education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12 / GRAAD 12

MATHEMATICS P1 / WISKUNDE V1

JUNE /JUNIE 2024

MARKING GUIDELINES / NASIENRIGLYNE

MARKS / PUNTE: 150

The marking guideline consists of 11 pages.
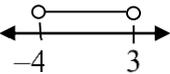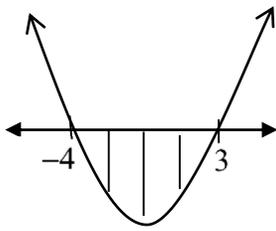
Die nasienriglyne bestaan uit 11 bladsye.

TAKE NOTE:
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:
- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyn van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

QUESTION 1 / VRAAG 1

1.1.1	$x^2 - 49 = 0$ $(x+7)(x-7) = 0$ $x = -7 \ or \ x = 7$	✓ factorisation/faktorisering ✓ answers (2)
1.1.2	$(x+4)(3-x) > 0$ $(x+4)(x-3) < 0$ $-4 < x < 3$ OR/OF $x \in (-4;3)$	✓ method/metode ✓ values/waardes ✓ notation/notasie (3)
1.1.3	$(x+4)(3-x) = 5$ $-x^2 - x + 12 = 5$ $-x^2 - x + 7 = 0$ $x^2 + x - 7 = 0$ $x = \dfrac{-1 + \sqrt{1^2 - 4(1)(-7)}}{2(1)}$ $x = \dfrac{-1 + \sqrt{29}}{2}$ $x = 2,193 \ or \ x = -3,193$ $\boxed{\begin{array}{l} -1 \text{ for rounding} \\ (3 \text{ decimals}) \\ -1 \text{ as nie} \\ \text{afgerond tot 3} \\ \text{desimale} \end{array}}$	✓ standard form ✓ substitution into correct formula substitusie in regte formule ✓ 2,193 ✓ −3,193 (4)
1.2.1	$\sqrt{x+2} = x - 4$	

NSC / NSS Marking Guideline/Nasienriglyn
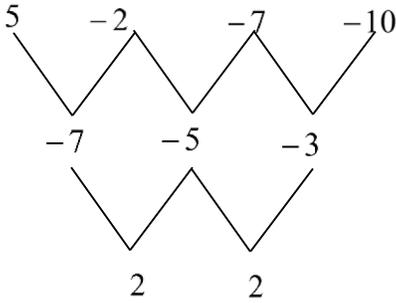
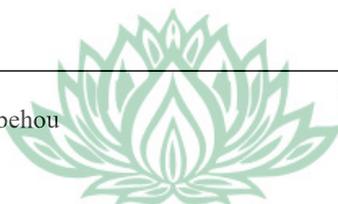|		
	$x + 2 = (x - 4)^2$ $x + 2 = x^2 - 8x + 16$ $x^2 - 9x + 14 = 0$ $(x - 7)(x - 2) = 0$ $x = 7 \ or \ x \neq 2$	✓squaring both sides kwadreer beide kante ✓ standard form ✓ factors/faktore ✓ $x = 7$ only (4)
1.2.2	$2x^{-\frac{5}{3}} = 64$ $x^{-\frac{5}{3}} = 32$ $\left(x^{-\frac{5}{3}}\right)^{-\frac{3}{5}} = \left(2^5\right)^{-\frac{3}{5}}$ $x = 2^{-3}$ $x = \dfrac{1}{8}$	✓ divide by 2/ deel deur 2 ✓ exponential law eksponentwet ✓ answer (3)

1.3	$x = -1 + 2y$
	$(-1 + 2y)^2 - 7 - y^2 = -y$
	$1 - 4y + 4y^2 - 7 - y^2 + y = 0$
	   $3y^2 - 3y - 6 = 0$
	     $y^2 - y - 2 = 0$
	$(y - 2)(y + 1) = 0$
	$y = 2$ or $y = -1$
	$x = -1 + 2(2)$ or $x = -1 + 2(-1)$
	   $= 3$ $= -3$
		✓ $x = -1 + 2y$
		✓ substitution of x
		✓ standard form
		✓ factorising/faktorisering
		
		✓ both y-values / beide y-waardes
		
		✓ both values of x /beide x-waardes (6)

1.4	$2^x = 1 - 2p$ $2^x > 0$ For real solutions: $1 - 2p > 0$ Vir reële oplossings: $-2p > -1$ $p < \dfrac{1}{2}$	 ✓ $1 - 2p > 0$ ✓ answer (2)
1.5	$M = \sqrt{\dfrac{9 - 3p}{p + 1}}$	
1.5.1	To be undefined / Om ongedefinieerd te wees : $p + 1 = 0$	✓ $p = -1$ (1)

