



education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P3

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MEMORANDUM

MARKS: 100

This memorandum consists of 8 pages.

QUESTION 1

1.1	313 ; 633	✓✓ answers (2)
1.2	$13 = 2 \times 3 + 7$ $33 = 2 \times 13 + 7$ $73 = 2 \times 33 + 7$ $T_{n+1} = 2T_n + 7, T_1 = 3 \quad (n \geq 1)$ OR $T_n = 2T_{n-1} + 7, T_1 = 3 \quad (n \geq 2)$ OR $13 = 3 + 10$ $33 = 13 + 20$ $73 = 33 + 40$ $T_{n+1} = T_n + 10.2^{n-1}, T_1 = 3 \quad (n \geq 1)$ OR $T_n = T_{n-1} + 10.2^{n-2}, T_1 = 3 \quad (n \geq 2)$	✓ 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]

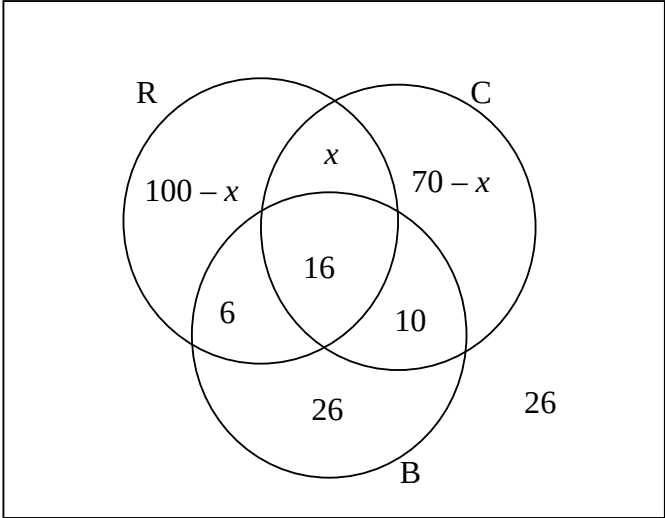
QUESTION 3

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	$P(A \text{ or } B) = 0,3 + 0,5$ $= 0,8$	✓ addition ✓ answer (2)
4.2	Since A and B are independent $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $= 0,3 + 0,5 - 0,15$ $= 0,65$	✓ $P(A \text{ and } B) = 0,15$ ✓ $0,3 + 0,5 - 0,15$ ✓ 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	$100 - x + x + 16 + 6 + 26 + 10 + 70 - x + 26 = 240$ $254 - x = 240$ $x = 14$ $\therefore$ Number of learners playing rugby and cricket = 30.	✓ set up equation ✓ answer $x = 14$ ✓ answer = 30 (3)
5.3.1	$P(\text{play basketball only}) = \frac{26}{240}$ $= 0,108$	✓ $= \frac{26}{240}$ ✓ answer (2)
5.3.2	$P(\text{does not play cricket}) = \frac{144}{240}$ $= 0,600$	✓ 144 ✓ answer (2)
5.3.3	$P(\text{plays at least 2 sports}) = \frac{14 + 6 + 10 + 16}{240}$ $= \frac{46}{240}$ $= 0,192$	✓ 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! ✓ $4! \times 4!$ ✓ answer (4) [9]

QUESTION 7

7.1 & 7.3	Scatter Plot of North Latitude vs Mean Maximum Temperature for April Mean Maximum Temperature (degree Celsius) North Latitude	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 $= 39,94 - 0,52(40)$ $= 19,14\text{ }^{\circ}\text{C}$	✓ 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	$\text{reflex } \hat{O} = 360^\circ - 100^\circ = 260^\circ$ ($\angle$'s round a point) $2\hat{LMN} = \text{reflex } \hat{O}$ ($\angle$ circ centre = 2 $\angle$ circumference) $\therefore \hat{LMN} = \frac{260^\circ}{2} = 130^\circ$	✓ reflex $\hat{O} = 260^\circ$ ✓ reason ✓ $\hat{LMN} = 130^\circ$ (3)
8.2.2	$\hat{N}_1 = \frac{180^\circ - 130^\circ}{2} = 25^\circ$ (base angles LM = MN) $\therefore \hat{K} = 25^\circ$ (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 theorem) $\therefore \hat{P}_1 = \hat{R}_2$ $\therefore$ 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 $\hat{CAB} = 90^\circ$ (diameter subtends right angle) $\hat{OEB} = \hat{CAB} = 90^\circ$ (corresponding angles $AC \parallel OE$) $\therefore AE = BE$ (line drawn from centre, perpend. to chord or midpoint theorem)	✓ $OC = OB$ ✓ conclusion and reason (2) ✓ $\hat{OEB} = \hat{CAB} = 90^\circ$ ✓ conclusion and reason (2)
10.2	In $\triangle AED$ and $\triangle CEB$ $\hat{AED} = \hat{CEB}$ (vertically opp angles) $\hat{D} = \hat{B}$ (angles in same segment) $\hat{A}_3 = \hat{C}_1$ (angles in same segment) $\therefore \triangle AED \sim \triangle CEB$ (equi - angular)	✓ statement ✓ statement ✓ statement (3)
10.3	$\frac{AE}{DE} = \frac{CE}{BE}$ (deduction) $AE \cdot BE = DE \cdot CE$ but $AE = BE$ (proven) $\therefore AE^2 = DE \cdot CE$	✓ $\frac{AE}{DE} = \frac{CE}{BE}$ ✓ $AE = BE$ (2)
10.4	$AE \cdot BE = DE \cdot CE$ But $AE \cdot BE = EF \cdot CE$ $\therefore DE \cdot CE = EF \cdot CE$ $DE = EF$ $\therefore E$ is the midpoint of DF OR $AE^2 = DE \cdot CE$ $AE \cdot BE = EF \cdot CE$ $\Rightarrow AE^2 = EF \cdot CE$ $\therefore EF \cdot CE = DE \cdot CE$ $EF = DE$ $\therefore E$ is the midpoint of DF	✓ $AE \cdot BE = DE \cdot CE$ ✓ $AE \cdot BE = EF \cdot CE$ ✓ $DE \cdot CE = EF \cdot CE$ (3) ✓ $AE \cdot BE = EF \cdot CE$ ✓ $\Rightarrow AE^2 = EF \cdot CE$ ✓ $\therefore EF \cdot CE = DE \cdot CE$ (3) [10]

QUESTION 11

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

TOTAL : 100