



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

MATHEMATICS P1

MEMORANDUM

NOVEMBER 2019

MARKS: 150

This memorandum consists of 12 pages

Please turn over

QUESTION/VRAAG 1

1.1.1	$5x^2 - 33x - 14 = 0$ $(5x + 2)(x - 7) = 0$ $x = -\frac{2}{5} \text{ or } x = 7$	✓ Factors/faktore ✓ both x - values <i>beide x -waardes</i> (2)
1.1.2	$x^2 + 7x + 4 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-7 \pm \sqrt{49 - 4(1)(4)}}{2(1)}$ $= -6,37 / -0,63$	✓ Correct substitution in correct formula/ <i>korrekte vervanging in korrekte formule</i> ✓✓ correct answers/ <i>korrekte antwoorde</i> (3)
1.2.1	$8 - x \geq 0 \quad \text{and} \quad x - 2 \geq 0$ $-x \geq -8 \quad \quad \quad x \geq 2$ $x \leq 8$ $\therefore 2 \leq x \leq 8$	✓ $8 - x \geq 0$ ✓ $x - 2 \geq 0$ ✓ $2 \leq x \leq 8$ (3)
1.2.2	$\sqrt{8 - x} = x - 2$ $8 - x = x^2 - 4x + 4$ $0 = x^2 - 3x - 4$ $0 = (x - 4)(x + 1)$ $\therefore x = 4 \text{ or } x = -1$	✓ $8 - x = x^2 - 4x + 4$ ✓ standard form/ <i>Standaardvorm</i> ✓ factors/faktore ✓ both answers/beide antwoorde ✓ selection/seleksie (5)
1.2.3	$x = -1$	✓✓ answer/antwoord (2)
1.3	$x^2 + 2x \geq 15$ $x^2 + 2x - 15 \geq 0$ $(x + 5)(x - 3) \geq 0$ Critical values are - 5 and 3 $\therefore x \leq -5 \text{ or } x \geq 3$	✓ standard form ✓ factors ✓ critical values ✓ $\therefore x \leq -5 \text{ or } x \geq 3$ (4)

1.4	$2^y = 32^x$ $2^y = 2^{5x}$ $\therefore y = 5x \dots (1)$ en $y = x^2 - 2x - 18 \dots (2)$ Sub (1) in (2): $5x = x^2 - 2x - 18$ $0 = x^2 - 7x - 18$ $0 = (x-9)(x+2)$ $\therefore x = 9$ or $x = -2$ sub into (1): $y = 45$ $y = -10$	$\checkmark 2^y = 2^{5x}$ $\checkmark y = 5x$ $\checkmark$ sub (1) in (2) $\checkmark$ standard form/ <i>standaard vorm</i> $\checkmark x$ - values $\checkmark y$ - values (6)
1.5.1	for equal roots: $\Delta = 0$ $7 + 3p = 0$ $p = -\frac{7}{3}$	$\checkmark \Delta = 7 + 3p = 0$ $\checkmark p = -\frac{7}{3}$ (2)
1.5.2	for non-real roots: $\Delta < 0$ $p < -\frac{7}{3}$	$\checkmark \Delta < 0$ $\checkmark p < -\frac{7}{3}$ (2)

[29]

QUESTION /VRAAG 2

2.1.1	$\frac{\sqrt{98} + \sqrt{8}}{\sqrt{50}}$ $= \frac{7\sqrt{2} + 2\sqrt{2}}{5\sqrt{2}}$ $= \frac{9\sqrt{2}}{5\sqrt{2}}$ $= \frac{9}{5}$	$\checkmark 7\sqrt{2} + 2\sqrt{2}$ Simplified surd/ <i>vereevoudigde wortels</i> $\checkmark 5\sqrt{2}$ $\checkmark \frac{9\sqrt{2}}{5\sqrt{2}}$ $\checkmark \frac{9}{5}$ (4)
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2.1.2	$\frac{5^{x+3} - 3 \cdot 5^{x+2}}{5^{x+1}}$ $= \frac{5^{x+1}(5^2 - 3 \cdot 5)}{5^{x+1}}$ $= 25 - 15$ $= 10$	✓ factorisation/ <i>faktorisering</i> ✓ $(5^2 - 3 \cdot 5)$ ✓ $25 - 15$ ✓ 10 (4)
2.2.1	$\sqrt{(x-3)^{-3}} = 27$ $(x-3)^{-\frac{3}{2}} = 3^3$ $x-3 = (3^3)^{-\frac{2}{3}}$ $x-3 = \frac{1}{9}$ $x = \frac{28}{9}$	✓ $(x-3)^{-\frac{3}{2}} = 3^3$ ✓ $(3^3)^{-\frac{2}{3}}$ ✓ $\frac{1}{9}$ ✓ $x = \frac{28}{9}$ (4)
2.2.2	$4^x - 3 \cdot 2^x = 40$ $2^{2x} - 3 \cdot 2^x - 40 = 0$ $(2^x - 8)(2^x + 5) = 0$ $2^x = 8 \text{ or } 2^x \neq -5$ $2^x = 2^3$ $\therefore x = 3$	✓standard form/ <i>standaardvorm</i> ✓factors/ <i>faktore</i> ✓ $2^x \neq -5$ ✓ $x = 3$ (4)
		[16]

