



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

MATHEMATICS P2

EXEMPLAR 2012

MEMORANDUM

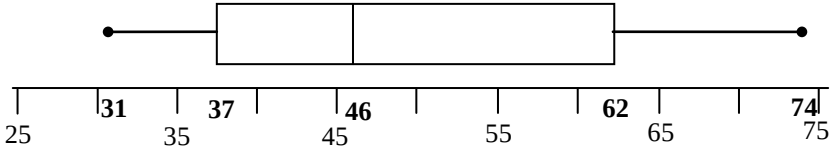
MARKS: 100

This memorandum consists of 10 pages.

NOTE:

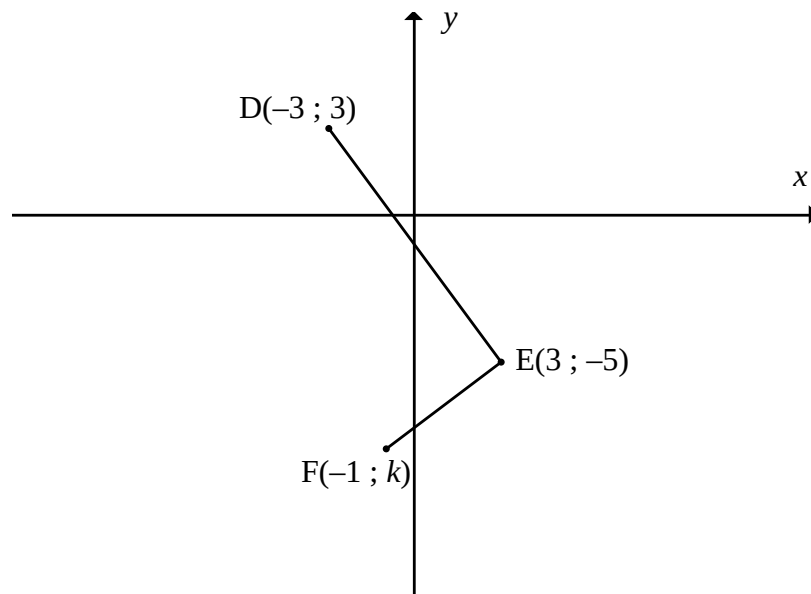
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum.
- Assuming answers/values in order to solve a problem is NOT acceptable.

QUESTION 1

1.1	$\text{Mean} = \frac{\sum_{i=1}^n x_i}{n} = \frac{929}{19} = 48,89$	✓ $\frac{929}{19}$ ✓ answer (2)
1.2	31 ; 31 ; 34 ; 36 ; 37 ; 39 ; 40 ; 43 ; 46 ; 46 ; 48 ; 52 ; 56 ; 60 ; 62 ; 63 ; 65 ; 66 ; 74. Median = 46	✓ arranging in ascending order ✓ median (2)
1.3	Lower quartile = 37 Upper quartile = 62	✓ lower quartile ✓ upper quartile (2)
1.4		✓ box with median ✓ whisker (2) [8]

QUESTION 2

2.1	The modal class is $2500 \leq x < 4500$	✓ $2500 \leq x < 4500$ (1)																																
2.2	<table><tr><th>Gross Vehicle Mass (GVM) (in kg)</th><th>Frequency</th><th>Midpoint</th><th>Frequency × midpoint</th></tr><tr><td>$2500 \leq x < 4500$</td><td>103</td><td>3500</td><td>360 500</td></tr><tr><td>$4500 \leq x < 6500$</td><td>19</td><td>5500</td><td>104 500</td></tr><tr><td>$6500 \leq x < 8500$</td><td>70</td><td>7500</td><td>525 000</td></tr><tr><td>$8500 \leq x < 10500$</td><td>77</td><td>9500</td><td>731 500</td></tr><tr><td>$10500 \leq x < 12500$</td><td>85</td><td>11500</td><td>977 500</td></tr><tr><td>$12500 \leq x < 14500$</td><td>99</td><td>13500</td><td>1 336 500</td></tr><tr><td>Sum</td><td>453</td><td></td><td>4 035 500</td></tr></table> Estimated mean $(\bar{X}) = \frac{4035500}{453} = 8908,39 \text{ kg.}$	Gross Vehicle Mass (GVM) (in kg)	Frequency	Midpoint	Frequency × midpoint	$2500 \leq x < 4500$	103	3500	360 500	$4500 \leq x < 6500$	19	5500	104 500	$6500 \leq x < 8500$	70	7500	525 000	$8500 \leq x < 10500$	77	9500	731 500	$10500 \leq x < 12500$	85	11500	977 500	$12500 \leq x < 14500$	99	13500	1 336 500	Sum	453		4 035 500	✓ midpoints ✓✓ frequencies × midpoint ✓ 4 035 500 ✓ answer (5)
Gross Vehicle Mass (GVM) (in kg)	Frequency	Midpoint	Frequency × midpoint																															
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Sum	453		4 035 500																															
2.3	The estimated mean. It is more at the centre of the data set. The modal class is found at the extreme left-hand side of the data set.	✓ estimated mean with reason (1) [7]																																