NSC / NSS Marking Guideline/Nasienriglyn

	$p = -1$	
1.5.2	To be rational/Om rasionaal te wees $p = 0 \quad (M = \sqrt{9} = 3)$ OR $\quad p = 3 \quad \left(M = \sqrt{\dfrac{0}{4}} = 0\right)$	✓ any of the 2 values of p enige van die 2 waardes van p (1)
		[26]

QUESTION 2 / VRAAG 2

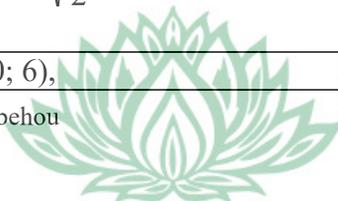|		
2.1.1	 $2a = 2 \qquad 3(1) + b = -7 \qquad a + b + c = 5$ $\quad a = 1 \qquad\qquad b = -10 \qquad\qquad\quad c = 14$ $T_n = n^2 - 10n + 14$	✓ $a = 1$ ✓ $b = -10$ ✓ $c = 14$ ✓ T_n answer (4)
2.1.2	$n^2 - 10n + 14 < -11$ $n^2 - 10n + 25 < 0$ $(n^2 - 5)^2 < 0$ This is **not true** for any value of n, thus the sequence will not have a term less than –11.	✓ substituting -11 ✓ standard form ✓ factorise ✓ conclusion /gevolgtrekking (4)
2.2	$a = \dfrac{1}{181}; \quad d = \dfrac{1}{181}; \quad n = 180$ ∴ The sequence is arithmetic/die ry is rekenkundig $S_{180} = \dfrac{180}{2}\left[2(\dfrac{1}{181}) + \dfrac{1}{181}(179)\right] = 90$	✓ a and d ✓ substitution/substitusie ✓ answer (3)
2.3.1	$r = 1,1 = \dfrac{11}{10}$ $T_{12} = 1,21(1,1)^{11}$ $\quad = 3,452271214$	✓ $r = 1,1$ ✓ substitution into T_n ✓ answer (3)

2.3.2	$S_{12} = \dfrac{1,21(1,1^{12} - 1)}{1,1 - 1}$ $= 25,87498336$ $\approx 25,875$	✓ $a = 1,21$ ✓ substitution ✓ answer $\qquad$ (3)
2.4	For the series $\qquad 1 + 4 + 7 + 10 + ... + 22$ $\qquad\qquad T_n = 1 + 3(n - 1)$ $\qquad\qquad\qquad = 3n - 2$ $\qquad\qquad 22 = 3n - 2$ $\qquad\qquad \therefore n = 8$ For the series $\qquad 3 + 9 + 27 .... + 6561$ $\qquad\qquad T_n = 3(3)^{n-1} = 3^n$ Therefore the sum in sigma notation: $\displaystyle\sum_{k=1}^{8} \dfrac{3k - 2}{3^k}$	✓ $T_n = 3n - 2$ ✓ $n = 8$ ✓ $T_n = 3^n$ ✓sigma notation $\qquad$ (4)
2.5	$r = \dfrac{4x^2 - 16}{2x - 4}$ $\;= \dfrac{(2x - 4)(2x + 4)}{2x - 4}$ $\;= 2x + 4$ $-1 < r < 1$ $-1 < 2x + 4 < 1$ $-\dfrac{5}{2} < x < -\dfrac{3}{2}$	✓ $r = 2x + 4$ ✓ $-1 < r < 1$ ✓ $-1 < 2x + 4 < 1$ ✓ $-\dfrac{5}{2} < x < -\dfrac{3}{2}$ $\quad$ (4)
		[25]

QUESTION 3 / VRAAG 3

3.1	$-4x^2 + 6 = 0$ $-4x^2 = -6$ $x^2 = \dfrac{3}{2}$ $x = \pm\sqrt{\dfrac{3}{2}}$ x-coordinate of A is $-\sqrt{\dfrac{3}{2}} = -1,22$	✓ $x^2 = \dfrac{3}{2}$ ✓x coordinate of A $-\sqrt{\dfrac{3}{2}} = -1,22$ $\qquad$ (2)
3.2	Max / maks TP = (0; 6),	✓ Max TP

