basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

MATHEMATICS P2

EXEMPLAR 2012

MEMORANDUM

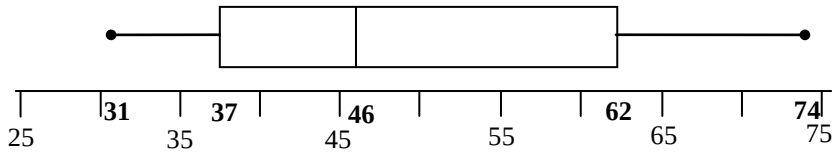
MARKS: 100

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	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 $2500 \le x < 4500$

✓ $2500 \le x < 4500$ (1)

2.2

Gross Vehicle Mass (GVM) (in kg)	Frequency	Midpoint	Frequency × midpoint
$2500 \le x < 4500$	103	3500	360 500
$4500 \le x < 6500$	19	5500	104 500
$6500 \le x < 8500$	70	7500	525 000
$8500 \le x < 10500$	77	9500	731 500
$10500 \le x < 12500$	85	11500	977 500
$12500 \le x < 14500$	99	13500	1 336 500
Sum	453		4 035 500

✓ midpoints

✓✓ frequencies × midpoint

✓4 035 500

Estimated mean $(\overline{X}) = \frac{4035500}{453} = 8908{,}39\,\text{kg}.$

✓ answer (5)

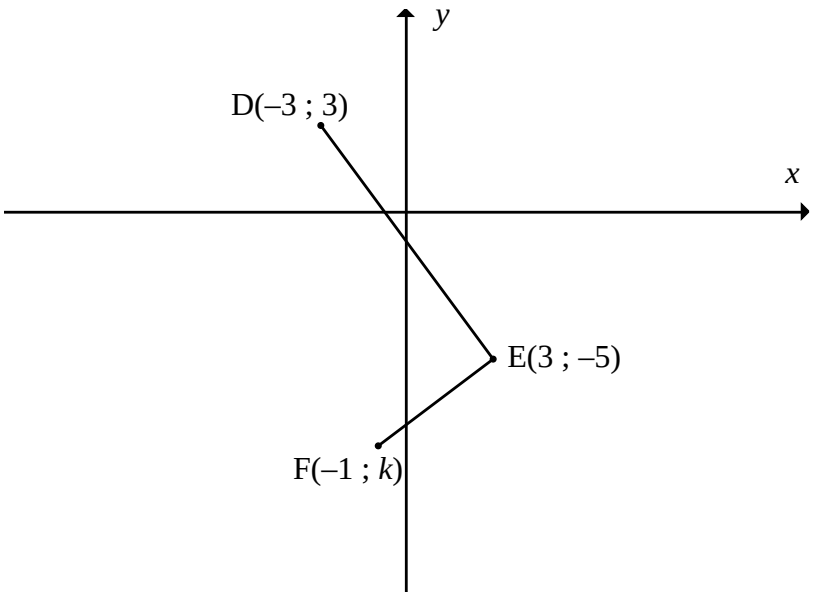
2.3

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	$m_{EF} = \frac{3}{4}$ EF ⊥ 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 $(x\,;\,y)$ $\left(\frac{x+3}{2}\,;\,\frac{y+(-5)}{2}\right)=\left(-2\,;\,-\frac{5}{2}\right)$ $\frac{x+3}{2}=-2$ and $\frac{y-5}{2}=-\frac{5}{2}$ $x+3=-4$ and $y-5=-5$ $x=-7$ $y=0$ $\therefore$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)	✓ $\frac{x+3}{2}=-2$ ✓ $x=-7$ ✓ $\frac{y-5}{2}=-\frac{5}{2}$ ✓ $y=0$ (4) ✓method ✓ $x-4$ ✓ $y-3$ ✓ answer (4) ✓method ✓ $x-6$ ✓ $y+8$ ✓ answer (4)
3.2	$\sqrt{(x-1)^2+(5-(-2))^2}=\sqrt{53}$ $(x-1)^2+49=53$ $x^2-2x+1+49-53=0$ $x^2-2x-3=0$ $(x+1)(x-3)=0$ $x=-1$ or $x=3$ but D is in the second quadrant $\therefore$ only $x=-1$ is valid	✓equation using distance formula ✓ standard form ✓ factorisation ✓ answer must exclude 3 (4) **[18]**