QUESTION 3

3.1.1	$DE = \sqrt{(-3-3)^2 + (3-(-5))^2}$ $= \sqrt{100}$ $= 10$	✓ substitution into distance formula ✓ answer (2)
3.1.2	$m_{DE} = \frac{-5-3}{3-(-3)}$ $= -\frac{4}{3}$	✓ substitution into gradient formula ✓ answer (2)
3.1.3	$m_{EF} = \frac{3}{4} \quad EF \perp DE$ $\frac{-5-k}{3-(-1)} = \frac{3}{4}$ $\frac{-5-k}{4} = \frac{3}{4}$ $-20-4k=12$ $-4k=32$ $k=-8$	✓ $m_{EF} = \frac{3}{4}$ ✓ $\frac{-5-k}{3-(-1)} = \frac{3}{4}$ ✓ simplification ✓ $k = -8$ (4)
3.1.4	$M\left(\frac{(-3)+(-1)}{2}; \frac{3+(-8)}{2}\right)$ $= \left(-2; -\frac{5}{2}\right)$	✓ substitution into midpoint formula ✓ answer (2)

3.1.5	If DEFG is a rectangle then M is also the midpoint of EG. Let the coordinates of G be $(x; y)$ $\left(\frac{x+3}{2}; \frac{y+(-5)}{2}\right) = \left(-2; -\frac{5}{2}\right)$ $\frac{x+3}{2} = -2 \qquad \qquad \frac{y-5}{2} = -\frac{5}{2}$ $x+3 = -4 \qquad \qquad \text{and} \qquad y-5 = -5$ $x = -7 \qquad \qquad y = 0$ $\therefore G(-7; 0)$ OR The translation that sends $E(3; -5)$ to $F(-1; -8)$ also sends $D(-3; 3)$ to G. $(-1; -8) = (3 - 4; -5 - 3)$ $\therefore G = (-3 - 4; 3 - 3) = (-7; 0)$ OR The translation that sends $E(3; -5)$ to $D(-3; 3)$ also sends $F(-1; -8)$ to G. $(-3; 3) = (3 - 6; -5 + 8)$ $\therefore G = (-1 - 6; -8 + 8) = (-7; 0)$	$\checkmark \frac{x+3}{2} = -2$ $\checkmark x = -7$ $\checkmark \frac{y-5}{2} = -\frac{5}{2}$ $\checkmark y = 0$ (4) $\checkmark \text{method}$ $\checkmark x - 4$ $\checkmark y - 3$ $\checkmark \text{answer}$ (4) $\checkmark \text{method}$ $\checkmark x - 6$ $\checkmark y + 8$ $\checkmark \text{answer}$ (4)
3.2	$\sqrt{(x-1)^2 + (5-(-2))^2} = \sqrt{53}$ $(x-1)^2 + 49 = 53$ $x^2 - 2x + 1 + 49 - 53 = 0$ $x^2 - 2x - 3 = 0$ $(x+1)(x-3) = 0$ $x = -1 \text{ or } x = 3$ but D is in the second quadrant $\therefore$ only $x = -1$ is valid	$\checkmark \text{equation using distance formula}$ $\checkmark \text{standard form}$ $\checkmark \text{factorisation}$ $\checkmark \text{answer must exclude 3}$ (4) [18]

