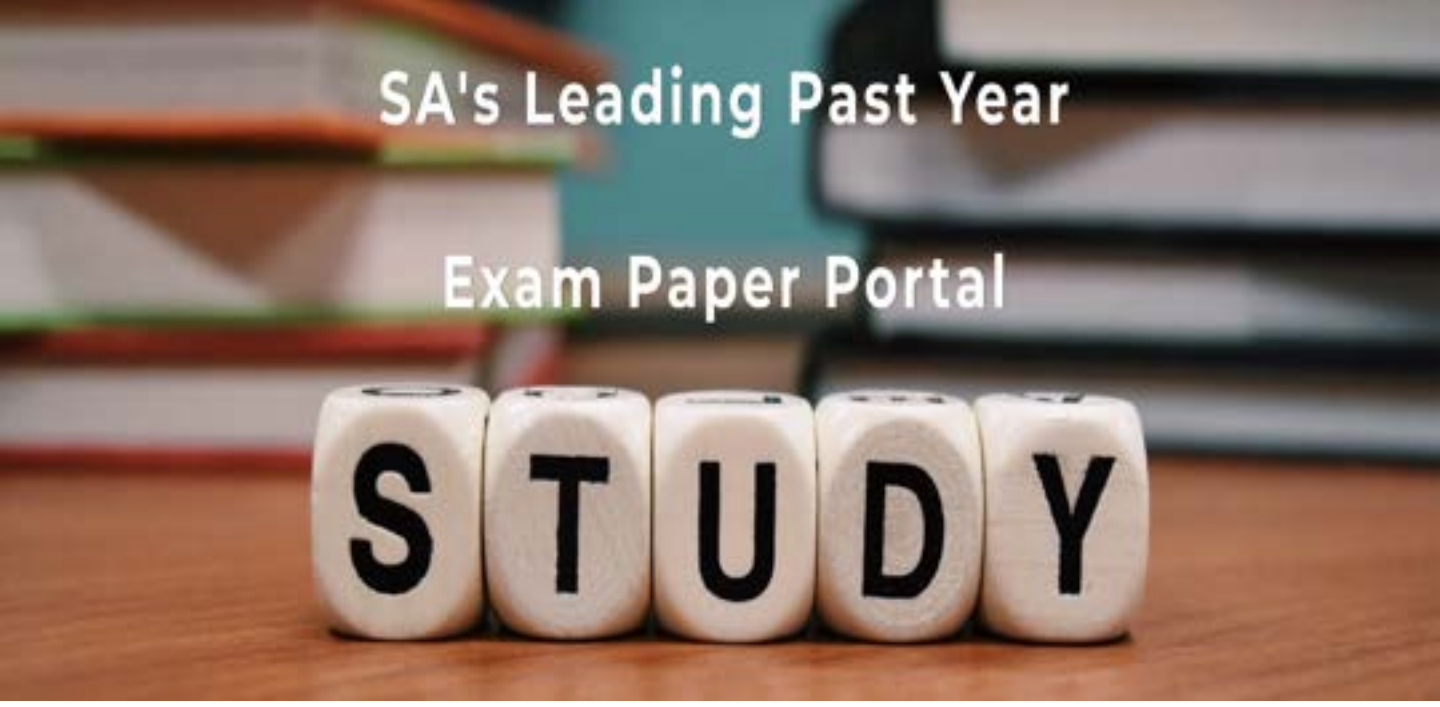

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GRADE 12

MATHEMATICS P3

FEBRUARY/MARCH 2011

MEMORANDUM

MARKS: 100

This memorandum consists of 11 pages.

