



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

QUESTION 2

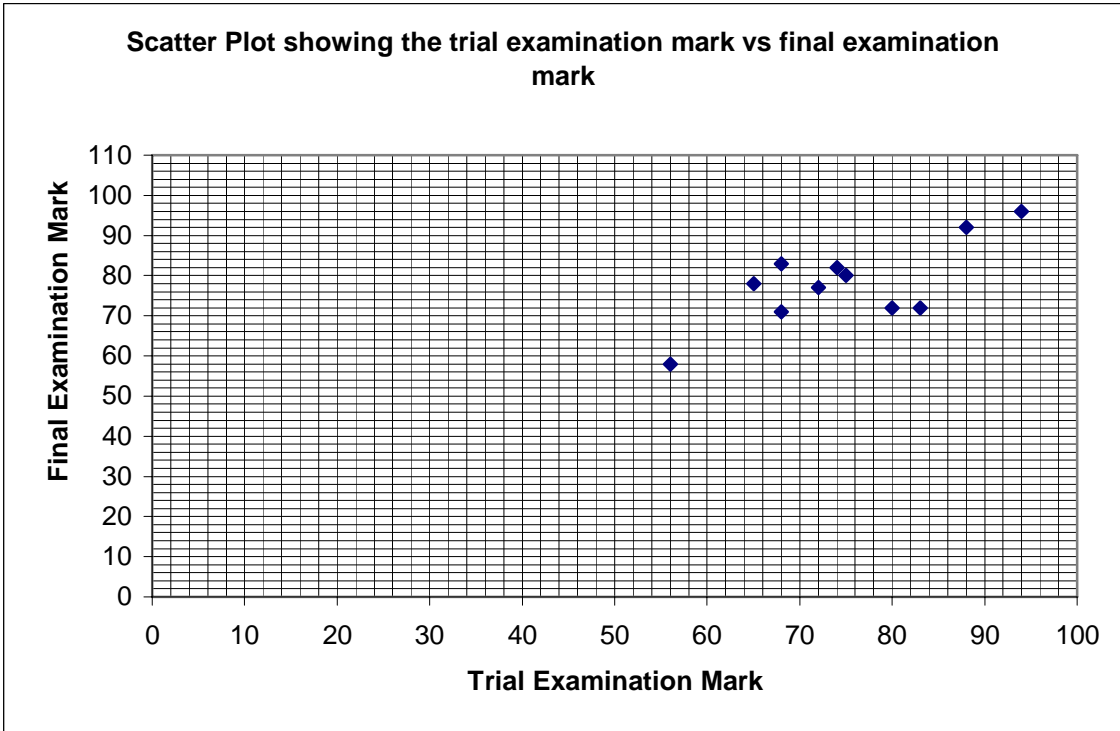
2.1	$\sigma = \frac{90 - 65}{2}$ $\sigma = 12,5$	✓ method ✓ answer (2)
2.2	University A: $78 - 65 = 13$ Her result lies just over 1 standard deviation from the mean. University B: $\bar{x} + \sigma = 54$ $\bar{x} + 2\sigma = 59$ Her result lies just over 2 standard deviations from the mean. Her result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

