Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2012

MATHEMATICS P3 MEMORANDUM

MARKS: 100

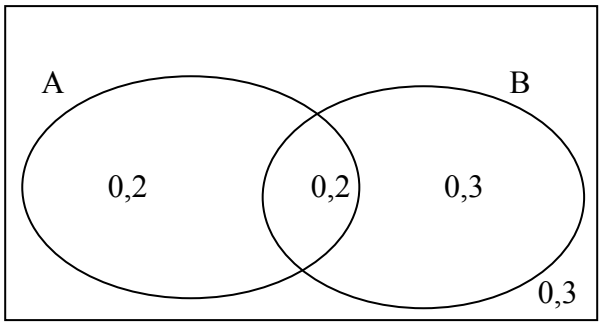
This memorandum consists of 13 pages.

QUESTION 1			
1.1	2; 4; 10; 20	(3)	✓✓✓4; 10; 20
1.2	$2a = 4$		
	$a = 2$		✓ $a = 2$
	$3a + b = 2$		
	$3(2) + b = 2$		
	$6 + b = 2$		
	$b = -4$ (OR OTHERWISE)		✓ $b = -4$
	$a + b + c = 2$		
	$2 - 4 + c = 2$		
	$c = 4$		✓ $c = 4$
	$T_n = an^2 + bn + c$		
	$T_n = 2n^2 - 4n + 4$	(4)	✓ $T_n = 2n^2 - 4n + 4$
		[7]	
QUESTION 2			
2.1	$\frac{87,5}{100} \times 36\,600$ OR $36\,600 - 12,5\%\ (36\,600)$		✓ 87,5 or 12,5%
	$= 32\,025$ $= 32\,025$	(2)	✓ answer
2.2	Increase $= 41\,109 - 36\,600$		
	$= 4509$		✓ 4509
	Percentage increase $= \frac{4509}{36\,600} \times 100$		
	$= 12,32\%$	(2)	✓ answer
2.3	Average monthly sales $= \frac{32\,025+36\,600+41\,109}{3}$		✓ 36 578
	$= 36\,578$		
	No, because $36\,578 < 37\,000$	(2)	✓ No/reason
		[6]	

QUESTION 3

3.1	IQ score > 115 $\frac{16}{100} \times 48\,000\,000$ = 7 680 000 people	(2)	✓ $\frac{16}{100}$ ✓ answer
3.2	IQ score < 130 = $\frac{98}{100} \times 48\,000\,000$ = 47 040 000 people	(2)	✓ $\frac{98}{100}$ ✓ answer
3.3	48 000 000 – 47 040 000 = 960 000 $\frac{960\,000}{48\,000\,000} \times 100$ = 2% OR answer only (full marks)	(2)	✓ 960 000 ✓ answer
3.4	Sample = $\frac{4\,800\,000}{48\,000\,000} \times 100$ = 10% Yes, sample is 10% of the population.	(2)	✓ 10% ✓ conclusion
		[8]	

QUESTION 4

4.1	4.1.1		(3)	✓ A only/ B only ✓ A ∪ B ✓ (A ∪ B)'
	4.1.2	For mutually exclusive events: P(A) + P(B) = P (A∪B) 0,4 + 0,5 = 0,7 0,9 ≠ 0,7 ∴ P(A) + P(B) ≠ P(A∪B) ∴ NOT mutually exclusive events	(3)	✓ probability rule ✓ substitution ✓ conclusion

	4.1.3	For independent events: $P(A) \times P(B) = P(A \cap B)$ $P(A) + P(B) - P(A \cap B) = P(A \cup B)$ $0,4 + 0,5 - P(A \cap B) = 0,7$ $- P(A \cap B) = -0,2$ $P(A \cap B) = 0,2$ $\therefore P(A) \times P(B) = 0,4 \times 0,5$ $= 0,2$ $\therefore P(A) \times P(B) = P(A \cap B)$ $\therefore$ independent events	(4)	✓ probability rule ✓ expansion ✓ answer ✓ conclusion
4.2	4.2.1			