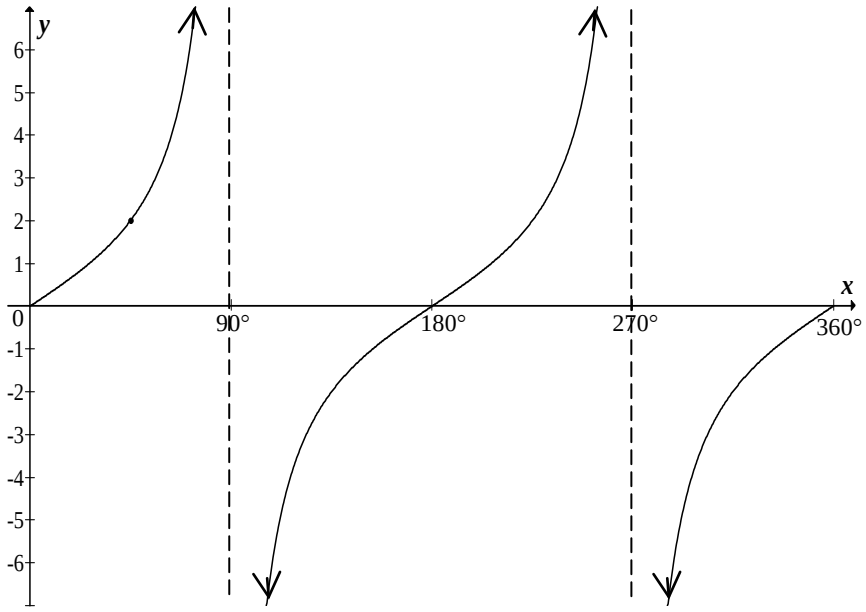
QUESTION 4

4.1.1	$\sin C = \frac{AB}{AC}$	✓ AC (1)
4.1.2	$\cot A = \frac{AB}{BC}$	✓ $\cot A$ (1)
4.2	$\frac{\sin 60°.\tan 30°}{\sec 45°}$ $= \frac{\left(\frac{\sqrt{3}}{2}\right)\left(\frac{1}{\sqrt{3}}\right)}{\sqrt{2}}$ $= \frac{\frac{1}{2}}{\sqrt{2}}$ $= \frac{1}{2} \times \frac{1}{\sqrt{2}}$ $= \frac{1}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ $= \frac{\sqrt{2}}{4}$	✓✓ 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	$\text{cosec}^2\theta + 1$ $= \left(\frac{13}{12}\right)^2 + 1$ $= \frac{169}{144} + \frac{144}{144}$ $= \frac{313}{144}$	✓ $= \frac{13}{12}$ ✓simplification ✓answer (3) **[12]**

QUESTION 5

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

QUESTION 6

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

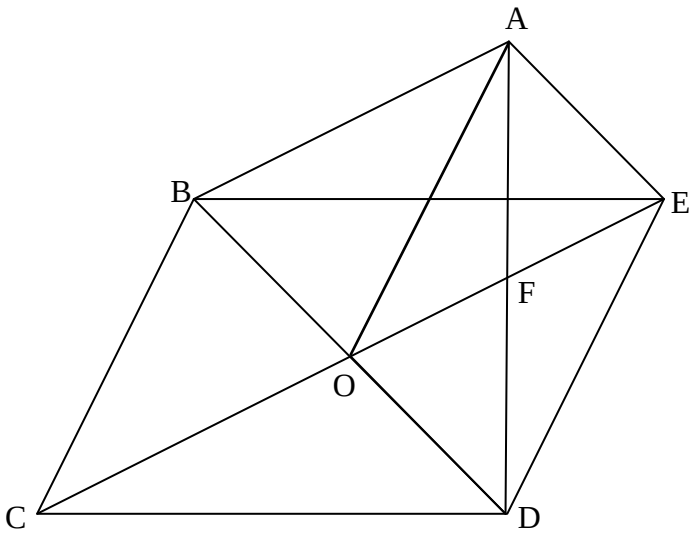
QUESTION 7

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

QUESTION 8

8.1	OQ = 2 cm …. (the long diagonal of a kite bisects the shorter diagonal)	✓ 2 cm ✓ correct reason (2)
8.2	$P\hat{O}Q = 90°$ …. (the diagonals of a kite intersect at right angles)	✓ 90° ✓correct reason (2)
8.3	$Q\hat{P}O = 20°$ …. (the longer diagonal bisects the angles of a kite) $\therefore Q\hat{P}S = 20° + 20° = 40°$	✓ $Q\hat{P}O = 20°$ with correct reason ✓ $Q\hat{P}S = 40°$ (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) ∴ OF || AB …. (The line joining the midpoints of two sides in a Δ is || 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 || OD …. (Opp sides of parm AODE are parallel) ∴ AE || OB OF || AB …. (proven above) ∴OE || AB ∴ ABOE is a parallelogram …. (both pairs of opposite sides of quad are parallel)	✓ AE || OB ✓ reason ✓ OE || 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) ∴ΔABO ≡ ΔEOD (S, S, S)	✓ AB = EO ✓ AO = ED ✓ reason – opp sides are equal ✓ BO = DO ✓ reason – diagonals of parm (5) **[13]**

TOTAL: 100