QUESTION 3

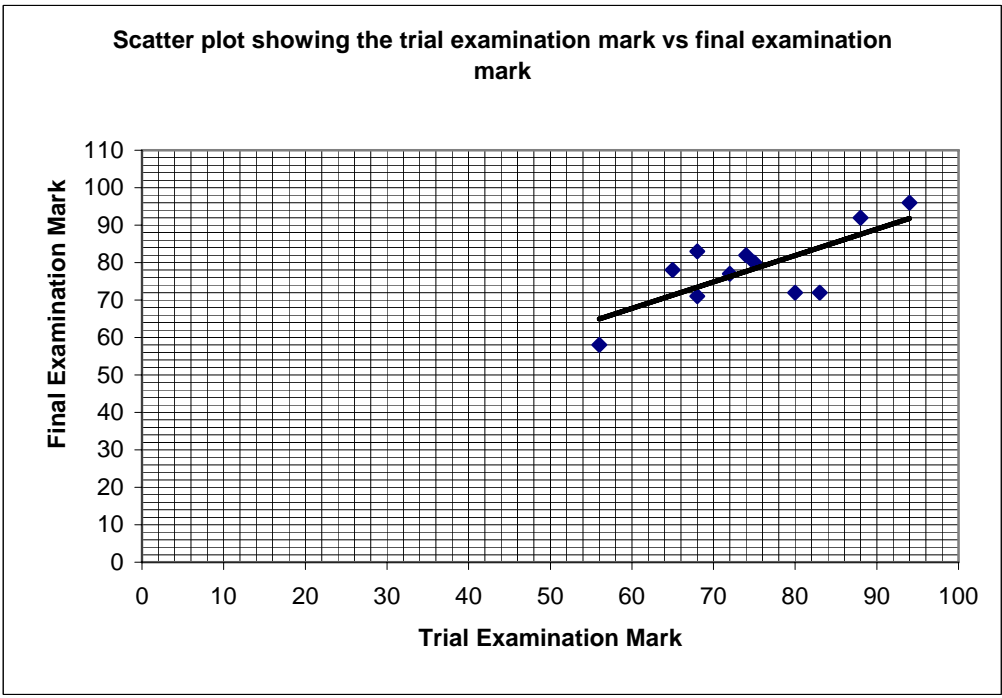
<p>3.1</p>	<p style="text-align: center;"> 36% Fall (Rain & Fall) 63% Rain (Rain & Not Fall) 64% Not Fall 37% No Rain (No Rain & Fall) 12% Fall 88% Not Fall (No Rain & Not Fall) </p>	<p>✓✓ structure of the tree diagram</p> <p>✓ 63% Rain ✓ 36% Fall</p> <p>✓ 64% Not fall</p> <p>✓ 88% Not Fall (6)</p>
<p>3.2</p>	$ \begin{aligned} 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 \end{aligned} $	<p>✓ $\frac{37}{100} \times \frac{88}{100}$</p> <p>✓ $\frac{63}{100} \times \frac{64}{100}$</p> <p>✓ answer (3)</p>
<p>3.3</p>	$ \begin{aligned} P(\text{Dry & Fall}) &= \frac{37}{100} \times \frac{12}{100} \\ &= \frac{111}{2500} \\ &= 0,0444 \end{aligned} $	<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	<p style="text-align: center;">Scatter Plot showing the trial examination mark vs final examination mark</p> 	<p>3 marks: All points plotted correctly.</p> <p>2 marks: 7 – 10 points plotted correctly</p> <p>1 mark: 3 – 6 points plotted correctly</p> <p style="text-align: right;">(3)</p>
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4.2	<p>$a = 25,38$ (25,38342009...)</p> <p>$b = 0,71$ (0,7069044703...)</p> <p>$\hat{y} = a + bx$</p> <p>$\hat{y} = 25,38 + 0,71x$</p>	<p>✓✓ a</p> <p>✓ b</p> <p>✓ answer</p> <p style="text-align: right;">(4)</p>
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4.3	<p style="text-align: center;">Scatter plot showing the trial examination mark vs final examination mark</p> 	<p>✓ slope</p> <p>✓ accurate drawing</p> <p style="text-align: right;">(2)</p>
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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]

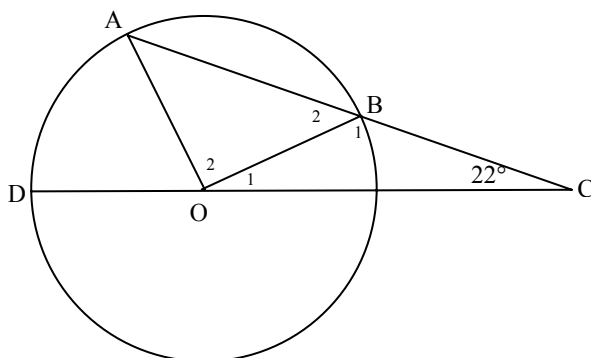
QUESTION 6

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

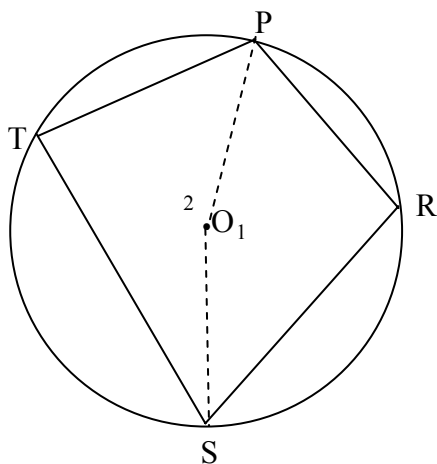
7.1	$ \begin{array}{cccccccccccc} 7 & & & 4 & & & -5 & & & -32 & & & -113 & & & -356 \\ & \diagdown & & / & \diagdown & & / & \diagdown & & / & \diagdown & & / & \diagdown & & / \\ & -3 & & -9 & & -27 & & -81 & & -243 & & & & & & \end{array} $ <p>$-113; -356$</p>	✓✓ answers (2)
7.2	$T_{k+1} = T_k - (3)^k$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

