



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P3

FEBRUARY/MARCH 2011

MEMORANDUM

MARKS: 100

This memorandum consists of 11 pages.

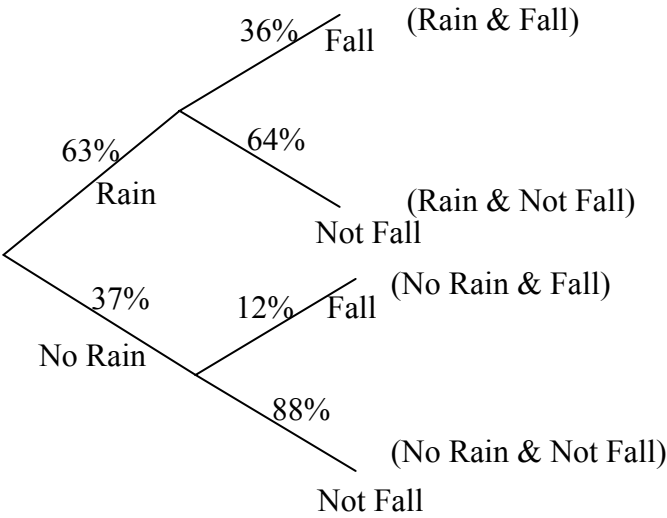
QUESTION 1

1.1	<p>Mean</p> $= \frac{3,2 + 3,2 + 3,2 + 4,2 + 4,5 + 4,9 + 8,3 + 9,5 + 11,7 + 12,2 + 12,5}{11}$ $= \frac{77,4}{11}$ $= 7,03$ <p>Median = 4,9 Mode = 2,3</p>	<p>✓ Mean ✓ Median ✓ Mode</p> <p>(3)</p>
1.2	<p>Mode</p> <p>This is the lowest value and will indicate that the increases are very poor.</p>	<p>✓ mode ✓ reason</p> <p>(2)</p>
1.3	<p>Mean.</p> <p>This is the highest value and can be used to indicate that increases are good.</p>	<p>✓ Mean ✓ Reason</p> <p>(2)</p> <p>[7]</p>

QUESTION 2

2.1	$\sigma = \frac{90 - 65}{2}$ $\sigma = 12,5$	<p>✓ method ✓ answer</p> <p>(2)</p>
2.2	<p>University A: $78 - 65 = 13$ Her result lies just over 1 standard deviation from the mean.</p> <p>University B: $\bar{x} + \sigma = 54$ $\bar{x} + 2\sigma = 59$ Her result lies just over 2 standard deviations from the mean.</p> <p>Her result for University B is better.</p>	<p>✓ 1 sd from the mean</p> <p>✓ 2 sd from the mean ✓ University B.</p> <p>(3)</p> <p>[5]</p>

QUESTION 3

3.1		<p>✓✓ structure of the tree diagram</p> <p>✓ 63% Rain ✓ 36% Fall</p> <p>✓ 64% Not fall</p> <p>✓ 88% Not Fall (6)</p>
3.2	$P(\text{Not Fall}) = \left(\frac{37}{100} \times \frac{88}{100} \right) + \left(\frac{63}{100} \times \frac{64}{100} \right)$ $= \frac{407}{1250} + \frac{252}{625}$ $= \frac{911}{1250}$ $= 0,7288$	<p>✓ $\frac{37}{100} \times \frac{88}{100}$</p> <p>✓ $\frac{63}{100} \times \frac{64}{100}$</p> <p>✓ answer (3)</p>
3.3	$P(\text{Dry \& Fall}) = \frac{37}{100} \times \frac{12}{100}$ $= \frac{111}{2500}$ $= 0,0444$	<p>✓ $\frac{37}{100} \times \frac{12}{100}$</p> <p>✓ answer (2) [11]</p>

QUESTION 4

Average of trial examination	80	68	94	72	74	83	56	68	65	75	88
Final examination mark	72	71	96	77	82	72	58	83	78	80	92

4.1

Scatter Plot showing the trial examination mark vs final examination mark

Trial Examination Mark	Final Examination Mark
56	58
65	78
68	83
72	77
74	82
75	80
80	72
83	72
88	92
94	96

3 marks:
All points plotted correctly.