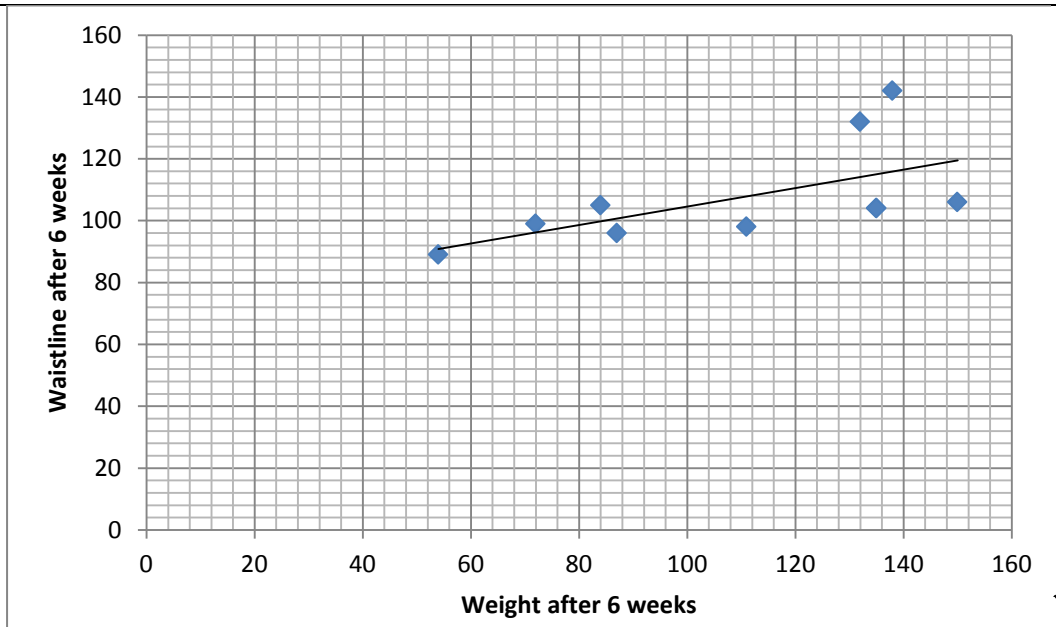
Ages / Qualifications	< 30	30 – 39	40 – 49	≥50	TOTALS
3 year, professional	15	152	102	221	490
4 year, professional	43	337	311	166	857
Degree, professional	211	578	298	145	1232
Higher degree, professional	12	121	127	37	297
Degree, no professional	13	55	45	15	128
TOTALS	294	1243	883	584	**3004**

(2) ✓ ages ✓ qualification

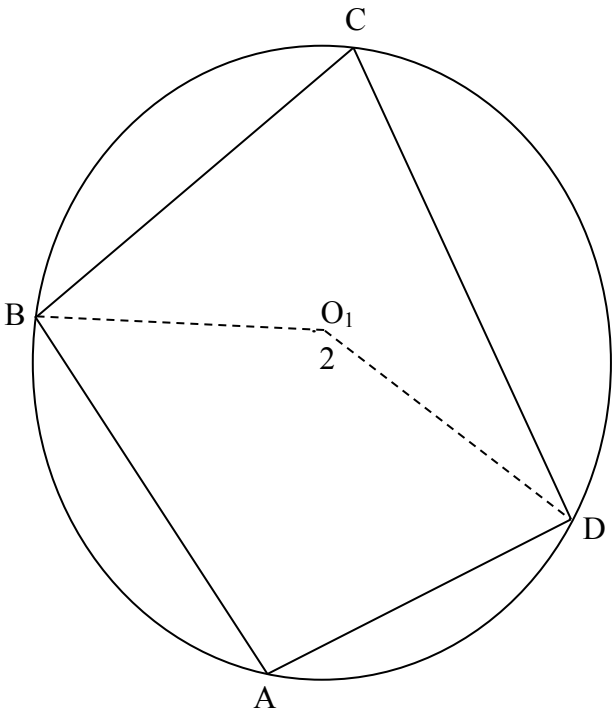
	4.2.2	P (teacher < 40) $= \frac{294+1243}{3004}$ $= \frac{1537}{3004}$ $= 0,51$	(2)	✓ addition ✓ answer
	4.2.3	P (teacher < 40 and professional degree) $= \frac{211+12+578+121}{3004}$ $= \frac{922}{3004}$ $= 0,31$	(2)	✓ addition ✓ ✓ answer