QUESTION 4

4.1.1	$\sin C = \frac{AB}{AC}$	✓ AC (1)
4.1.2	$\cot A = \frac{AB}{BC}$	✓ $\cot A$ (1)
4.2	$\frac{\sin 60^\circ \cdot \tan 30^\circ}{\sec 45^\circ}$ $= \frac{\left(\frac{\sqrt{3}}{2}\right)\left(\frac{1}{\sqrt{3}}\right)}{\sqrt{2}}$ $= \frac{1}{2\sqrt{2}}$ $= \frac{1}{2} \times \frac{1}{\sqrt{2}}$ $= \frac{1}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ $= \frac{\sqrt{2}}{4}$	✓✓ substitution ✓ simplification ✓ answer (4)
4.3.1	$r^2 = (-5)^2 + (12)^2$ $r^2 = 169$ $r = 13$ $\cos \theta = -\frac{5}{13}$	✓ $r^2 = (-5)^2 + (12)^2$ ✓ $r = 13$ ✓ answer (3)
4.3.2	$\operatorname{cosec}^2 \theta + 1$ $= \left(\frac{13}{12}\right)^2 + 1$ $= \frac{169}{144} + \frac{144}{144}$ $= \frac{313}{144}$	✓ $= \frac{13}{12}$ ✓ simplification ✓ answer (3) [12]

QUESTION 5

5.1.1	$5 \cos x = 3$ $\cos x = \frac{3}{5}$ $x = \cos^{-1}\left(\frac{3}{5}\right)$ $x = 53,1^\circ$	$\checkmark \cos x = \frac{3}{5}$ $\checkmark$ answer (2)
5.1.2	$\tan 2x = 1,19$ $2x = \tan^{-1}(1,19)$ $2x = 49,95845.....^\circ$ $x = 25^\circ$	$\checkmark \checkmark 2x = 49,958....^\circ$ $\checkmark$ answer (3)
5.1.3	$4 \sec x - 3 = 5$ $4 \sec x = 8$ $\sec x = 2$ $\frac{1}{\sec x} = \frac{1}{2}$ $\cos x = \frac{1}{2}$ $x = \cos^{-1}\left(\frac{1}{2}\right)$ $x = 60^\circ$	$\checkmark \sec x = 2$ $\checkmark$ inverting both sides $\checkmark \cos x$ $\checkmark$ answer (4)
5.2.1	$\hat{JKD} = 8^\circ$ alternate angles	$\checkmark$ answer (1)
5.2.2	$\tan 8^\circ = \frac{5}{DK}$ $DK = \frac{5}{\tan 8^\circ}$ $DK = 35,57684..... \text{ km}$ $DK = 35\,577 \text{ m}$	$\checkmark \tan 8^\circ = \frac{5}{DK}$ $\checkmark DK = \frac{5}{\tan 8^\circ}$ $\checkmark$ answer (3)
5.2.3	$DS = 35,58 - 8 = 27,58 \text{ km}$	$\checkmark$ answer (1)
5.2.4	$\tan \hat{DSJ} = \frac{5}{27,58}$ $\hat{DSJ} = \tan^{-1}\left(\frac{5}{27,58}\right)$ $\hat{DSJ} = 10,3^\circ$	$\checkmark \tan \hat{DSJ} = \frac{5}{27,58}$ $\checkmark$ answer (2) [16]

QUESTION 6

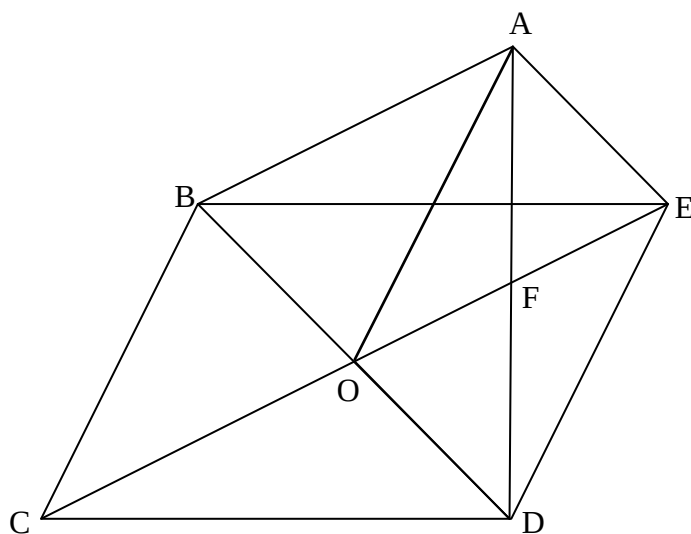
6.1.1		✓ correct x -intercepts ✓ correct y -intercept ✓ asymptotes ✓ shape (must pass through $(45^\circ ; 2)$) (4)
6.1.2	$y = -2 \tan x$	✓ answer (1)
6.2.1	$g(x) = a \sin x$ $4 = a \sin 90^\circ$ $4 = a(1)$ $a = 4$	✓ $a = 4$ (1)
6.2.2	Range is $-2 \leq y \leq 6$.	✓ -2 ✓ 6 (2) [8]