2 marks:
7 – 10 points plotted correctly

1 mark:
3 – 6 points plotted correctly

(3)

4.2

$a = 25,38$ (25,38342009...)
 $b = 0,71$ (0,7069044703...)
 $\hat{y} = a + bx$
 $\hat{y} = 25,38 + 0,71x$

✓✓ a
 ✓ b
 ✓ answer

(4)

4.3

Scatter plot showing the trial examination mark vs final examination mark

✓ slope
 ✓ accurate drawing

(2)

4.4	$r = 0,74$ (0, 7391817008...)	✓✓ answer (2)
4.5	$\hat{y} = 25,38 + 0,71x$ $\hat{y} = 25,38 + 0,71(75)$ $= 78,63 \%$ If the original values of a and b then $\hat{y} = 78,401$	✓ substitution ✓ answer (2) [13]

QUESTION 5

	Broken a limb	Not broken a limb	TOTAL
Male	463	b	782
Female	a	c	d
TOTAL	913	617	1 530

5.1	$a = 450$ $b = 319$ $c = 298$ $d = 748$	✓ answer for a ✓ answer for b ✓ answer for c ✓ answer for d (4)
5.2	P(Female who has not broken a limb) $= \frac{298}{1530}$ $= \frac{149}{765}$	✓ 298 ✓ answer (2)
5.3	P(Female & broken a limb) $= \frac{450}{1530}$ $= \frac{5}{17}$ $= 0,2941176471...$ $= 0,29$ P(Female) \times P(Broken a limb) $= \frac{748}{1530} \times \frac{913}{1530}$ $= 0,29$ The events of being female and having broken a limb are independent. If a candidate answers not independent due to the fact that the answers are not accurate to more than 2 decimal places, award full marks.	✓ $\frac{463}{1530}$ ✓✓ $\frac{782}{1530} \times \frac{913}{1530}$ ✓ independent (4) [10]

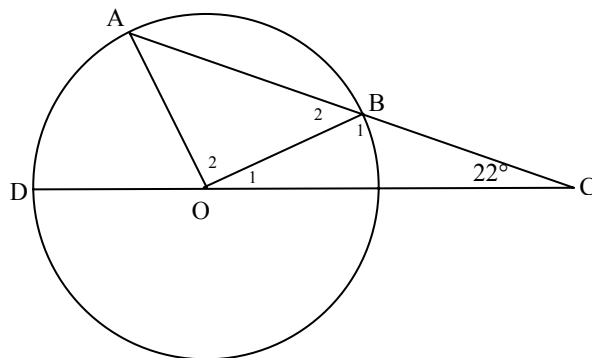
QUESTION 6

6.1	Number of different ways the shirts and trousers can be arranged $= (7 + 4)!$ $= 11!$ $= 39\,916\,800$	✓ 11 ✓ 11! (2)
6.2	Number of ways so that the shirts are together and trousers are together $= 7! \cdot 4! \cdot 2$ $= 241\,920$	✓ 7! ✓ 4! ✓ $\times 2$ (3)
6.3	P(Shirt at beginning and trouser at the end) $= \frac{9! \times 4 \times 7}{11!}$ $= \frac{14}{55}$	✓ $\times 4 \times 7$ ✓ 9! ✓ 11! ✓ answer (4) [9]

QUESTION 7

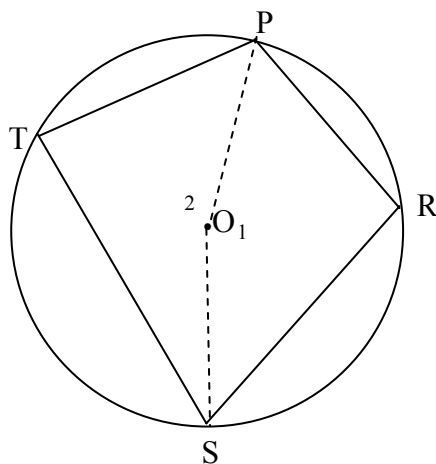
7.1	$ \begin{array}{cccccccccccc} 7 & & & 4 & & & -5 & & & -32 & & & -113 & & & -356 \\ & \diagdown & & / & \diagdown & & / & \diagdown & & / & \diagdown & & / & \diagdown & & / \\ & -3 & & -9 & & -27 & & -81 & & -243 & & & & & & \end{array} $ $-113; -356$	✓✓ answers (2)
7.2	$T_{k+1} = T_k - (3)^k$ $T_1 = 7$ $k \geq 1$ OR $T_{k+1} = T_k - 3(3)^{k-1}; \quad T_1 = 7; \quad k \geq 1$ OR $T_k = T_{k-1} - (3)^{k-1}; \quad T_1 = 7; \quad k \geq 2$	✓ $T_{k+1} = T_k - (3)^k$ ✓ $T_1 = 7$ ✓ $k \geq 1$ (3) [5]