	4.2.4	P (teacher, no degree) $= \frac{490+857}{3004}$ $= \frac{1347}{3004}$ $= 0,45$	(2)	✓ addition ✓ answer
	4.2.5	P (teacher > 40, no degree) $= \frac{102+221+311+166}{3004}$ $= \frac{800}{3004}$ $= 0,27$	(2)	✓ addition ✓ answer
	4.2.6	For mutually exclusive events: P(A) + P(Q) = P (A∪Q) $\frac{294}{3004} + \frac{857}{3004} = \frac{211}{3004}$ 0,383 ≠ 0,070 ∴ not mutually exclusive events	(3)	✓ addition ✓ answer ✓ conclusion
			[23]	

QUESTION 5				
5.1	Number of letters available: 26 Number of digits available: 9 Must have a total ≥ 75 000 1 digit: $9 \times 26 = 234$ 2 digits: $9 \times 9 \times 26 = 2106$ 3 digits: $9 \times 9 \times 9 \times 26 = 18\,954$ 4 digits: $9 \times 9 \times 9 \times 9 \times 26 = 170\,586$ $\therefore$ The inventory system must have FOUR digits.		(4)	✓ 26 and 9 ✓ inequality ✓ multiplication ✓ conclusion
5.2	5.2.1	$5 \times 3 = 15$	(1)	✓ answer
	5.2.2	${}^{8}C_{2} = 28$ ways OR $7 + 6 + 5 + 4 + 3 + 2 + 1 = 28$	(2)	✓ counting principle ✓ answer
			[7]	

QUESTION 6	**NOTE**: According to the NCS the solutions to data-handling problems should be done with the use of a calculator. The alternative is to use the pen and paper method.		
6.1			✓✓ 9 points
		(2)	
6.2	weak, positive relationship	(1)	✓ weak, positive
6.3	r = 0,597	(2)	✓✓ answer
6.4	ŷ = a + bx = 74,8 + 0,3x	(3)	✓✓a ✓ b
6.5	y = 92,8 cm from the graph	(2)	✓ answer ✓ line
6.6	ŷ = 74,8 + 0,3x = 74,8 + (0,3 × 200) = 134,8 cm	(2)	✓ substitution ✓ answer
		[12	