QUESTION/VRAAG 3

	$h(x) = -x^2 + 4x$ $= -(x^2 - 4x)$ $= -\left[x^2 - 4x + \left(\frac{1}{2}(-4)^2\right) - \left(\frac{1}{2}(-4)^2\right)\right]$ $= -[(x-2)^2 - 4]$ $= -(x-2)^2 + 4$ $\therefore \text{maximum value of } h(x) \text{ is 4 units}$ OR $h(x) = -x^2 + 4x$ Maximum height at turning point. $x = \frac{-b}{2a}$ $\therefore x = \frac{-4}{2(-1)}$ $\therefore x = 2$ $\therefore h(2) = -(2)^2 + 4(2)$ $= 4$ $\therefore \text{Maximum height} = 4 \text{ units}$	✓ completing the squares ✓ simplification ✓ Writing in the form $a(x+p)^2 + q$ ✓ maximum value ✓ correct substitution in the symmetry formula of parabola/<i>korrekte vervanging in die simmetries formule van parabool</i> ✓ $x = 2$ ✓ substitution/<i>vervangin</i> ✓ answer/<i>antwoord</i> (4) [4]
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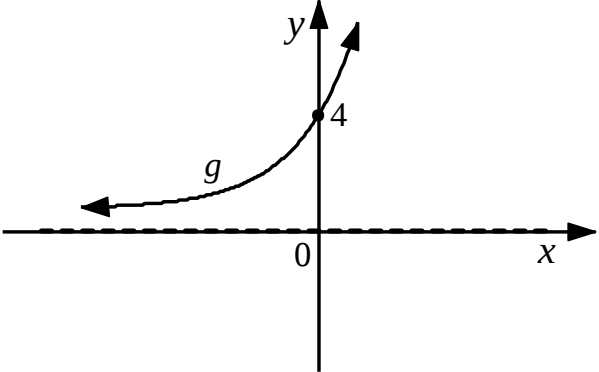
QUESTION/VRAAG 4

4.1		
	4.1.1 19 ; 24	✓19 ✓24 (2)
	4.1.2 $T_n = 5n - 1$	✓✓ $5n - 1$ (2)
	4.1.3 $T_n = 1099$ $5n - 1 = 1099$ $5n = 1100$ $n = 220$ $\therefore T_{220} = 1099 \therefore \text{it is in the sequence}$	✓equating/<i>stel gelyk</i> ✓simplification/<i>vereenvoudiging</i> $5n = 1100$ ✓answer/<i>antwoord</i> (3)
4.2		
	4.2.1 30 ; 46	✓30 ✓46 (2)

	4.2.2	$T_n = an^2 + bn + c$ $2a = 4$ $\therefore a = 2$ $3a + b = 3$ $\therefore 3(2) + b = 3$ $\therefore b = -3$ $a + b + c = 6$ $2 - 3 + c = 6$ $c = 7$ $\therefore T_n = 2n^2 - 3n + 7$	✓ second difference = 4 / <i>tweede konstante verskil</i> = 4 ✓ $a = 2$ ✓ $b = -3$ ✓ $c = 7$ (4)
	4.2.3	$T_{12} = 2(12)^2 - 3(12) + 7$ $= 270$	✓ correct substitution in T_n korrekte vervanging in T_n ✓ answer / <i>antwoord</i> (2)
	4.2.4	$T_n = 766$ $2n^2 - 3n + 7 = 766$ $2n^2 - 3n - 759 = 0$ $n^2 - n - 380 = 0$ $(n - 20)(n + 19) = 0$ $n = 20 \therefore$ it is term number 20	✓ equating / <i>gelyk stelling</i> ✓ standard form = 0 / <i>standaard formule = 0</i> ✓ factors / <i>faktore</i> ✓ $n = 20$ (4)
4.3		T_1 ; T_2 ; T_3 ; T_4 k ; 14 ; 24 ; $7k$ $14 - k$; 10 ; $7k - 24$ $-4 + k = 7k - 34$ $6k = 30$ $k = 5$	✓ first differences / <i>eerste verskille</i> ✓ second differences / <i>tweede verskille</i> ✓ equating / <i>gelykstelling</i> ✓ $6k = 30$ ✓ answer / <i>anwoord</i> (5)
			[24]

