



education

MPUMALANGA PROVINCE  
REPUBLIC OF SOUTH AFRICA

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12 / GRAAD 12**

**MATHEMATICS P1 / WISKUNDE V1**

**JUNE / JUNIE 2024**

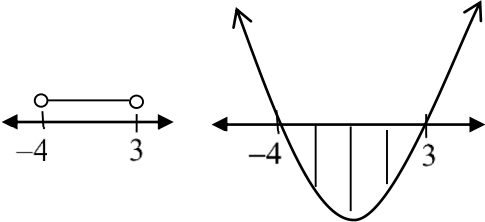
**TAKE NOTE:**

- 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**

<p>1.1.1</p>	$x^2 - 49 = 0$ $(x + 7)(x - 7) = 0$ $x = -7 \text{ or } x = 7$	<p>✓ factorisation/faktorisering</p> <p>✓ answers (2)</p>
<p>1.1.2</p>	$(x + 4)(3 - x) > 0$ $(x + 4)(x - 3) < 0$ $-4 < x < 3$ <p>OR/OF</p> $x \in (-4; 3)$ 	<p>✓ method/metode</p> <p>✓ values/waardes</p> <p>✓ notation/notasie (3)</p>
<p>1.1.3</p>	$(x + 4)(3 - x) = 5$ $-x^2 - x + 12 = 5$ $-x^2 - x + 7 = 0$ $x^2 + x - 7 = 0$ $x = \frac{-1 + \sqrt{1^2 - 4(1)(-7)}}{2(1)}$ $x = \frac{-1 + \sqrt{29}}{2}$ $x = 2,193 \text{ or } x = -3,193$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>-1 for rounding (3 decimals) -1 as nie afgerond tot 3 desimale</p> </div>	<p>✓ standard form</p> <p>✓ substitution into correct formula substitusie in regte formule</p> <p>✓ 2,193 ✓ -3,193 (4)</p>
<p>1.2.1</p>	$\sqrt{x + 2} = x - 4$	

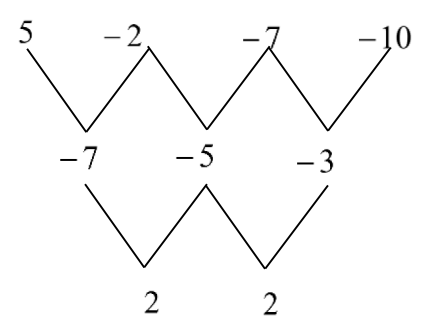
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	$x + 2 = (x - 4)^2$ $x + 2 = x^2 - 8x + 16$ $x^2 - 9x + 14 = 0$ $(x - 7)(x - 2) = 0$ $x = 7 \text{ or } x = 2$	✓ squaring both sides kwadreer beide kante  ✓ standard form ✓ factors/faktore ✓ $x = 7$ only (4)
1.2.2	$2x^{\frac{5}{3}} = 64$ $x^{\frac{5}{3}} = 32$ $\left(x^{\frac{5}{3}}\right)^{\frac{3}{5}} = \left(2^5\right)^{\frac{3}{5}}$ $x = 2^{-3}$ $x = \frac{1}{8}$	✓ divide by 2/ deel deur 2  ✓ exponential law eksponentwet  ✓ answer (3)
1.3	$x = -1 + 2y$ $(-1 + 2y)^2 - 7 - y^2 = -y$ $1 - 4y + 4y^2 - 7 - y^2 + y = 0$ $3y^2 - 3y - 6 = 0$ $y^2 - y - 2 = 0$ $(y - 2)(y + 1) = 0$ $y = 2 \quad \text{or} \quad y = -1$ $x = -1 + 2(2) \text{ or } x = -1 + 2(-1)$ $= 3 \quad \quad \quad = -3$	✓ $x = -1 + 2y$ ✓ substitution of $x$ ✓ standard form ✓ factorising/faktoriserings  ✓ 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: $-2p > -1$ $p < \frac{1}{2}$	✓ $1 - 2p > 0$  ✓ answer (2)
1.5	$M = \sqrt{\frac{9 - 3p}{p + 1}}$	
1.5.1	To be undefined / Om ongedefinieerd te wees $: p + 1 = 0$	✓ $p = -1$ (1)