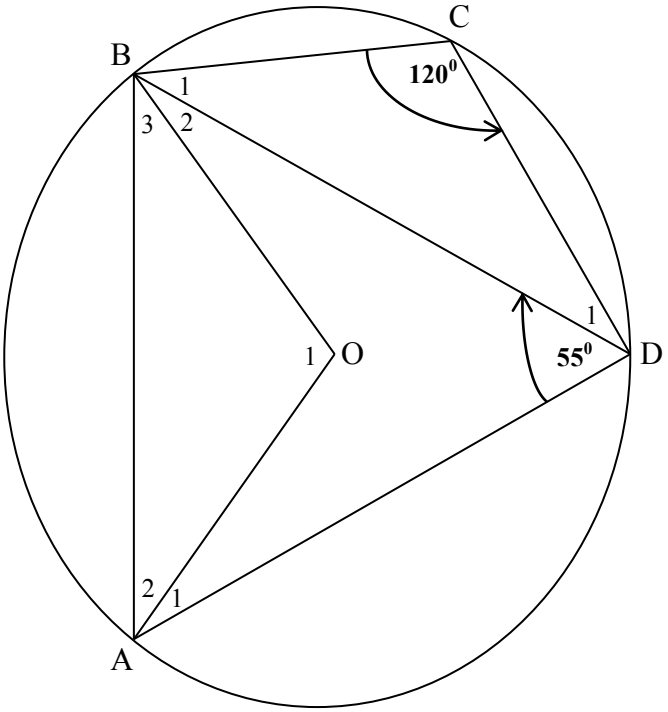
* FOR QUESTIONS 7 TO 10 FOLLOW CANDIDATES REASONING *	
QUESTION 7	



Construction: Make O the centre of the circle. Draw radii BO and DO		✓construction
To prove: $\hat{A} + \hat{C} = 180°$		
Proof: $\hat{O}_2 = 2\hat{A}$ (angle at centre = 2 × angle at circumf.)		✓ statement/reason
$\hat{O}_1 = 2\hat{C}$ (angle at centre = 2 × angle at circumf.)		✓ statement/reason
$\hat{O}_2 + \hat{O}_1 = 360°$ (sum of angles around a point = 360°)		✓ statement/reason
$2\hat{A} + 2\hat{C} = 360°$		
$2(\hat{A} + \hat{C}) = 360°$		
$\hat{A} + \hat{C} = \frac{360°}{2}$		
$= 180°$		✓ deduction
	[5]	

