



# education

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Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**MATHEMATICS P3**

**FEBRUARY/MARCH 2010**

**MEMORANDUM**

**MARKS: 100**

**This memorandum consists of 8 pages.**

**QUESTION 1**

1.1	313 ; 633	✓✓ answers (2)
1.2	$13 = 2 \times 3 + 7$ $33 = 2 \times 13 + 7$ $73 = 2 \times 33 + 7$ $T_{n+1} = 2T_n + 7, T_1 = 3 \quad (n \geq 1)$ OR $T_n = 2T_{n-1} + 7, T_1 = 3 \quad (n \geq 2)$  <b>OR</b>  $13 = 3 + 10$ $33 = 13 + 20$ $73 = 33 + 40$ $T_{n+1} = T_n + 10.2^{n-1}, T_1 = 3 \quad (n \geq 1)$ OR $T_n = T_{n-1} + 10.2^{n-2}, T_1 = 3 \quad (n \geq 2)$	✓ developing sequence ✓ $T_{n+1} = 2T_n + 7$ ✓ $T_1 = 3$  (3)   ✓ developing sequence ✓ $T_{n+1} = T_n + 10.2^{n-1}$ ✓ $T_1 = 3$  (3) <b>[5]</b>

**QUESTION 2**

2.1	Yes. All three graphs represent the annual profits for the same company (2005 – R60 million; 2006 – R100 million and 2007 – R180 million). There are, however, differences in the way the information is presented – the scale on the vertical axis has been changed in graph 2 and the order of the years reversed in graph 3.	✓ yes ✓ profits for the same company but presented differently.  (2)
2.2	In graph 2, the impression created is that the annual profit is levelling off or shows a slight increase year on year. In graph 3, the impression created is that the annual profit is decreasing.	✓ graph 2 - annual profit is levelling off ✓ graph 3 - decreasing  (2)
2.3	Graph 1. This graph shows a substantial increase in annual profits year on year.	✓ answer ✓ explanation  (2) <b>[6]</b>

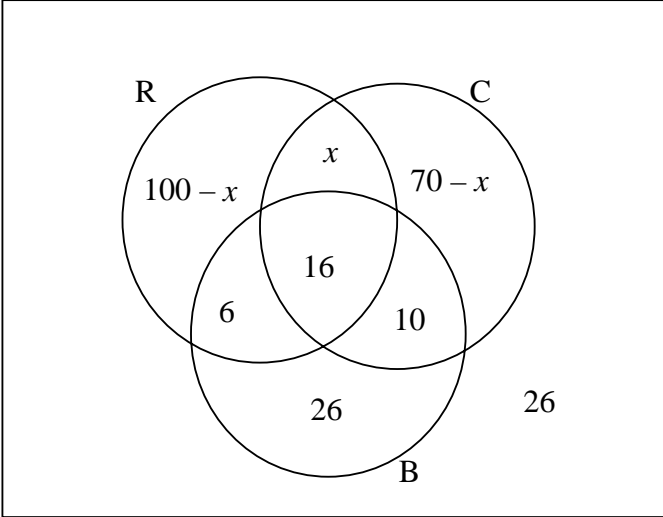
**QUESTION 3**

3.1	39 minutes	✓ answer  (1)
3.2	The standard deviation is 8 minutes. $m = 39 + 2(8) = 55$ $n = 39 - 3(8) = 15$	✓ answer for $m$ ✓ answer for $n$  (2)
3.3	20 learners represent 16% of total number $\text{Total number} = \frac{20 \times 100}{16}$ $= 125$	✓ $20 = 16\%$  ✓ answer  (2)
3.4	The library assistant should be employed for one hour each afternoon. There is a small percentage (< 2%) of learners who spend more than more than 1 hour in the library.	✓ one hour ✓ justification  (2) <b>[7]</b>

**QUESTION 4**

4.1	$P(A \text{ or } B) = 0,3 + 0,5$ $= 0,8$	✓ addition ✓ answer (2)
4.2	Since A and B are independent  $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $= 0,3 + 0,5 - 0,15$ $= 0,65$	✓ $P(A \text{ and } B) = 0,15$ ✓ $0,3 + 0,5 - 0,15$ ✓ answer (3)  <b>[5]</b>

