



# 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:**

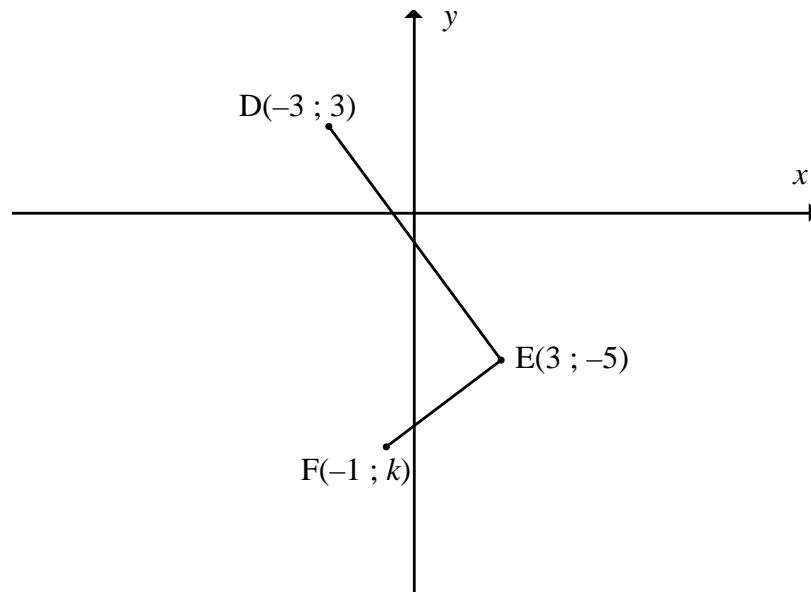
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Consistent accuracy applies in ALL aspects of the marking memorandum.
- Assuming answers/values in order to solve 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) <b>[8]</b>

**QUESTION 2**

2.1	The modal class is $2500 \leq x < 4500$	✓ $2500 \leq x < 4500$ (1)																																
2.2	<table border="1" data-bbox="268 450 1054 1039"> <thead> <tr> <th>Gross Vehicle Mass (GVM) (in kg)</th> <th>Frequency</th> <th>Midpoint</th> <th>Frequency × midpoint</th> </tr> </thead> <tbody> <tr> <td><math>2500 \leq x &lt; 4500</math></td> <td>103</td> <td>3500</td> <td>360 500</td> </tr> <tr> <td><math>4500 \leq x &lt; 6500</math></td> <td>19</td> <td>5500</td> <td>104 500</td> </tr> <tr> <td><math>6500 \leq x &lt; 8500</math></td> <td>70</td> <td>7500</td> <td>525 000</td> </tr> <tr> <td><math>8500 \leq x &lt; 10500</math></td> <td>77</td> <td>9500</td> <td>731 500</td> </tr> <tr> <td><math>10500 \leq x &lt; 12500</math></td> <td>85</td> <td>11500</td> <td>977 500</td> </tr> <tr> <td><math>12500 \leq x &lt; 14500</math></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> </tbody> </table> <p data-bbox="268 1077 868 1155">Estimated mean <math>(\bar{X}) = \frac{4035500}{453} = 8908,39 \text{ kg.}</math></p>	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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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)

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

**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	$\frac{\sin 60^\circ \cdot \tan 30^\circ}{\sec 45^\circ}$ $= \left(\frac{\sqrt{3}}{2}\right) \left(\frac{1}{\sqrt{3}}\right)$ $= \frac{1}{\sqrt{2}}$ $= \frac{2}{\sqrt{2}}$ $= \frac{1}{2} \times \frac{1}{\sqrt{2}}$ $= \frac{1}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ $= \frac{\sqrt{2}}{4}$	✓✓ 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) <b>[12]</b>