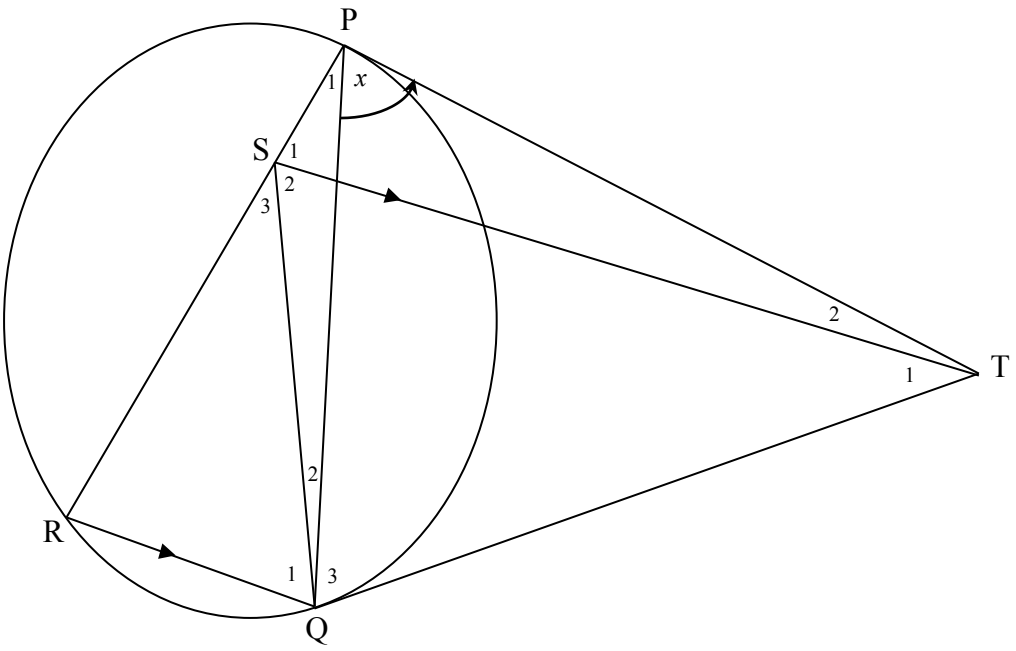
QUESTION 8

8.1



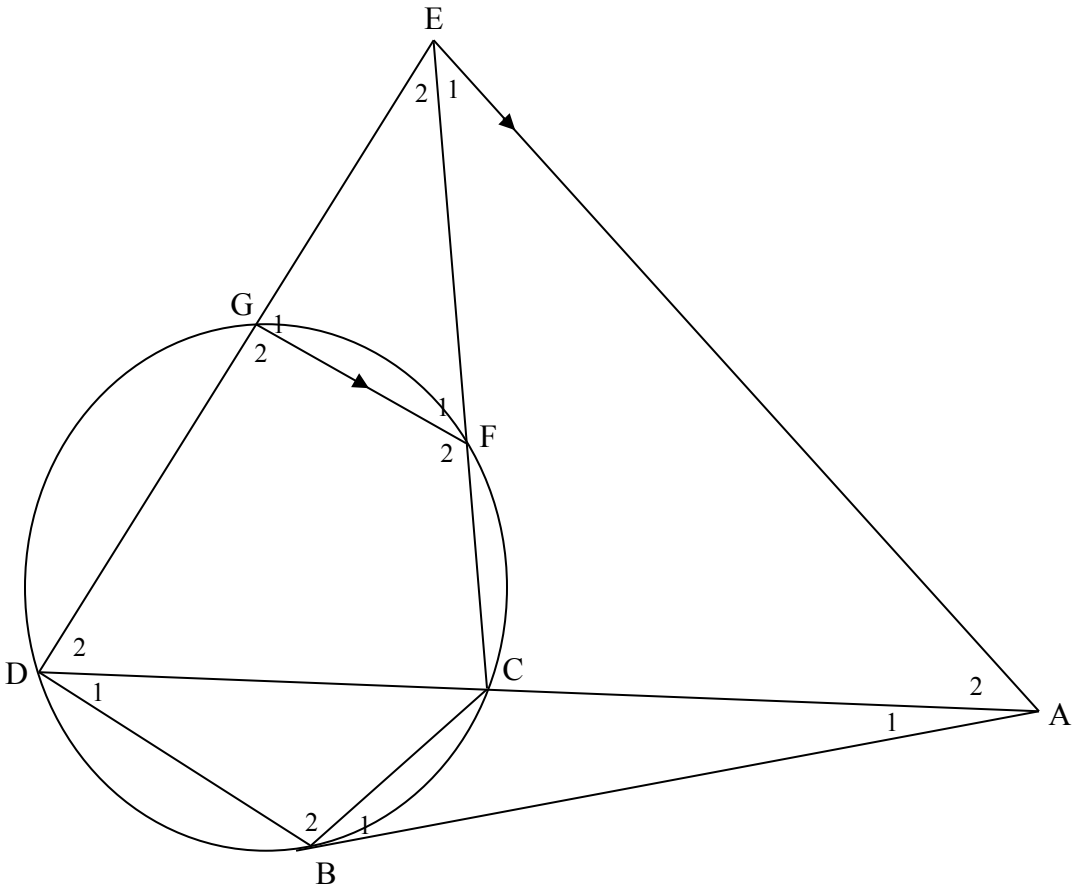
	8.1.1	$\hat{O}_1 = 2A\hat{D}B$ (angle at centre = 2 × angle at circumf.) = 2 (55°) = 110°	(2)	✓ statement ✓ reason
	8.1.2	$\hat{A}_2 = 35°$ (ΔAOB is isosceles, OB = OA radii) $B\hat{A}D = 60°$ (sum of opposite. $\angle^s$ of cyclic quad. = 180°) $O\hat{A}D = 60° - 35°$ = 25°	(4)	✓ statement ✓ reason ✓ statement/reason ✓ answer