QUESTION/VRAAG 5

5.1.1	$x = 2$ $y = 1$	$\checkmark x = 2$ $\checkmark y = 1$ (2)
5.1.2	$f(x) = \frac{k}{x-2} + 1$ through $(0; -2)$ $-2 = \frac{k}{0-2} + 1$ $-3 = \frac{k}{-2}$ $k = 6$ $\therefore f(x) = \frac{6}{x-2} + 1$	$\checkmark \checkmark$ substitute / <i>vervang</i> $(0; -2)$ $\checkmark k = 6$ (3)
5.1.3	$x \in R ; x \neq 2$	$\checkmark x \neq 2$ (1)
5.1.4	x – intercept $(y = 0)$ $0 = \frac{6}{x-2} + 1$ $-x + 2 = 6$ $-x = 4$ $x = -4$ $\therefore D(-4; 0)$	$\checkmark$ substitute / <i>vervang</i> $= 0$ $\checkmark$ simplification / <i>vereenvoudiging</i> $\checkmark x = -4$ $\checkmark D(-4; 0)$ (4)
5.1.4	$h(x) = a(x - R_1)(x - R_2)$ $h(x) = a(x - 2)(x + 4)$ through $(0; -2)$ $-2 = a(0 - 2)(0 + 4)$ $-2 = -8a$ $\therefore a = \frac{1}{4}$ $\therefore h(x) = \frac{1}{4}(x - 2)(x + 4)$ $= \frac{1}{4}(x^2 + 2x - 8)$ $= \frac{1}{4}x^2 + \frac{1}{2}x - 2$	$\checkmark$ substitution in correct formula / <i>vervanging in korrekte formule</i> $\checkmark$ substitute / <i>vervang</i> $(0; -2)$ $\checkmark a = \frac{1}{4}$ $\checkmark h(x) = \frac{1}{4}(x - 2)(x + 4)$ $\checkmark$ answer in quadratic form / <i>antwoord in kwadratiese vorm</i> (5)

5.2.1		✓ shape/vorm ✓ y – intercept/afsnit ✓ asymptote /asimptoot $y = 0$ (3)
5.2.2	$g(x-3) = 2^{x-3+2}$ $= 2^{x-1}$	✓✓ answer/antwoord (2)
[20]		

QUESTION /VRAAG 6

6.1	$D(-3;0)$	✓ $(-3;0)$ (1)
6.2	$y = -x^2 + bx + c$ $y = a(x - R_1)(x - R_2)$ but $D(-3;0)$; $B(1;0)$ and $a = -1$ $y = -(x+3)(x-1)$ $y = -(x^2 + 2x - 3)$ $\therefore y = -x^2 - 2x + 3$	✓ substitute /vervang $D(-3;0), B(1;0)$ ✓ substitute/vervang $a = -1$ ✓ multiplication ✓ $y = -x^2 - 2x + 3$ (4)
6.3.1	$f(x) = -x^2 - 2x + 3$ $f(-1) = -(-1)^2 - 2(-1) + 3$ $= 4$ $A(-1;4)$ $\therefore \text{Range} : y \leq 4$	✓ $f(-1) = 4$ ✓ $y \leq 4$ OR $y \in (-\infty; 4]$ (2)
6.3.2	$A(-1;4)$ and $D(-3;0)$ $m = \frac{4-0}{-1+3}$ $= 2$ $y - y_c = m(x - x_c)$ $y - 0 = 2(x + 3)$ $\therefore y = 2x + 6$	✓ $m = 2$ ✓ substitute $A(-1;4)$ OR $C(-3;0)$