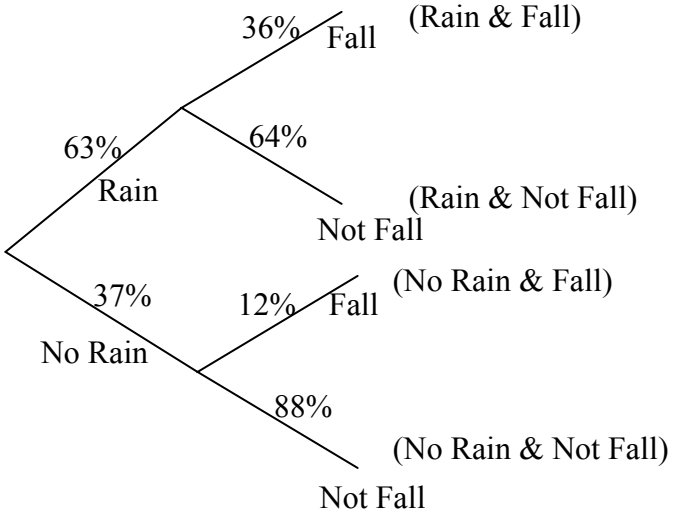
QUESTION 1

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]**

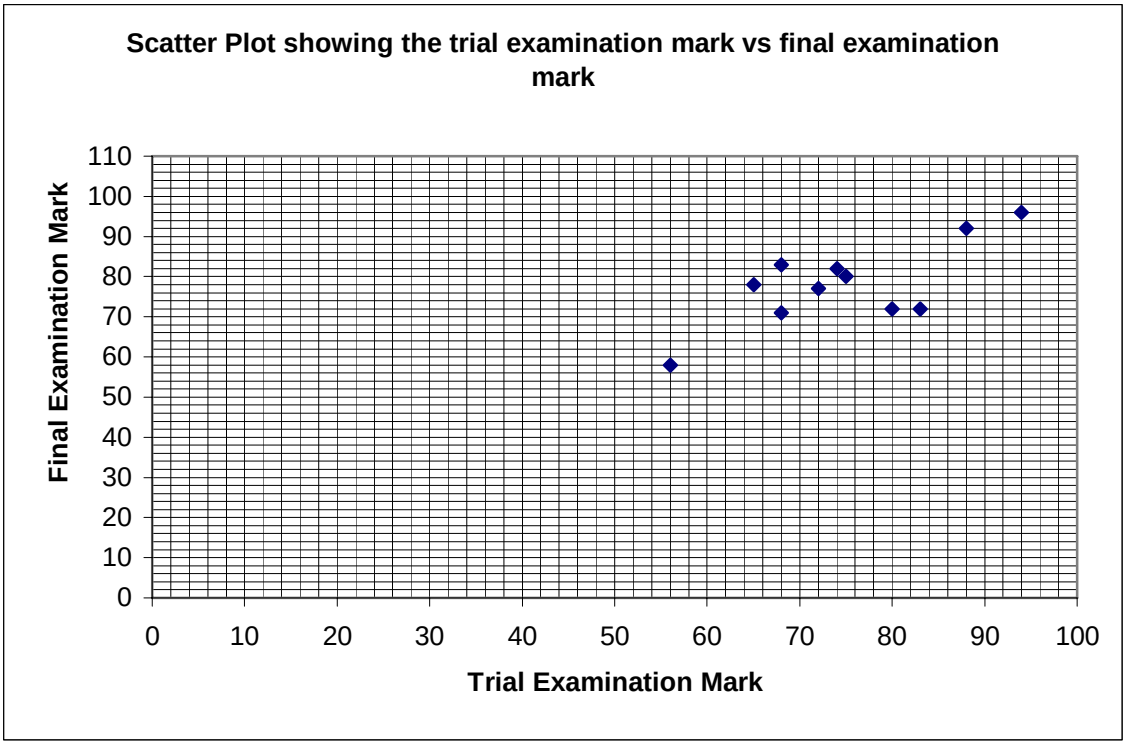
QUESTION 3

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

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



3 marks: All points plotted correctly.

2 marks: 7 – 10 points plotted correctly

1 mark: 3 – 6 points plotted correctly

(3)