**QUESTION 5**

5.1		✓ 16 ✓ 6 and 10 ✓ 26 (inside B only), 100 - x and 70 - x ✓ 26 (outside)  (4)
5.2	$100 - x + x + 16 + 6 + 26 + 10 + 70 - x + 26 = 240$ $254 - x = 240$ $x = 14$ $\therefore \text{Number of learners playing rugby and cricket} = 30.$	✓ set up equation  ✓ answer $x = 14$ ✓ answer = 30 (3)
5.3.1	$P(\text{play basketball only}) = \frac{26}{240}$ $= 0,108$	✓ $= \frac{26}{240}$ ✓ answer (2)
5.3.2	$P(\text{does not play cricket}) = \frac{144}{240}$ $= 0,600$	✓ 144 ✓ answer (2)
5.3.3	$P(\text{plays at least 2 sports}) = \frac{14 + 6 + 10 + 16}{240}$ $= \frac{46}{240}$ $= 0,192$	✓ method  ✓ answer (2) <b>[13]</b>

**QUESTION 6**

6.1	Number of ways in which performances take place : $= 7! = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ $= 5040$	✓ multiplication rule ✓ answer (2)
6.2	Since first and last performance are fixed, the number of different ways performances can be arranged in 5 cities $= 1 \times 5! \times 1 = 5 \times 4 \times 3 \times 2 \times 1$ $= 120$	✓ 5 cities ✓ multiplication rule ✓ answer (3)
6.3	The different ways the coastal cities tours can take place $= 4!$ $= 24$ Total number of ways the itinerary can be arranged $= 4! \times 4!$ $= 24 \times 24$ $= 576$	✓ coastal cities = 4!  ✓ $4! \times 4!$  ✓ answer (4) <b>[9]</b>

**QUESTION 7**

<p>7.1 &amp; 7.3</p>	<p style="text-align: center;"><b>Scatter Plot of North Latitude vs Mean Maximum Temperature for April</b></p>	<p>7.1 ✓✓✓ plotting points (3)</p> <p>7.3 ✓ gradient correct ✓ x-intercept (2)</p>
<p>7.2</p>	<p><math>a = 39,94</math> (39,94369425...)  <math>b = -0,52</math> (- 0,5235636749...)                  Equation of regression line  <math>\hat{y} = 39,94 - 0,52x</math></p>	<p>✓✓ <math>a</math>-value                  ✓ <math>b</math>-value                  ✓ equation (4)</p>
<p>7.4</p>	<p>The <math>y</math>-intercept represents the mean maximum temperature for April at the equator.</p>	<p>✓ answer (1)</p>
<p>7.5</p>	<p>Mean maximum temperature for April in Madrid  <math>= 39,94 - 0,52(40)</math>  <math>= 19,14</math> °C</p>	<p>✓ substitution                  ✓ answer (2)</p>
<p>7.6</p>	<p><math>r = -0,91</math> (- 0,9129015212...)</p>	<p>✓✓ answer (2)</p>
<p>7.7</p>	<p>The value of <math>r</math> is close to <math>-1</math> and suggests that there is a very strong relationship between distance from the equator and the mean maximum temperature for April.                  The further one moves away from the equator, the colder it gets.</p>	<p>✓ very strong and further away from the equator, the colder it gets (1)  <b>[15]</b></p>

**QUESTION 8**

8.1	Equal to $360^\circ$	✓ answer (1)
8.2.1	$\text{reflex } \hat{O} = 360^\circ - 100^\circ = 260^\circ$ ( $\angle$ 's round a point) $2\hat{LMN} = \text{reflex } \hat{O}$ ( $\angle$ circ centre = 2 $\angle$ circumference) $\therefore \hat{LMN} = \frac{260^\circ}{2} = 130^\circ$	✓ reflex $\hat{O} = 260^\circ$ ✓ reason ✓ $\hat{LMN} = 130^\circ$ (3)
8.2.2	$\hat{N}_1 = \frac{180^\circ - 130^\circ}{2} = 25^\circ$ (base angles LM = MN) $\therefore \hat{K} = 25^\circ$ (angles in same segment)	✓ = $25^\circ$ ✓ answer ✓ reason (3) <b>[7]</b>

**QUESTION 9**

9.1	Is equal to the angle subtended by the chord in the alternate segment	✓ answer (1)
9.2.1	$\hat{A}_2 = x$ (tangent chord theorem) $\hat{A}_5 = x$ (vertically opp. angles) $\hat{P}_2 = x$ (tangent chord theorem)	✓ answer ✓ reason ✓ answer ✓ answer ✓ reason (5)
9.2.2	$PT = TA$ (tangents drawn from same point) $\hat{P}_1 = \hat{A}_3$ (angles opp equal sides) ; $PT = TA$ $\hat{A}_3 = \hat{A}_6$ (vertical opp angles) $\hat{A}_6 = \hat{R}_2$ (tangent chord theorem) $\therefore \hat{P}_1 = \hat{R}_2$ $\therefore$ APTR is a cyclic quadrilateral (converse : ext angle of cycl.quad.)	✓ statement ✓ statement ✓ statement ✓ equal angles ✓ reason (5) <b>[11]</b>

