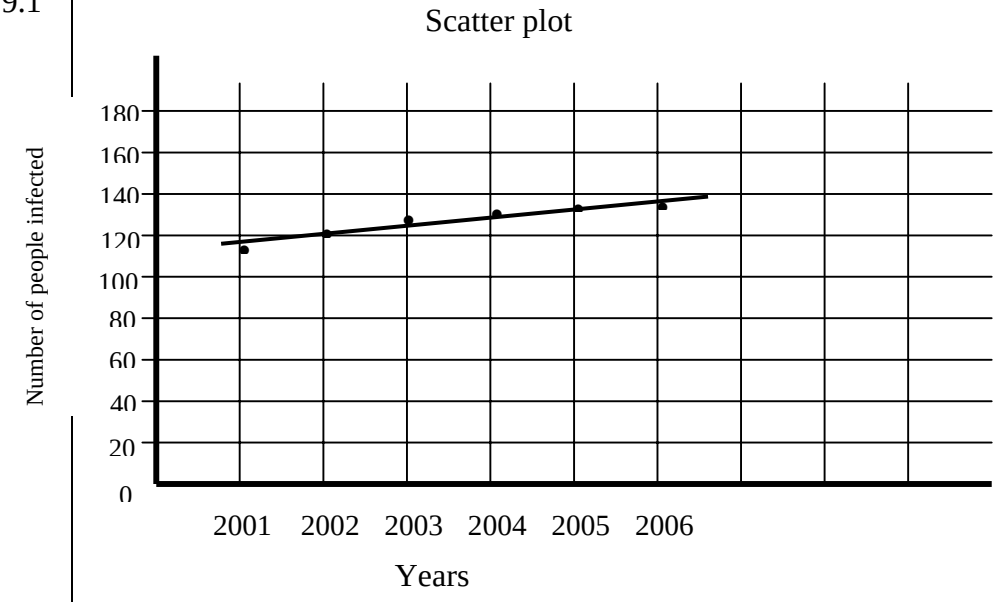
QUESTION 7

7.1	Height of the cone = 140 – 40 = 100 cm $\text{Volume of cone} = \frac{1}{3}\pi r^2 h$ $= \frac{1}{3}.\pi.(40)^2.100$ $= 167551,6082 cm^3$ $\text{Volume of the hemisphere} = \frac{1}{2}.\left[\frac{4}{3}\pi r^3\right]$ $= \frac{1}{2}.\frac{4}{3}.\pi.(40)^3$ $= 134041,2866 cm^3$ Total volume of model = 301 592,89 cm^3	✓ substitution ✓ answer ✓ $\frac{1}{2}$ ✓ answer ✓ total answer (5)
7.2	$H^2 = 1^2 + (0,4)^2 = 1,16$ $H = 1,077032961\ m$ Total exterior surface area = surface area of hemisphere + surface area of cone $= \frac{1}{2}.4\pi r^2 + \pi rH$ $= 2.\pi.(0,4)^2 + \pi.(0,4).(1,07703961)$ $= 2,358...\ m^2$ $= 2,36\ m^2$	✓ Pythagoras ✓ Slant height ✓ addition of formulae ✓ substitution ✓ answer (5)
7.3	mass = $2,36 \times 2,5$ mass = 5,90 kg	✓ answer (1) **[11]**

QUESTION 8

8.1	12 29 33 39 40 42 48 50 50 51 55 58 62 64 73 76 77 80 88 median : 51	✓ordered data ✓median (2)
8.2	lower quartile : 40 upper quartile : 73	✓Q_1 ✓Q_3 (2)
8.3		✓ min / max ✓quartiles ✓box joining ✓whiskers (4)
8.4	One quarter, 25%, of the player's scores were below 40 runs OR Three quarters, 75%, of the player's scores were above 40 runs.	✓answer (1) **[9]**

QUESTION 9

9.1		✓axes ✓✓plotting the points (3)
9.2	Linear	✓ answer (1)
9.3	141 People	✓ answer (1) **[5]**

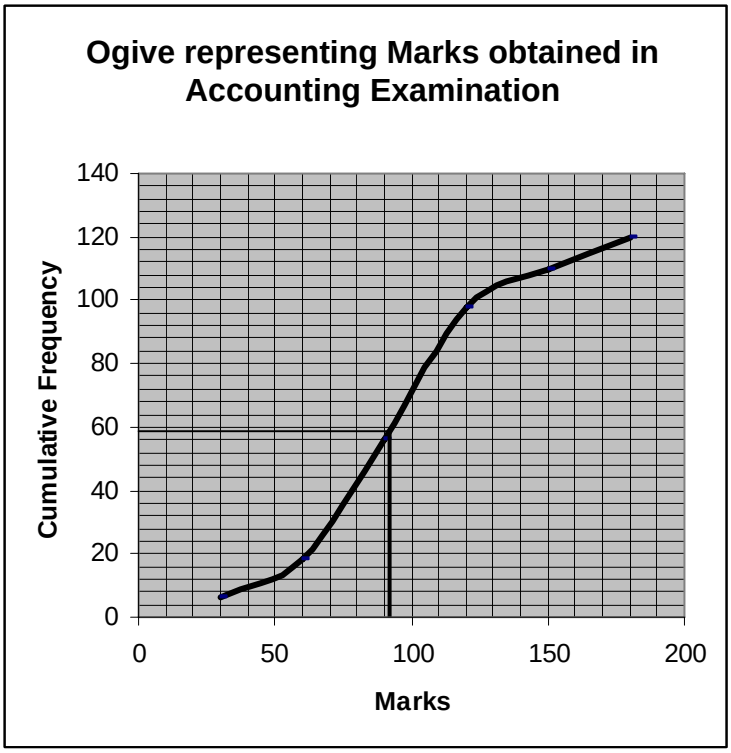
QUESTION 10

10.1

Mark	Frequency	Cumulative Frequency
$0 \le m < 30$	6	6
$30 \le m < 60$	12	18
$60 \le m < 90$	38	56
$90 \le m < 120$	42	98
$120 \le m < 150$	12	110
$150 \le m < 180$	10	120

✓correct totals
✓ 120
(2)

10.2



✓ axes (correctly labelled)
✓ plotting points correctly
✓ shape
(3)

10.3

Median ≈ 91

✓answer
(1)

[6]

QUESTION 11

11.1

$\bar{x} = \frac{480}{10} = 48$

✓ sum
✓ answer
(2)

11.2

Data	$(x_i - \bar{x})$	$(x_i - \bar{x})^2$
21	– 27	729
32	– 16	256
37	– 11	121
38	– 10	100
42	– 6	36
51	3	9
55	7	49
62	14	196
68	20	400
74	26	676
	$\sum_{i=1}^{n}(x_i - \bar{x})^2$ =	2572

✓ calculating differences
✓ calculating squares
✓sum
(3)

11.3

Variance = $\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{10}$ = 257,2

✓dividing by 10
✓ answer
(2)

11.4

Standard Deviation = $\sqrt{257,2}$ = 16,04

✓ answer
(1)

11.5

Seven of the players are within the standard deviation distance from the mean. These players have scored points close to the mean score. This suggests that they have played well together as a team.

✓close to the mean score
(1)

[9]