4.2

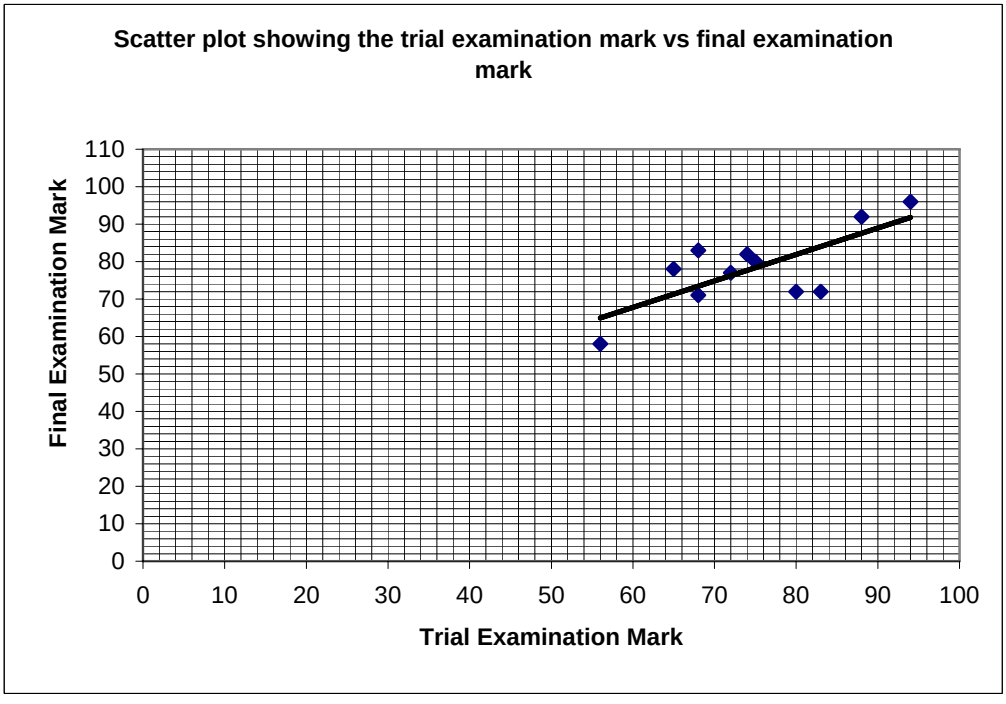
$a = 25,38 \quad (25, 38342009\ldots)$
$b = 0,71 \quad (0, 7069044703\ldots)$
$\hat{y} = a + bx$
$\hat{y} = 25,38 + 0,71x$

✓✓ a
✓ b

✓ answer

(4)

4.3



✓ 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) × 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]**

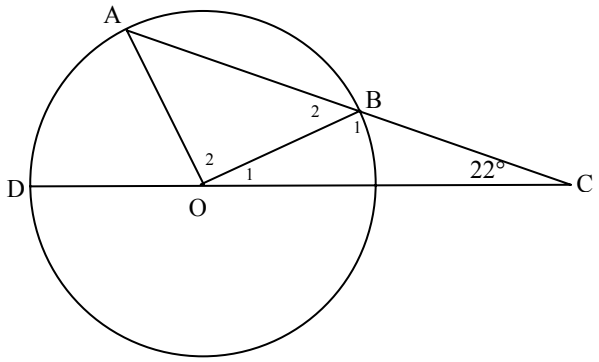
QUESTION 6

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 $=7!.4!.2$ $=241\ 920$	✓ 7! ✓ 4! ✓ × 2 (3)
6.3	P(Shirt at beginning and trouser at the end) $=\frac{9!\times 4\times 7}{11!}$ $=\frac{14}{55}$	✓ × 4 × 7 ✓ 9! ✓ 11! ✓ answer (4) **[9]**

QUESTION 7

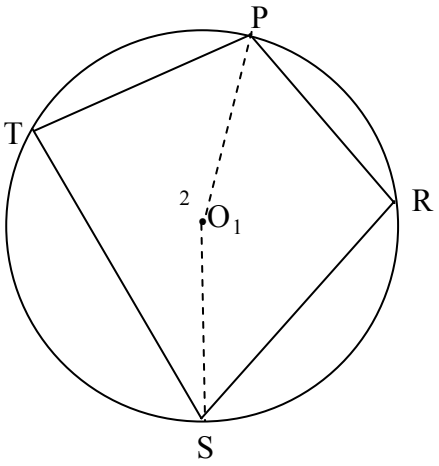
7.1	7 $\searrow$ –3 $\nearrow$ 4 $\searrow$ –9 $\nearrow$ –5 $\searrow$ –27 $\nearrow$ –32 $\searrow$ –81 $\nearrow$ –113 $\searrow$ –243 $\nearrow$ –356 $-113; -356$	✓✓ answers (2)
7.2	$T_{k+1}=T_k-(3)^k$ $T_1=7$ $k\geq 1$ **OR** $T_{k+1}=T_k-3(3)^{k-1};\quad T_1=7;\quad k\geq 1$ **OR** $T_k=T_{k-1}-(3)^{k-1};\quad T_1=7;\quad k\geq 2$	✓ $T_{k+1}=T_k-(3)^k$ ✓ $T_1=7$ ✓ $k\geq 1$ (3) **[5]**