QUESTION 8

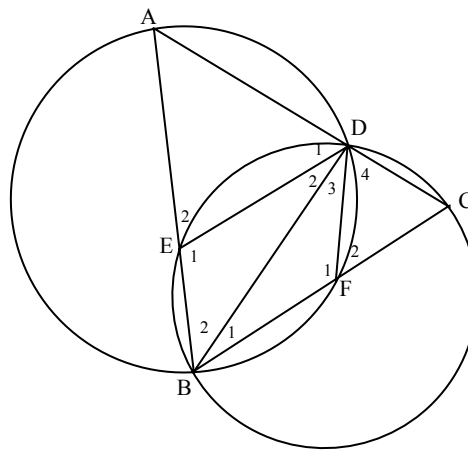


8.	$AO = OB$ (radii) $AO = BC$ (given) $OB = BC$ $\hat{O}_1 = 22^\circ$ (\angle s opp = radii) $\hat{B}_2 = 44^\circ$ (ext $\angle \Delta =$ sum int opp) $\hat{A} = 44^\circ$ (\angle s opp = radii) $A\hat{O}D = 66^\circ$ (ext $\angle \Delta =$ sum int opp)	✓ S ✓ S ✓ S/R ✓ S ✓ S ✓ answer
		[5]

QUESTION 9

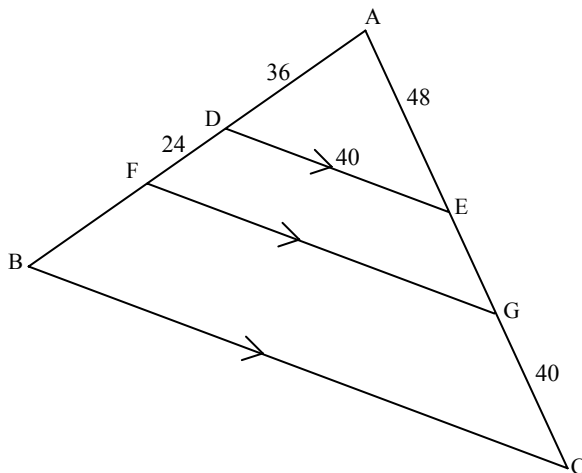


9.1	Join PO and OS Let $\hat{O}_1 = 2x$ $\hat{T} = x$ (\angle at circ centre = 2 \angle at circumference) $\hat{O}_2 = 360^\circ - 2x$ (\angle s round a point) $\hat{R} = 180^\circ - x$ (\angle at circ centre = 2 \angle at circumference) $\hat{T} + \hat{R} = x + 180^\circ - x$ $= 180^\circ$	✓ construction ✓ S/R ✓ S ✓ S/R ✓ S
		(5)



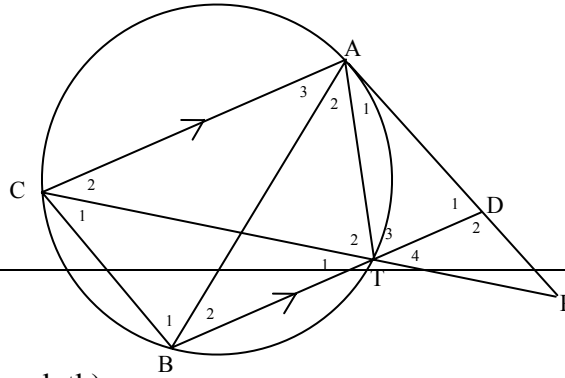
9.2.1(a)	$\hat{D}_4 = \hat{C}$ (\angle s opp = sides) $\hat{C} = x$ (\angle sum Δ) $\hat{DEB} = 180^\circ - x$ (opp \angle cyclic quad supp)	✓ S/R ✓ S ✓ S/R (3)
9.2.1(b)	$\hat{A} = 180^\circ - 2x$ (ext \angle cyclic quad = int opp \angle)	✓ S ✓ R (2)
9.2.2	$\hat{D}_1 + \hat{A} = \hat{E}_1$ (ext \angle Δ = sum int opp) $\hat{D}_1 = x$ $\hat{C} = x$ (\angle sum Δ) OR proved above $\hat{D}_1 = \hat{C} = x$ $DE \parallel CB$ (corres \angle s =)	✓ S/R ✓ statement ✓ Reason (3) [13]

