education

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 × 3 + 7 33 = 2 × 13 + 7 73 = 2 × 33 + 7 $T_{n+1} = 2T_n + 7$, $T_1 = 3$ $(n \geq 1)$ OR $T_n = 2T_{n-1} + 7$, $T_1 = 3$ $(n \geq 2)$ **OR** 13 = 3 + 10 33 = 13 + 20 73 = 33 + 40 $T_{n+1} = T_n + 10.2^{n-1}, T_1 = 3$ $(n \geq 1)$ OR $T_n = T_{n-1} + 10.2^{n-2}, T_1 = 3$ $(n \geq 2)$	✓ 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) **[5]**

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) **[6]**

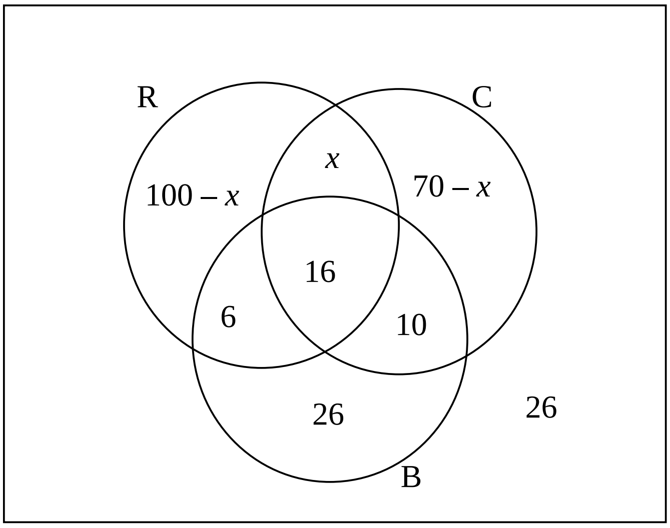
QUESTION 3

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 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) **[7]**

QUESTION 4

4.1	P(A or B) = 0,3 + 0,5 = 0,8	✓ addition ✓ answer (2)
4.2	Since A and B are independent P(A or B) = P(A) + P(B) – P(A and B) = 0,3 + 0,5 – 0,15 = 0,65	✓ P(A and B) = 0,15 ✓ 0,3 + 0,5 – 0,15 ✓ answer (3) **[5]**

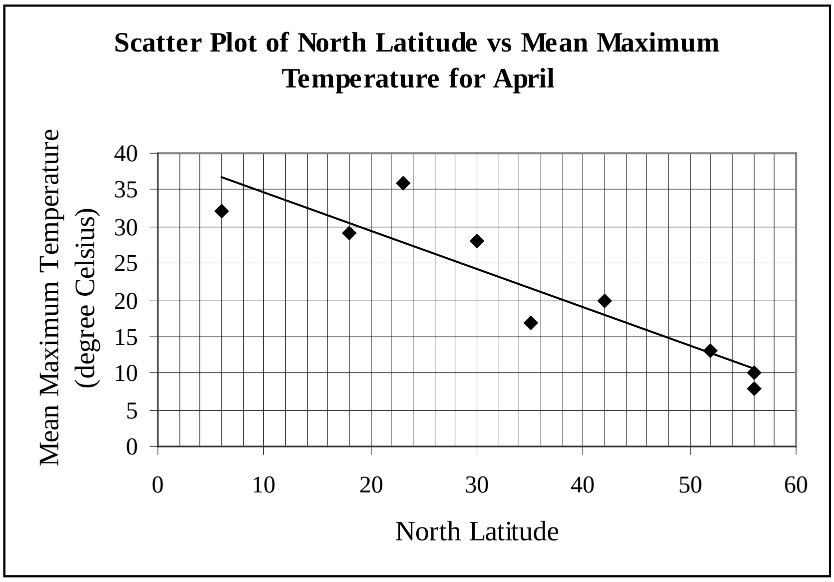
QUESTION 5

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

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! × 4! ✓ answer (4) **[9]**

QUESTION 7

7.1 & 7.3		7.1 ✓✓✓ plotting points (3) 7.3 ✓ gradient correct ✓ x-intercept (2)
7.2	$a = 39{,}94$ (39,94369425…) $b = -0{,}52$ (– 0,5235636749…) Equation of regression line $\hat{y} = 39{,}94 - 0{,}52x$	✓✓ a-value ✓ b-value ✓ equation (4)
7.4	The y-intercept represents the mean maximum temperature for April at the equator.	✓ answer (1)
7.5	Mean maximum temperature for April in Madrid = 39,94 – 0,52(40) = 19,14 °C	✓ substitution ✓ answer (2)
7.6	$r = -0{,}91$ (– 0,9129015212…)	✓ ✓answer (2)
7.7	The value of r is close to – 1 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.	✓ very strong and further away from the equator, the colder it gets (1) **[15]**