QUESTION 8

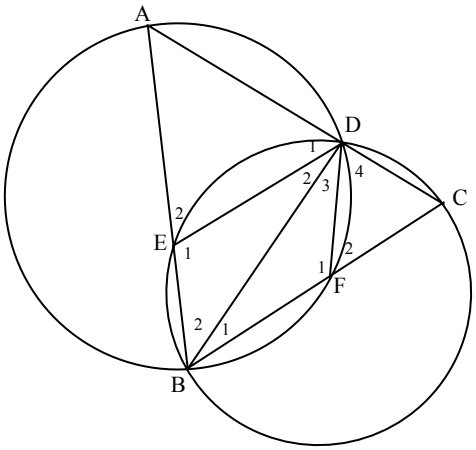


8.	AO = OB (radii) AO = BC (given) OB = BC $\hat{O}_1 = 22°$ ($\angle$s opp = radii) $\hat{B}_2 = 44°$ (ext $\angle$ Δ = sum int opp) $\hat{A} = 44°$ ($\angle$s opp = radii) $A\hat{O}D = 66°$ (ext $\angle$ Δ = sum int opp)	✓ S ✓ S ✓ S/R ✓ S ✓ S ✓ answer **[5]**

QUESTION 9

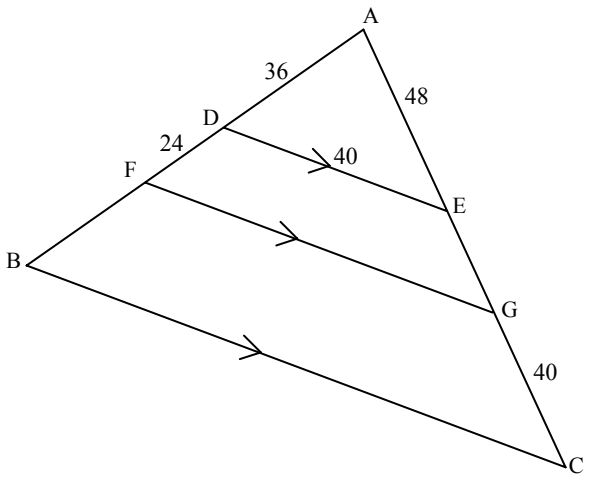


9.1	Join PO and OS Let $\hat{O}_1 = 2x$ $\hat{T} = x$ ($\angle$ at circ centre = 2 $\angle$ at circumference) $\hat{O}_2 = 360° - 2x$ ($\angle$s round a point) $\hat{R} = 180° - x$ ($\angle$ at circ centre = 2 $\angle$ at circumference) $\hat{T} + \hat{R} = x + 180° - x$ $= 180°$	✓ construction ✓ S/R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



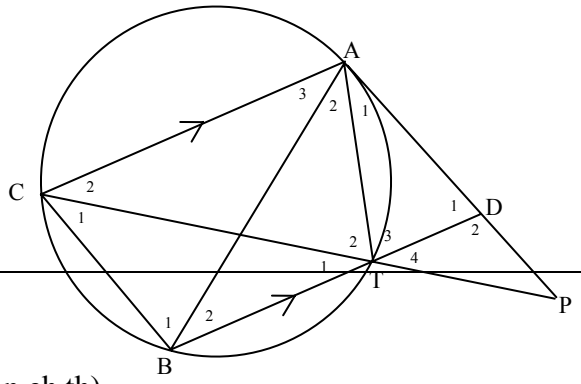
9.2.1(a)	$\hat{D}_4 = \hat{C}$ $\hat{C} = x$ $D\hat{E}B = 180° - x$	($\angle$s opp = sides) ($\angle$ sum Δ) (opp $\angle$ cyclic quad supp)	✓ S/R ✓ S ✓ S/R (3)
9.2.1(b)	$\hat{A} = 180° - 2x$	(ext $\angle$ cyclic quad = int opp $\angle$)	✓ S ✓ R (2)
9.2.2	$\hat{D}_1 + \hat{A} = \hat{E}_1$ $\hat{D}_1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