QUESTION 7

7.1.1	$AH^2 = 0,8^2 + 1,5^2$ $AH^2 = 2,89$ $AH = 1,7$	$\checkmark AH^2 = 0,8^2 + 1,5^2$ $\checkmark AH = 1,7$ (2)
7.1.2	Surface area of roof $= 4 \times \frac{1}{2} (3 \times 1,7)$ $= 10,2 \text{ m}^2$	$\checkmark 4 \times \frac{1}{2} (3 \times 1,7)$ $\checkmark$ answer (2)
7.1.3	Surface area of walls $= 4 \times 3 \times 2,1$ $= 25,2 \text{ m}^2$ Total surface area $= 10,2 \text{ m}^2 + 25,2 \text{ m}^2 = 35,4 \text{ m}^2$	$\checkmark 25,2 \text{ m}^2$ $\checkmark$ answer (2)
7.2.1	Volume $= \frac{4}{3} \pi (8)^3$ $= 2144,66 \text{ mm}^3$	$\checkmark \frac{4}{3} \pi (8)^3$ $\checkmark$ answer (2)
7.2.2	New volume : original volume $= 2^3 : 1$ $= 8 : 1$	$\checkmark 2^3$ $\checkmark$ answer (2)
7.2.3	Volume including silver $= \frac{4}{3} \pi (9)^3 = 3\,053,63 \text{ mm}^3$. Volume of silver $= 3\,053,63 - 2144,66$ $= 908,97 \text{ mm}^3$	$\checkmark \frac{4}{3} \pi (9)^3$ $\checkmark$ answer (2) [12]

QUESTION 8

8.1	OQ = 2 cm (the long diagonal of a kite bisects the shorter diagonal)	$\checkmark 2 \text{ cm}$ $\checkmark$ correct reason (2)
8.2	$\hat{P}OQ = 90^\circ$ (the diagonals of a kite intersect at right angles)	$\checkmark 90^\circ$ $\checkmark$ correct reason (2)
8.3	$\hat{Q}PO = 20^\circ$ (the longer diagonal bisects the angles of a kite) $\therefore \hat{Q}PS = 20^\circ + 20^\circ = 40^\circ$	$\checkmark \hat{Q}PO = 20^\circ$ with correct reason $\checkmark \hat{Q}PS = 40^\circ$ (2) [6]

QUESTION 9

9.1	O is the midpoint of BD. (Diagonals of parm BCDE bisect each other) F is the midpoint of OE. (Diagonals of parm AODE bisect each other) $\therefore OF \parallel AB$ (The line joining the midpoints of two sides in a Δ is $\parallel$ to third side)	✓ O is the midpoint of BD ✓ reason – diagonals of parm ✓ F is the midpoint of OE ✓ reason – midpoint theorem (4)
9.2	$AE \parallel OD$ (Opp sides of parm AODE are parallel) $\therefore AE \parallel OB$ $OF \parallel AB$ (proven above) $\therefore OE \parallel AB$ $\therefore ABOE$ is a parallelogram (both pairs of opposite sides of quad are parallel)	✓ $AE \parallel OB$ ✓ reason ✓ $OE \parallel AB$ ✓ reason – opp sides parallel (4)
9.3	In ΔABO and ΔEOD 1. $AB = EO$...(Opp sides of parm ABOE are equal) 2. $AO = ED$...(Opp sides of parm AODE are equal) 3. $BO = DO$...(Diagonals of parm BCDE bisect each other) $\therefore \Delta ABO \equiv \Delta EOD$ (S, S, S)	✓ $AB = EO$ ✓ $AO = ED$ ✓ reason – opp sides are equal ✓ $BO = DO$ ✓ reason – diagonals of parm (5) [13]

TOTAL: 100