	$\therefore f(x) \le 6, \quad \therefore f(x) \ne 8$	✓Answer	(2)
3.3	Length of CBD $= -4x^2 + 6 - \left(-2\sqrt{-x}\right)$ $= -4x^2 + 6 + 2\sqrt{-x}$	✓ difference/verskil ✓ answer	(2)
3.4	Max length: Derivate/afgeleide = 0 $CBD'(x) = -8x + \left(\dfrac{1}{2}\right)(2)(-x)^{-\frac{1}{2}}$ $-8x + (-x)^{-\frac{1}{2}} = 0$ $-8x = -(-x)^{-\frac{1}{2}}$ $64x^2 = (-x)^{-1} = -\dfrac{1}{x}$ $x^3 = -\dfrac{1}{64}$ $x = -\dfrac{1}{4}$ Max length $= -4\left(-\dfrac{1}{4}\right)^2 + 6 + \left[2\left(\sqrt{-\left(-\dfrac{1}{4}\right)}\right)\right]$ $= \dfrac{27}{4} = 6\dfrac{3}{4}$	✓ derivative/afgeleide ✓ equate to 0/stel gelyk aan 0 ✓simplification/vereenvoudiging ✓ answer for x ✓ substitution / substitusie ✓ answer	 (6)
3.5	$g(x) = -2\sqrt{-x}$ For inverse h: $x = -2\sqrt{-y}$ $x^2 = 4(-y)$ $y = -\dfrac{x^2}{4}; \quad x \le 0$	✓ change x and y ruil x en y om ✓ simplification / vereenvoudig ✓ equation / vergelyking ✓ $x \le 0$	(4)
3.6	$k(x) = -\left(-2\sqrt{-x}\right)$ $= 2\sqrt{-x}; \; x \le 0$	✓answer	(1)
3.7	$-6 < k < 0$	✓ values/waardes ✓ notation/notasie	(2)
			[19]

QUESTION 4 / VRAAG 4

4.1	$x = 3$ $y = 2$	✓ $x = 3$ ✓ $y = 2$	(2)

NSC / NSS Marking Guideline/Nasienriglyn

4.2	$y = 2^0 + 1 = 2$ y-intercept / y-afsnit: (0; 2)	✓ $x = 0$ ✓ (0; 2) (2)
4.3	$0 = \dfrac{a}{-1+3} + 2$ $-2 = \dfrac{a}{2}$ $a = -4$ $f(x) = -\dfrac{4}{x+3} + 2$	✓ substitution of p and q ✓ substitution of $(-1;0)$ ✓ value of a ✓ equation (4)
4.4	$y = -(x+3) + 2$ $y = -x - 1$	✓ substitution ✓ equation (2)
4.5	domain of / definisieversameling van $4\,f(x-2)$ $x \in R;\ x \neq -1$	✓✓ $x \neq -1$ (2)
4.6	$h(x) = 2^x$	✓ equation (1)
4.7	$h^{-1}(x) = \log_2 x$	✓✓ log equation (2)
4.8	$y \in R$	✓ answer (1)
4.9	$-3 < x \leq -1$	✓ values ✓ notation (2)
		[18]

QUESTION 5 / VRAAG 5

5.1	$A = P(1 - i.n)$ $0 = x(1 - 0{,}125.n)$ $0{,}125n = 1$ $n = 8\ years$/ jaar	✓ substitution into correct formula ✓ n value (2)
5.2.1	$1 + i_{eff} = \left(1 + \dfrac{i_{nom}}{m}\right)^m$ $1 + 0{,}073 = (1 + \dfrac{i_{nom}}{4})^4$ $\sqrt[4]{1{,}073} - 1 = \dfrac{i_{nom}}{4}$ $0{,}017770\ldots = \dfrac{i_{nom}}{4}$ $i_{nom} = 0{,}07108\ldots$ Rate $= 7{,}108\%$	✓ Substitution into correct formula ✓ Use of surd ✓ $i_{nom} = 0{,}07108\ldots$ ✓ Rate (4)

NSC / NSS Marking Guideline/Nasienriglyn

5.2.2	$A = 25000(1+0,073)^{5,5}$ $\quad$ (66 months = $5,5 years$) $= R36833,12$	✓ substitution into correct formula ✓ 5,5 years ✓ answer $\qquad$ (3)
5.3	$x = 100000\left(1+\dfrac{0,06}{12}\right)^{-60} + 100000(1+\dfrac{0,06}{12})^{-36}$ $= R157701,71$ $\approx R157\ 700$	✓ first bracket substitution ✓ second bracket substitution ✓ R157 701,71 ✓ R157 700 $\qquad$ (4)
5.4	$A = 5000\left(1+\dfrac{0,084}{4}\right)^8\left(1+\dfrac{0,079}{2}\right)^{10}$ $= R\ 86\ 980,30$	✓8 and 10 ✓$\left(1+\dfrac{0,084}{4}\right)^8$ ✓$\left(1+\dfrac{0,079}{2}\right)^{10}$ ✓answer $\qquad$ (4)
		[17]