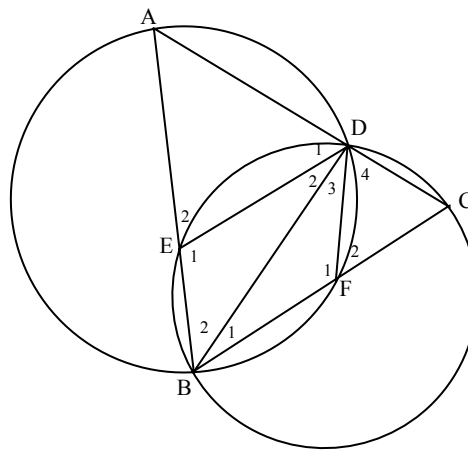


8.	$AO = OB$ (radii) $AO = BC$ (given) $OB = BC$ $\hat{O}_1 = 22^\circ$ (\angle s opp = radii) $\hat{B}_2 = 44^\circ$ (ext $\angle \Delta =$ sum int opp) $\hat{A} = 44^\circ$ (\angle s opp = radii) $A\hat{O}D = 66^\circ$ (ext $\angle \Delta =$ sum int opp)	✓ S ✓ S ✓ S/R ✓ S ✓ S ✓ answer
		[5]

QUESTION 9

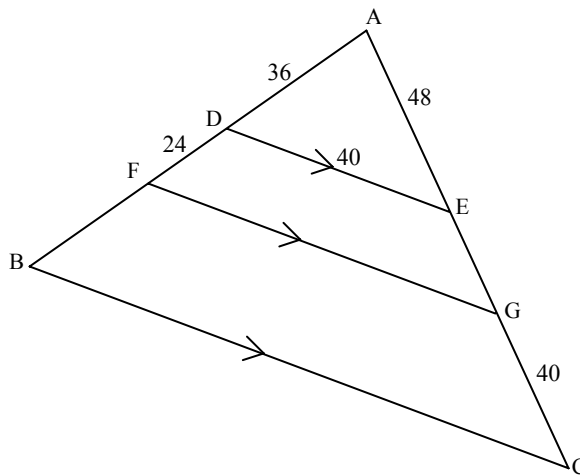


9.1	Join PO and OS Let $\hat{O}_1 = 2x$ $\hat{T} = x$ (\angle at circ centre = 2 \angle at circumference) $\hat{O}_2 = 360^\circ - 2x$ (\angle s round a point) $\hat{R} = 180^\circ - x$ (\angle at circ centre = 2 \angle at circumference) $\hat{T} + \hat{R} = x + 180^\circ - x$ $= 180^\circ$	✓ construction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



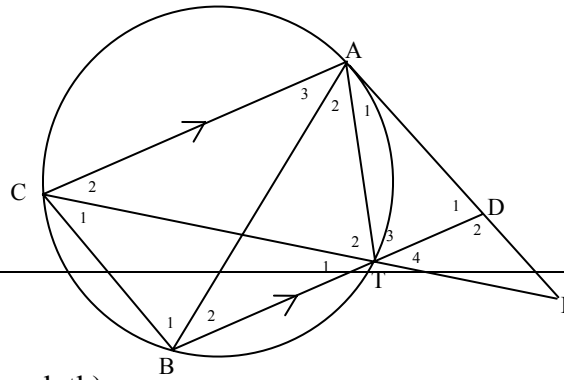
9.2.1(a)	$\hat{D}_4 = \hat{C}$ (\angle s opp = sides) $\hat{C} = x$ (\angle sum Δ) $\hat{DEB} = 180^\circ - x$ (opp \angle cyclic quad supp)	✓ S/R ✓ S ✓ S/R (3)
9.2.1(b)	$\hat{A} = 180^\circ - 2x$ (ext \angle cyclic quad = int opp \angle)	✓ S ✓ R (2)
9.2.2	$\hat{D}_1 + \hat{A} = \hat{E}_1$ (ext \angle 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



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

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