TEACHERS WITHOUT BORDERS PROGRAMME

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In Bill Gates words, at the Mandela Day 'Living Together' address: "Maintaining the quality of this country's higher education system while expanding access to more students will not be easy. But it's critical to South Africa's future" – working together, we can help achieve this."

Contributing schools to date:

Clifton School	Milnerton High	Rustenburg Girls' High	St Peter's
Durban Girls'	Northwood High	St Anne's DC	St Stithians
Fairmont High	Roedean	St John's DSG	Wynberg Boys' High
Herzlia High	Rondebosch Boys'	St Mary's DSG Kloof	Wynberg Secondary

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NATIONAL SENIOR CERTIFICATE

GRADE 10

MATHEMATICS P2

EXEMPLAR 2012

MEMORANDUM

MARKS: 100

This memorandum consists of 10 pages.

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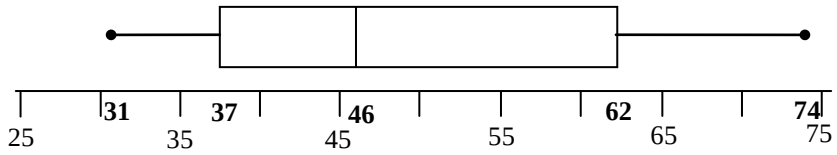
NOTE:

- 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]**

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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]

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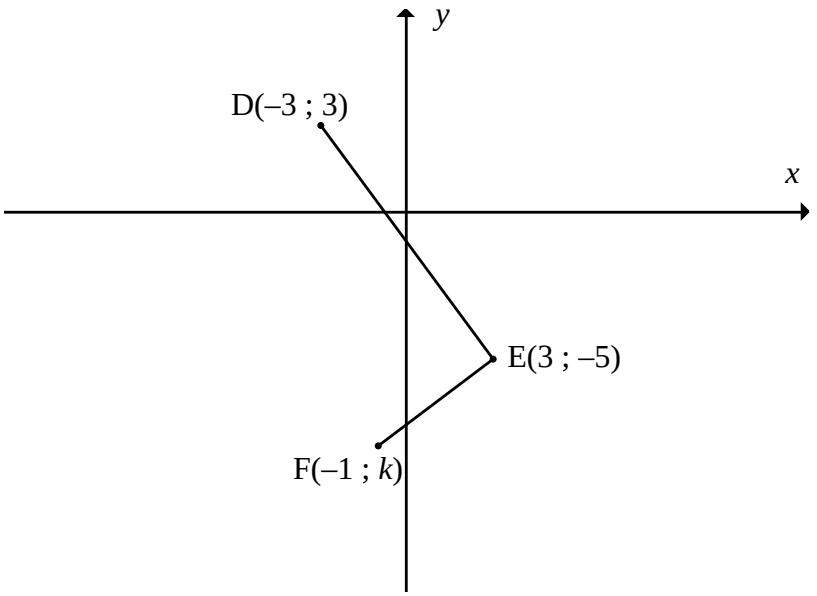
QUESTION 3



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)

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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]**

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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]**

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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	$\tan 8° = \frac{5}{DK}$ $DK = \frac{5}{\tan 8°}$ $DK = 35{,}57684..... \text{ km}$ $DK = 35\,577 \text{ m}$	✓ $\tan 8° = \frac{5}{DK}$ ✓ $DK = \frac{5}{\tan 8°}$ ✓ answer (3)
5.2.3	$DS = 35{,}58 - 8 = 27{,}58 \text{ km}$	✓ 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]**

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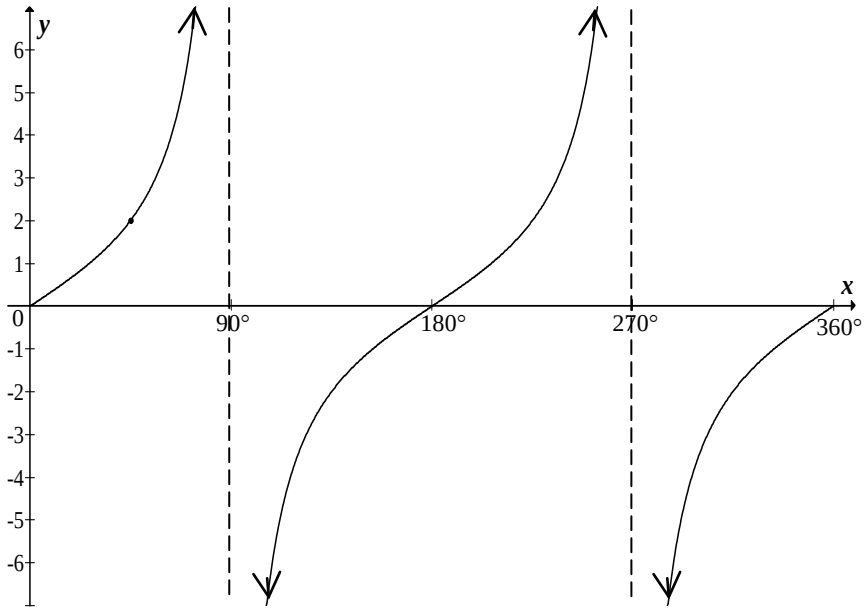
QUESTION 6

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]**

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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	$Q\hat{P}O = 20°$ $\therefore Q\hat{P}S = 20° + 20° = 40°$	…. (the longer diagonal bisects the angles of a kite)	✓ $Q\hat{P}O = 20°$ with correct reason ✓ $Q\hat{P}S = 40°$ (2) **[6]**

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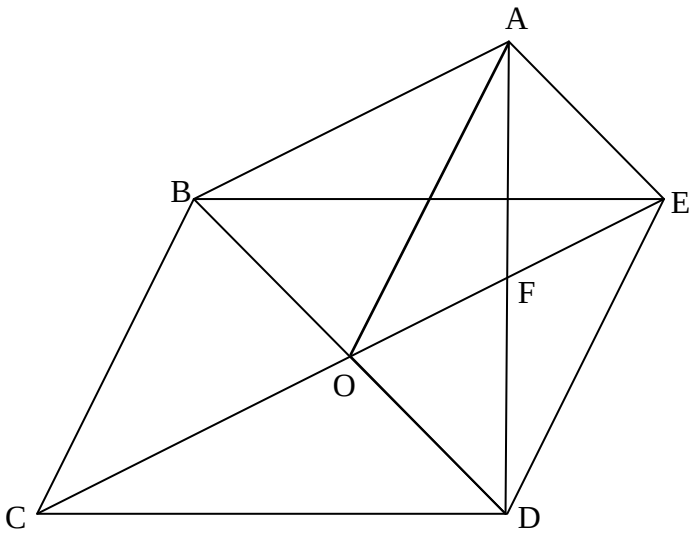
QUESTION 9



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

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