**QUESTION 5**

5.1.1	$5 \cos x = 3$ $\cos x = \frac{3}{5}$ $x = \cos^{-1}\left(\frac{3}{5}\right)$ $x = 53,1^\circ$	$\checkmark \cos x = \frac{3}{5}$ $\checkmark \text{ answer}$ <p style="text-align: right;">(2)</p>
5.1.2	$\tan 2x = 1,19$ $2x = \tan^{-1}(1,19)$ $2x = 49,95845\dots^\circ$ $x = 25^\circ$	$\checkmark \checkmark 2x = 49,958\dots^\circ$ $\checkmark \text{ answer}$ <p style="text-align: right;">(3)</p>
5.1.3	$4 \sec x - 3 = 5$ $4 \sec x = 8$ $\sec x = 2$ $\frac{1}{\sec x} = \frac{1}{2}$ $\cos x = \frac{1}{2}$ $x = \cos^{-1}\left(\frac{1}{2}\right)$ $x = 60^\circ$	$\checkmark \sec x = 2$ $\checkmark \text{ inverting both sides}$ $\checkmark \cos x$ $\checkmark \text{ answer}$ <p style="text-align: right;">(4)</p>
5.2.1	$\hat{J}KD = 8^\circ$ alternate angles	$\checkmark \text{ answer}$ <p style="text-align: right;">(1)</p>
5.2.2	$\tan 8^\circ = \frac{5}{DK}$ $DK = \frac{5}{\tan 8^\circ}$ $DK = 35,57684\dots \text{ km}$ $DK = 35\,577 \text{ m}$	$\checkmark \tan 8^\circ = \frac{5}{DK}$ $\checkmark DK = \frac{5}{\tan 8^\circ}$ $\checkmark \text{ answer}$ <p style="text-align: right;">(3)</p>
5.2.3	$DS = 35,58 - 8 = 27,58 \text{ km}$	$\checkmark \text{ answer}$ <p style="text-align: right;">(1)</p>
5.2.4	$\tan \hat{D}SJ = \frac{5}{27,58}$ $\hat{D}SJ = \tan^{-1}\left(\frac{5}{27,58}\right)$ $\hat{D}SJ = 10,3^\circ$	$\checkmark \tan \hat{D}SJ = \frac{5}{27,58}$ $\checkmark \text{ answer}$ <p style="text-align: right;">(2)</p> <p style="text-align: right;"><b>[16]</b></p>

**QUESTION 6**

<p>6.1.1</p>		<ul style="list-style-type: none"> <li>✓ correct <math>x</math>-intercepts</li> <li>✓ correct <math>y</math>-intercept</li> <li>✓ asymptotes</li> <li>✓ shape (must pass through <math>(45^\circ ; 2)</math>)</li> </ul> <p style="text-align: right;">(4)</p>
<p>6.1.2</p>	<p><math>y = -2 \tan x</math></p>	<ul style="list-style-type: none"> <li>✓ answer</li> </ul> <p style="text-align: right;">(1)</p>
<p>6.2.1</p>	<p><math>g(x) = a \sin x</math>  <math>4 = a \sin 90^\circ</math>  <math>4 = a(1)</math>  <math>a = 4</math></p>	<ul style="list-style-type: none"> <li>✓ <math>a = 4</math></li> </ul> <p style="text-align: right;">(1)</p>
<p>6.2.2</p>	<p>Range is <math>-2 \leq y \leq 6</math>.</p>	<ul style="list-style-type: none"> <li>✓ <math>-2</math></li> <li>✓ <math>6</math></li> </ul> <p style="text-align: right;">(2)  <b>[8]</b></p>



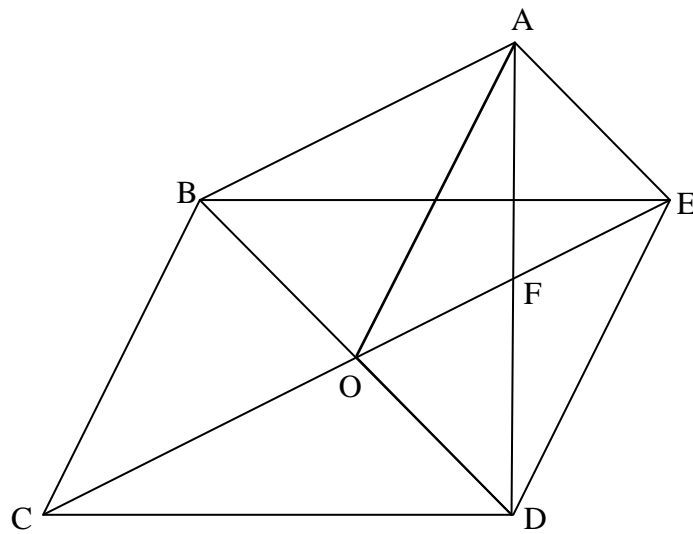
**QUESTION 7**

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) <b>[12]</b>

**QUESTION 8**

8.1	$OQ = 2 \text{ cm}$ .... (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) <b>[6]</b>

**QUESTION 9**



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

**TOTAL: 100**