QUESTION 6 / VRAAG 6

6.1	$f(x) = 2-3x^2$ $f(x+h) = 2-3(x+h)^2$ $f(x+h) = 2-3(x^2+2xh+h^2)$ $\qquad = 2-3x^2-6xh-3h^2$ $f'(x) = \lim\limits_{h\to0}\dfrac{f(x+h)-f(x)}{h}$ $f'(x) = \lim\limits_{h\to0}\dfrac{[2-3x^2-6xh-3h^2-(2-3x^2)]}{h}$ $f'(x) = \lim\limits_{h\to0}\dfrac{2-3x^2-6xh-3h^2-2+3x^2}{h}$ $f'(x) = \lim\limits_{h\to0}\dfrac{-6xh-3h^2}{h}$ $f'(x) = \lim\limits_{h\to0}\dfrac{h(-6x-3h)}{h}$ $\qquad = -6x$	✓ substitute/ vervang $f(x+h)$ ✓ correct substitution into formula and notation ✓ simplification ✓ common factor gemeenskaplike faktor ✓ answer $\qquad$ (5)

NSC / NSS Marking Guideline/Nasienriglyn

6.2.1	$f(x) = \dfrac{x^4}{2} + x^0 - \pi t^2$ $f'(x) = 2x^3 + 0 - 0$ $\qquad = 2x^3$	✓ $2x^3$ ✓ 0 (2)
6.2.2	$D_x\left[\dfrac{-3x^3 + \sqrt[5]{x^2}}{x^2}\right]$ $= D_x\left[-\dfrac{3x^3}{x^2} + \dfrac{x^{\frac{2}{5}}}{x^2}\right]$ $= D_x\left[-3x + x^{\frac{-8}{5}}\right]$ $= -3 - \dfrac{8}{5}x^{\frac{-13}{5}}$	✓ $\sqrt[5]{x^2} = x^{\frac{2}{5}}$ ✓ $-\dfrac{8}{5}x^{-\frac{13}{5}}$ ✓ 3 ✓ $-\dfrac{8}{5}x^{-\frac{13}{5}}$ (4)
6.2.3	$y = \dfrac{8x^3 - 125}{2x - 5}$ $\quad = \dfrac{(2x-5)(4x^2 + 10x + 25)}{2x - 5}$ $\quad = 4x^2 + 10x + 25$ $\dfrac{dy}{dx} = 8x + 10$	✓factorisation/faktorisering ✓answer ✓derivative/afgeleide (3)
		[14]

QUESTION 7 / VRAAG 7

7.2	$\left(x^2 - 4x + 4\right)(x + 3) = 0$ $(x - 2)(x - 2)(x + 3) = 0$ $x = 2 \quad or \quad x = -3$ $B(2;0)$ $\therefore AB = 5units$	✓ factorise/faktoriseer ✓ $(x - 2)(x - 2)(x + 3) = 0$ ✓ B(2; 0) ✓ AB is 5 units (4)
7.3	$f''(x) > 0$ $6x - 2 > 0$ $x > \dfrac{1}{3}$	✓ $f''(x) > 0$ ✓ $6x - 2 > 0$ ✓ $x > \dfrac{1}{3}$ (3)
7.4	$f\left(\dfrac{1}{3}\right) = \left(\dfrac{1}{3}\right)^3 - \left(\dfrac{1}{3}\right)^2 - 8\left(\dfrac{1}{3}\right) + 12$	✓ y- coordinate

Copyright reserved/ Kopiereg voorbehou   Please turn over / Blaai asb om

	$$= \frac{250}{27}$$ $$f'\left(\frac{1}{3}\right) = 3\left(\frac{1}{3}\right)^2 - 2\left(\frac{1}{3}\right) - 8$$ $$= -\frac{25}{3} = m$$ $$y = -\frac{25}{3}x + c$$ $$\frac{250}{27} = -\frac{25}{3}\left(\frac{1}{3}\right) + c$$ $$c = \frac{325}{27}$$ $$y = -\frac{25}{3}x + \frac{325}{27}$$	✓ gradient ✓ substitution ✓ equation
7.5	$$k > 18\frac{14}{27} \ or \ k < 0$$	✓✓two answers (2)
7.6	$x > -3, \ x \neq 2$	✓ $x > -3$ ✓ $x \neq 2$ (2)
		[19]

QUESTION 8 / VRAAG 8

8.1.1		✓ 2 ✓ 4; 6; 8 ✓ 3; 5; 7 ✓ 1; 9 (4)
8.1.2	No, $A \cup B \neq 1$	✓ No ✓ reason (2)
8.1.3	$n(A \cup B)' = 2$	✓ answer (1)
8.1.4	$P(Even\ and\ prime) = \dfrac{1}{9}$	✓ answer (1)
8.2	P(Male and Speeding) = $\dfrac{398}{1000} = 0,398$ P(Male) × P(Speeding) = $\dfrac{615}{1000} \times \dfrac{603}{1000} = 0,37$ P(Male and Speeding) $\neq$ P(*Male*) × P(*Speeding*) $\therefore$ Not independent / nie onafhanklik	✓ $\dfrac{398}{1000} = 0,398$ ✓ 0,37 ✓ $\neq$ ✓ conclusion / gevolgtrekking (4)
		[12]

TOTAL / TOTAAL: 150