8.2

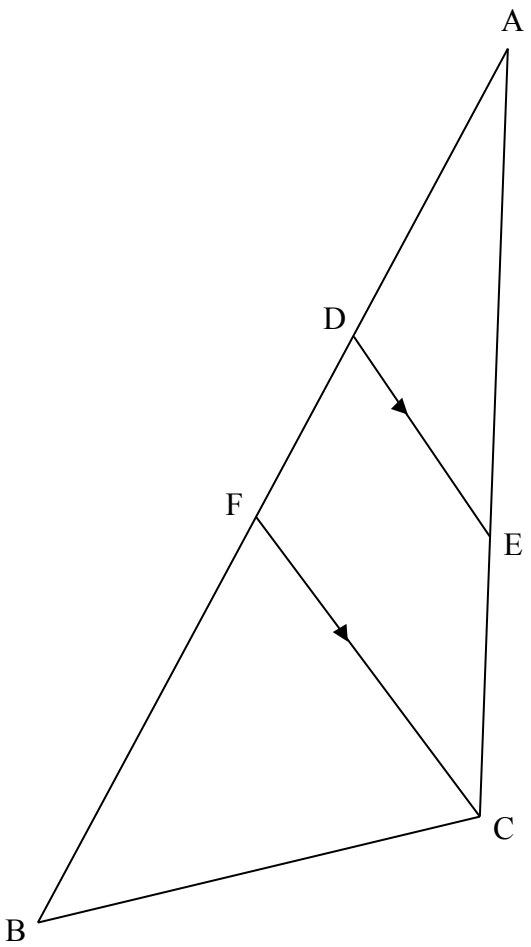


	8.2.1	$\hat{Q}_3 = x$ (two tangents joining from the same point) $\hat{R} = x$ (tangent/chord theorem) $\hat{S}_1 = x$ (corresponding angles, RQ∥ ST	(3)	✓ answer/reason ✓ answer/reason ✓ answer/reason
	8.2.2	$\hat{Q}_3 = \hat{S}_1 = x$ (see above) ∴ TPSQ is a cyclic quadrilateral; angles subtended by the same chord are equal.	(2)	✓ statement ✓ conclusion
	8.2.3	T$\hat{P}$Q = $\hat{S}_2$ ($\angle's$ on same chord: TPSQ is a cyclic quadrilateral) T$\hat{P}$Q = $\hat{S}_1$ = x (from QUESTION 8.2.1) ∴ $\hat{S}_1 = \hat{S}_2$ TS bisects P$\hat{S}$Q	(2)	✓ statement ✓ conclusion/ reason
	8.2.4	$\hat{Q}_1 = \hat{S}_2 = x$ (alternate angles, RQ∥ ST) P$\hat{R}$Q = $\hat{Q}_1 = x$ (proven in QUESTION 8.2.1) ∴ Δ RQS is an isosceles triangle, base angles are equal.	(2)	✓ statement/reason ✓ statement/ conclusion
			[15]	

QUESTION 9



9.1	In ΔABC and ΔADB: $\hat{A}_1$ is common $\hat{B}_1 = \hat{D}_1$ (tangent/chord theorem) ∴ ΔABC///ΔADB (∠, ∠, ∠) ∴ $\frac{AB}{AD} = \frac{AC}{AB}$ ∴ AB^2 = AC.AD	(3)	✓ statement/reason ✓ statement/reason ✓ conclusion
9.2	In ΔACE and ΔAED: $\hat{A}_2$ is common $\hat{E}_1 = \hat{F}_1$ (alternate angles, AE∥ GF) $\hat{D}_2 = \hat{F}_1$ (ext. angle of cyclic quadrilateral GDCF) ∴ $\hat{E}_1 = \hat{D}_2$ ∴ ΔACE///ΔAED (∠, ∠, ∠)	(3)	✓ statement/reason ✓ statement/reason ✓ statement/reason

9.3	$\frac{AE}{AD} = \frac{AC}{AE}$ (ΔACE///ΔAED) $\therefore AE^2 = AC.AD$ and $AB^2 = AC.AD$ (proved in QUESTION 9.1) $\therefore AB^2 = AE^2$ $\therefore AB = AE$	(3)	✓ statement/reason ✓ deduction ✓ conclusion
		[9]	
QUESTION 10			
			
10.1	$\frac{AE}{EC} = \frac{2}{1}$ (given)	(1)	✓ answer
10.2	$\frac{AD}{DF} = \frac{AE}{EC} = \frac{2}{1}$ (line∥ to one side of Δ)	(1)	✓ statement

10.3	$\frac{AD}{AB} = \frac{1}{3}$ $\frac{2x}{AB} = \frac{1}{3}$ AB = 6*x* $\therefore \frac{AD}{DB} = \frac{2x}{4x}$ $= \frac{1}{2}$	(3)	✓ ratio ✓AB = 6*x* ✓ answer
10.4	Area of ΔCFB = $\frac{1}{2}$ FB.h Area of ΔCFA = $\frac{1}{2}$ AF.h AB = FB + AF 6x = 3x + 3x (AB = 6x from QUESTION 10.3) $\therefore \frac{Area\ \Delta CFB}{Area\ \Delta CFA} = \frac{\frac{1}{2}.3x.h}{\frac{1}{2}.3x.h}$ $= \frac{1}{1}$ ∴ Area of ΔCFB = Area of ΔCFA	(3)	✓ formula ✓ FB = AF = 3x ✓ answer
		[8]	
	TOTAL:	**100**	