QUESTION 8

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

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 theorom) $\therefore \hat{P}_1 = \hat{R}_2$ ∴ APTR is a cyclic quadrilateral (converse : ext angle of cycl.quad.)	✓ statement ✓ statement ✓ statement ✓ equal angles ✓ reason (5) **[11]**

QUESTION 10

10.1	OC = OB (radii) Hence AE = BE (midpoint theorem) **OR** $\hat{CAB} = 90°$ (diameter subtends right angle) $\hat{OEB} = \hat{CAB} = 90°$ (corresponding angles AC//OE) $\therefore$ AE = BE (line drawn from centre, perpend. to chord or midpoint theorem)	✓ OC = OB ✓ conclusion and reason (2) ✓ $\hat{OEB} = \hat{CAB} = 90°$° ✓ conclusion and reason (2)
10.2	In ΔAED and ΔCEB $\hat{AED} = \hat{CEB}$ (vertically opp angles) $\hat{D} = \hat{B}$ (angles in same segment) $\hat{A}_3 = \hat{C}_1$ (angles in same segment) $\therefore \Delta AED \mathbin{///} \Delta CEB$ (equi - angular)	✓ statement ✓ statement ✓statement (3)
10.3	$\frac{AE}{DE} = \frac{CE}{BE}$ (deduction) $AE.BE = DE.CE$ but AE = BE (proven) $\therefore AE^2 = DE.CE$	✓ $\frac{AE}{DE} = \frac{CE}{BE}$ ✓ AE = BE (2)
10.4	AE.BE = DE.CE But AE.BE = EF.CE $\therefore$ DE.CE = EF.CE DE = EF $\therefore$ E is the midpoint of DF **OR** AE^2 = DE.CE AE.BE = EF.CE $\Rightarrow AE^2$ = EF.CE $\therefore$ EF.CE = DE.CE EF = DE $\therefore$ E is the midpoint of DF	✓ AE.BE = DE.CE ✓ AE.BE = EF.CE ✓ DE.CE = EF.CE (3) ✓ AE.BE = EF.CE ✓ $\Rightarrow AE^2$ = EF.CE ✓ $\therefore$ EF.CE = DE.CE (3) **[10]**

QUESTION 11

11.1	In ΔBDA and ΔCDB $B\hat{D}A = C\hat{D}B = 90°$ $\hat{B}_1 = \hat{C}$ (both $= x$) $\hat{A} = \hat{B}_2$ (remaining angles) $\Delta BDA \mathbin{///} \Delta CDB$ (equiangular)	✓ $B\hat{D}A = C\hat{D}B$ ✓ $\hat{B}_1 = \hat{C}$ ✓ $\hat{A} = \hat{B}_2$ (3)
11.2	AD : DC = 3 : 2 $\therefore CD = \frac{2}{3} \times 15 = 10$ But $\frac{BD}{AD} = \frac{CD}{BD}$ $\therefore BD^2 = AD.CD$ $BD^2 = 15.10$ $= 150$ $BD = \sqrt{150}$	✓ CD ✓ $\frac{BD}{AD} = \frac{CD}{BD}$ ✓ BD (3)
11.3	$AB^2 = (\sqrt{150})^2 + (15)^2$ (Theorem of Pythagoras) $= 150 + 225$ $= 375$ $AB = \sqrt{375}$ $\hat{E}_1 = A\hat{B}C = 90°$ $\therefore BC \parallel DE$ $\frac{AE}{AB} = \frac{AD}{AC}$ (proportion theorem) $\frac{AE}{\sqrt{375}} = \frac{15}{25}$ $AE = \frac{15 \times \sqrt{375}}{25} = \sqrt{135} = 3\sqrt{15}$	✓using Pythagoras ✓ answer ✓ $= 90^o$ ✓ $\therefore BC \parallel DE$ ✓ $\frac{AE}{AB} = \frac{AD}{AC}$ ✓ answer (6) **[11]**

TOTAL : 100