QUESTION 10



10.1	$\frac{EG}{48}=\frac{24}{36}$ (DE || FG) $EG=\frac{48\times 24}{36}$ EG = 32 cm	✓ S/R ✓ answer (2)
10.2	$\frac{BC}{DE}=\frac{AC}{AE}$ $BC=\frac{120\times 40}{48}$ = 100 cm **OR** $\frac{AB}{AD}=\frac{AC}{AE}$ $AB=\frac{120\times 36}{48}$ AB = 90 ΔABC ||| ΔADE (∠∠∠) $\frac{BC}{DE}=\frac{AB}{AD}$ (sides in proportion) $BC=\frac{90\times 40}{36}$ BC = 100 cm **OR** ΔABC ||| ΔADE (∠∠∠) $\frac{BC}{DE}=\frac{AC}{AE}$ (sides in proportion) $BC=\frac{120\times 40}{36}$ BC = 100 cm	✓ statement ✓✓ substitution ✓ answer (4) ✓ S ✓ S ✓ 90 ✓ answer (4) ✓ S ✓ S ✓ substitution ✓ answer (4) **[6]**

QUESTION 11



11.1	Let $\hat{A}_1 = x$ In ΔABC and ΔADT 1. $\hat{A}_1 = \hat{B}_2 = x$ (tan ch th) $\hat{B}_2 = \hat{A}_3 = x$ (AC || BD alt $\angle$s) $\hat{A}_1 = \hat{A}_3$ 2. $\hat{T}_3 = B\hat{C}A$ (ext $\angle$ cyclic quad) 3. $\hat{B}_1 = \hat{D}_1$ (3^{rd} $\angle$ on triangle) $\Delta ABC \text{ ||| } \Delta ADT$ ($\angle\angle\angle$)	✓ statement ✓ reason ✓ statement ✓ statement ✓ reason ✓ statement (6)
11.2	$\hat{A}_1 = \hat{C}_2 = x$ (tan ch th) $\hat{T}_1 = \hat{C}_2 = x$ (AC || BD; alt $\angle$s) $\therefore \hat{T}_1 = \hat{A}_1 = x$ $\hat{T}_4 = x$ (vert opp angles) $\hat{T}_4 = \hat{A}_1$ ($= x$) PT is a tangent (conv tan ch th) **OR** $\hat{A}_1 = \hat{B}_2 = \hat{A}_3 = x$ (AC || BT) $\hat{A}_3 = \hat{T}_1 = \hat{T}_4 = x$ ($\angle$s in same segment) $\hat{A}_1 = \hat{T}_4 = x$ PT is a tangent (conv tan ch th) **OR** $\hat{B}_1 = \hat{T}_2$ ($\angle$s in same seg) $\hat{B}_1 = \hat{D}_1$ (||| Δs) $\hat{D}_1 = \hat{T}_2$ PT is a tangent (conv tan ch th)	✓ S/R ✓ S/R ✓ Reason (3) ✓ S/R ✓ S/R ✓ Reason (3) ✓ S/R ✓ S/R ✓ Reason (3)
11.3	In ΔAPT and ΔTPD 1. $\hat{P}$ is common. 2. $\hat{T}_4 = \hat{A}_1$ (proven) 3. $A\hat{T}P = \hat{D}_2$ (3^{rd} $\angle$ on triangle) $\Delta APT \text{ ||| } \Delta TPD$ ($\angle\angle\angle$)	✓ S/R ✓ S/R ✓ S (3)

11.4	$\frac{AP}{PT} = \frac{PT}{PD}$ $(\Delta APT \text{ ||| } \Delta TPD)$ $AP.PD = PT.PT$ $AP.\frac{1}{3}AP = PT^2$ $AP^2 = 3PT^2$	✓ statement ✓ reason ✓ $DP = \frac{1}{3}AP$ ✓ substitution (4) **[16]**

TOTAL: 150