QUESTION 10



<p>10.1</p>	$\frac{EG}{48} = \frac{24}{36} \quad (DE \parallel FG)$ $EG = \frac{48 \times 24}{36}$ $EG = 32 \text{ cm}$	<p>✓ S/R</p> <p>✓ answer (2)</p>
<p>10.2</p>	<p>$\frac{BC}{DE} = \frac{AC}{AE}$</p> $BC = \frac{120 \times 40}{48}$ $= 100 \text{ cm}$ <p>OR</p> $\frac{AB}{AD} = \frac{AC}{AE}$ $AB = \frac{120 \times 36}{48}$ $AB = 90$ <p>$\triangle ABC \parallel \triangle ADE \quad (\angle\angle\angle)$</p> $\frac{BC}{DE} = \frac{AB}{AD} \quad (\text{sides in proportion})$ $BC = \frac{90 \times 40}{36}$ $BC = 100 \text{ cm}$ <p>OR</p> <p>$\triangle ABC \parallel \triangle ADE \quad (\angle\angle\angle)$</p> $\frac{BC}{DE} = \frac{AC}{AE} \quad (\text{sides in proportion})$ $BC = \frac{120 \times 40}{36}$ $BC = 100 \text{ cm}$	<p>✓ statement</p> <p>✓✓ substitution</p> <p>✓ answer (4)</p> <p>✓ S</p> <p>✓ S</p> <p>✓ 90</p> <p>✓ answer (4)</p> <p>✓ S</p> <p>✓ S</p> <p>✓ substitution</p> <p>✓ answer (4)</p> <p>[6]</p>

QUESTION 11



<p>11.1</p>	<p>Let $\hat{A}_1 = x$ In $\triangle ABC$ and $\triangle ADT$</p> <ol style="list-style-type: none"> $\hat{A}_1 = \hat{B}_2 = x$ (tan ch th) $\hat{B}_2 = \hat{A}_3 = x$ ($AC \parallel BD$ alt \angles) $\hat{A}_1 = \hat{A}_3$ $\hat{T}_3 = \hat{B}CA$ (ext \angle cyclic quad) $\hat{B}_1 = \hat{D}_1$ (3^{rd} \angle on triangle) $\triangle ABC \parallel \triangle ADT$ ($\angle\angle\angle$) 	<p>✓ statement ✓ reason ✓ statement ✓ statement ✓ reason ✓ statement (6)</p>
<p>11.2</p>	<p>$\hat{A}_1 = \hat{C}_2 = x$ (tan ch th) $\hat{T}_1 = \hat{C}_2 = x$ ($AC \parallel BD$; alt \angles) $\therefore \hat{T}_1 = \hat{A}_1 = x$ $\hat{T}_4 = x$ (vert opp angles) $\hat{T}_4 = \hat{A}_1$ ($= x$) PT is a tangent (conv tan ch th)</p> <p>OR</p> <p>$\hat{A}_1 = \hat{B}_2 = \hat{A}_3 = x$ ($AC \parallel BT$) $\hat{A}_3 = \hat{T}_1 = \hat{T}_4 = x$ (\angles in same segment) $\hat{A}_1 = \hat{T}_4 = x$ PT is a tangent (conv tan ch th)</p> <p>OR</p> <p>$\hat{B}_1 = \hat{T}_2$ (\angles in same seg) $\hat{B}_1 = \hat{D}_1$ ($\parallel \Delta$s) $\hat{D}_1 = \hat{T}_2$ PT is a tangent (conv tan ch th)</p>	<p>✓ S/R ✓ S/R ✓ Reason (3)</p> <p>✓ S/R ✓ S/R ✓ Reason (3)</p> <p>✓ S/R ✓ S/R ✓ Reason (3)</p>
<p>11.3</p>	<p>In $\triangle APT$ and $\triangle TPD$</p> <ol style="list-style-type: none"> \hat{P} is common. $\hat{T}_4 = \hat{A}_1$ (proven) $\hat{A}TP = \hat{D}_2$ (3^{rd} \angle on triangle) $\triangle APT \parallel \triangle TPD$ ($\angle\angle\angle$) 	<p>✓ S/R ✓ S/R ✓ S (3)</p>

11.4	$\frac{AP}{PT} = \frac{PT}{PD} \quad (\triangle APT \parallel \triangle TPD)$ $AP \cdot PD = PT \cdot PT$ $AP \cdot \frac{1}{3} AP = PT^2$ $AP^2 = 3PT^2$	✓ statement ✓ reason ✓ $DP = \frac{1}{3} AP$ ✓ substitution (4) [16]
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TOTAL: 150