**QUESTION 10**

<p>10.1</p>	<p>OC = OB (radii) Hence AE = BE (midpoint theorem)</p> <p><b>OR</b></p> <p><math>\hat{C}AB = 90^\circ</math> (diameter subtends right angle) <math>\hat{O}EB = \hat{C}AB = 90^\circ</math> (corresponding angles AC//OE) <math>\therefore AE = BE</math> (line drawn from centre, perpend. to chord or midpoint theorem)</p>	<p>✓ OC = OB ✓ conclusion and reason (2)</p> <p>✓ <math>\hat{O}EB = \hat{C}AB = 90^\circ</math> ✓ conclusion and reason (2)</p>
<p>10.2</p>	<p>In <math>\triangle AED</math> and <math>\triangle CEB</math></p> <p><math>\hat{A}ED = \hat{C}EB</math> (vertically opp angles) <math>\hat{D} = \hat{B}</math> (angles in same segment) <math>\hat{A}_3 = \hat{C}_1</math> (angles in same segment) <math>\therefore \triangle AED \sim \triangle CEB</math> (equi - angular)</p>	<p>✓ statement ✓ statement ✓ statement</p> <p>(3)</p>
<p>10.3</p>	<p><math>\frac{AE}{DE} = \frac{CE}{BE}</math> (deduction) AE.BE = DE.CE but AE = BE (proven) <math>\therefore AE^2 = DE.CE</math></p>	<p>✓ <math>\frac{AE}{DE} = \frac{CE}{BE}</math> ✓ AE = BE</p> <p>(2)</p>
<p>10.4</p>	<p>AE.BE = DE.CE But AE.BE = EF.CE <math>\therefore DE.CE = EF.CE</math> DE = EF <math>\therefore E</math> is the midpoint of DF</p> <p><b>OR</b></p> <p><math>AE^2 = DE.CE</math> AE.BE = EF.CE <math>\Rightarrow AE^2 = EF.CE</math> <math>\therefore EF.CE = DE.CE</math> EF = DE <math>\therefore E</math> is the midpoint of DF</p>	<p>✓ AE.BE = DE.CE ✓ AE.BE = EF.CE ✓ DE.CE = EF.CE</p> <p>(3)</p> <p>✓ AE.BE = EF.CE ✓ <math>\Rightarrow AE^2 = EF.CE</math> ✓ <math>\therefore EF.CE = DE.CE</math></p> <p>(3) <b>[10]</b></p>

**QUESTION 11**

<p>11.1</p>	<p>In <math>\triangle BDA</math> and <math>\triangle CDB</math>  <math>\hat{BDA} = \hat{CDB} = 90^\circ</math>  <math>\hat{B}_1 = \hat{C}</math> (both = <math>x</math>)  <math>\hat{A} = \hat{B}_2</math> (remaining angles)  <math>\triangle BDA \text{ /// } \triangle CDB</math> (equiangular)</p>	<p>✓ <math>\hat{BDA} = \hat{CDB}</math>                  ✓ <math>\hat{B}_1 = \hat{C}</math>                  ✓ <math>\hat{A} = \hat{B}_2</math>                  (3)</p>
<p>11.2</p>	<p><math>AD : DC = 3 : 2</math>  <math>\therefore CD = \frac{2}{3} \times 15 = 10</math>                  But <math>\frac{BD}{AD} = \frac{CD}{BD}</math>  <math>\therefore BD^2 = AD \cdot CD</math>  <math>BD^2 = 15 \cdot 10</math>  <math>= 150</math>  <math>BD = \sqrt{150}</math></p>	<p>✓ CD                  ✓ <math>\frac{BD}{AD} = \frac{CD}{BD}</math>                  ✓ BD (3)</p>
<p>11.3</p>	<p><math>AB^2 = (\sqrt{150})^2 + (15)^2</math> (Theorem of Pythagoras)  <math>= 150 + 225</math>  <math>= 375</math>  <math>AB = \sqrt{375}</math>  <math>\hat{E}_1 = \hat{ABC} = 90^\circ</math>  <math>\therefore BC \parallel DE</math>  <math>\frac{AE}{AB} = \frac{AD}{AC}</math> (proportion theorem)  <math>\frac{AE}{\sqrt{375}} = \frac{15}{25}</math>  <math>AE = \frac{15 \times \sqrt{375}}{25} = \sqrt{135} = 3\sqrt{15}</math></p>	<p>✓ using Pythagoras                  ✓ answer                  ✓ <math>= 90^\circ</math>                  ✓ <math>\therefore BC \parallel DE</math>                  ✓ <math>\frac{AE}{AB} = \frac{AD}{AC}</math>                  ✓ answer (6)                  [11]</p>

**TOTAL : 100**