		✓ $y = 2x + 6$ (3)
6.4	$x < -3$ or $0 < x < 1$	✓ $x < -3$ ✓ or ✓ critical values ✓ $0 < x < 1$ correct notation (4)
6.5	$-x^2 - 2x + 3 = k$ $-x^2 - 2x + (3 - k) = 0$ $\Delta < 0$ for non-real roots $b^2 - 4ac < 0$ $4 - 4(-1)(3 - k) < 0$ $4 + 12 - 4k < 0$ $-4k < -16$ $\therefore k > 4$	✓ standard form ✓ $b^2 - 4ac < 0$ ✓ $k > 4$ (answer only, full marks) (3)
6.6	$PM = f(x) - g(x)$ $= -x^2 - 2x + 3 - 2x - 6$ $= -x^2 - 4x - 3$ $= -(x^2 + 4x + 3)$ $= -(x^2 + 4x + 4 - 4 + 3)$ $= -[(x + 2)^2 - 1]$ $= -(x + 2)^2 + 1$ $\therefore \max PM = 1 \text{ unit}$	✓ $-x^2 - 2x + 3 - 2x - 6$ ✓ simplification ✓ $-[(x + 2)^2 - 1]$ ✓ maximum PM = 1 unit (4)
		[21]

QUESTION/VRAAG 7

	✓ shape/vorm ✓ asymptote/asimptote ✓ intercepts of the axis/ afsnitte van die asse (3)
	[3]

QUESTION/ VRAAG 8

8.1	$A = P(1-i)^n$ $150000 = 250000(1-i)^6$ $i = 1 - \sqrt[6]{\frac{3}{5}}$ $= 0,0816$ $r = 8,16\% p.a.$	✓ correct substitution in correct formula/ <i>korrekte vervanging in korrekte formule</i> $\sqrt[6]{\frac{3}{5}}$ ✓ $r = 8,16\%$ (3)
8.2	$i^{eff} = \left(1 + \frac{i^{nom}}{f}\right)^f - 1$ $= \left(1 + \frac{0,089}{12}\right)^{12} - 1$ $= 0,092721727$ $r = 9,27\% p.a. \text{ compounded yearly}$	✓ correct substitution in correct formula/ <i>korrekte vervanging in korrekte formule</i> ✓ $f = 12$ ✓ $r = 9,27\%$ (3)
8.3	$A = 35000 \left(1 + \frac{0,08}{2}\right)^{1,5 \times 2} \left(1 + \frac{0,065}{12}\right)^{3,5 \times 12}$ $= R49\,397,32$	✓ $\left(1 + \frac{0,08}{2}\right)$ ✓ $n = 1,5 \times 2$ ✓ $\left(1 + \frac{0,065}{12}\right)$ ✓ $n = 3,5 \times 12$ ✓ R49 397,32 (5)
8.4	$A = 15000 \left(1 + \frac{0,16}{12}\right)^{7 \times 12} + 10000 \left(1 + \frac{0,16}{12}\right)^{4 \times 12} - 8000 \left(1 + \frac{0,16}{12}\right)^{2 \times 12}$ $= R53\,524,85$	✓ $15000 \left(1 + \frac{0,16}{12}\right)^{84}$ ✓ $10000 \left(1 + \frac{0,16}{12}\right)^{48}$ ✓ ✓ $- 8000 \left(1 + \frac{0,16}{12}\right)^{24}$ ✓ R5352485 (5)
		[16]

QUESTION /VRAAG 9

9.1			
	9.1.1	No, A and B are not mutually exclusive: $P(A \text{ and } B) \neq 0$ Nee, A en B is nie onderling uitsluitend is want $P(A \text{ en } B) \neq 0$	✓No ✓ $P(A \text{ and } B) \neq 0$ $P(A \text{ en } B) \neq 0$ (2)
	9.1.2	$P(A \text{ and } B) = 0,1$ And/en $P(A) \times P(B)$ $= 0,2 \times 0,5$ $= 0,1$ $\therefore P(A) \times P(B) = P(A \text{ en } B)$ Ja, die twee gebeurtenisse is onafhanklik $P(A) \times P(B) = P(A \text{ and } B)$ Yes, they are independent	

	9.3.2		✓ $\frac{26}{59}$ ✓ $\frac{27}{59}$ ✓ $\frac{23}{59}$ (3)
	9.3.3	$P(B \text{ and } G) = \frac{9}{60} \times \frac{24}{59} + \frac{24}{60} \times \frac{9}{59}$ $= 0,122$ $P(B \text{ en } G) = \frac{9}{60} \times \frac{24}{59} + \frac{24}{60} \times \frac{9}{59}$ $= 0,122$	✓ $\frac{9}{60} \times \frac{24}{59}$ ✓ $\frac{24}{60} \times \frac{9}{59}$ ✓ 0,12 (3)
			[17]

TOTAL:

[150]