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

**QUESTION 2 / VRAAG 2**

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

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

**QUESTION 3 / VRAAG 3**

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

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	$\therefore f(x) \leq 6, \therefore f(x) \neq 8$	✓ Answer (2)
3.3	$\text{Length of CBD} = -4x^2 + 6 - (-2\sqrt{-x})$ $= -4x^2 + 6 + 2\sqrt{-x}$	✓ difference/verskil ✓ answer (2)
3.4	Max length: Derivate/afgeleide = 0 $CBD'(x) = -8x + \left(\frac{1}{2}\right)(2)(-x)^{-\frac{1}{2}}$ $-8x + (-x)^{-\frac{1}{2}} = 0$ $-8x = -(-x)^{-\frac{1}{2}}$ $64x^2 = (-x)^{-1} = -\frac{1}{x}$ $x^3 = -\frac{1}{64}$ $x = -\frac{1}{4}$ $\text{Max length} = -4\left(-\frac{1}{4}\right)^2 + 6 + \left[2\left(\sqrt{-\left(-\frac{1}{4}\right)}\right)\right]$ $= \frac{27}{4} = 6\frac{3}{4}$	✓ 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: $x = -2\sqrt{-y}$ $x^2 = 4(-y)$ $y = -\frac{x^2}{4}; x \leq 0$	✓ change x and y ruil x en y om ✓ simplification / vereenvoudig  ✓ equation / vergelyking ✓ $x \leq 0$ (4)
3.6	$k(x) = -(-2\sqrt{-x})$ $= 2\sqrt{-x}; x \leq 0$	✓ answer (1)
3.7	$-6 < k < 0$	✓ values/waardes ✓ notation/notasie (2)
		<b>[19]</b>

**QUESTION 4 / VRAAG 4**

4.1	$x = 3$ $y = 2$	✓ $x = 3$ ✓ $y = 2$ (2)
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5.2.2	$A = 25000(1 + 0,073)^{5,5} \quad (66 \text{ months} = 5,5 \text{ years})$ $= R36833,12$	✓ substitution into correct formula ✓ 5,5 years ✓ answer (3)
5.3	$x = 100000 \left(1 + \frac{0,06}{12}\right)^{-60} + 100000 \left(1 + \frac{0,06}{12}\right)^{-36}$ $= R157701,71$ $\approx R157\,700$	✓ first bracket substitution ✓ second bracket substitution ✓ R157 701,71 ✓ R157 700 (4)
5.4	$A = 5000 \left(1 + \frac{0,084}{4}\right)^8 \left(1 + \frac{0,079}{2}\right)^{10}$ $= R\,86\,980,30$	✓ 8 and 10 ✓ $\left(1 + \frac{0,084}{4}\right)^8$ ✓ $\left(1 + \frac{0,079}{2}\right)^{10}$ ✓ answer (4)
		<b>[17]</b>

**QUESTION 6 / VRAAG 6**

6.1	$f(x) = 2 - 3x^2$ $f(x + h) = 2 - 3(x + h)^2$ $f(x + h) = 2 - 3(x^2 + 2xh + h^2)$ $= 2 - 3x^2 - 6xh - 3h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{[2 - 3x^2 - 6xh - 3h^2 - (2 - 3x^2)]}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{2 - 3x^2 - 6xh - 3h^2 - 2 + 3x^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-6xh - 3h^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{h(-6x - 3h)}{h}$ $= -6x$	✓ substitute/ vervang $f(x + h)$  ✓ correct substitution into formula and notation  ✓ simplification  ✓ common factor gemeenskaplike faktor  ✓ answer (5)
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6.2.1	$f(x) = \frac{x^4}{2} + x^0 - \pi t^2$ $f'(x) = 2x^3 + 0 - 0$ $= 2x^3$	✓ $2x^3$ ✓ 0 (2)
6.2.2	$D_x \left[ \frac{-3x^3 + \sqrt[5]{x^2}}{x^2} \right]$ $= D_x \left[ -\frac{3x^3}{x^2} + \frac{x^{\frac{2}{5}}}{x^2} \right]$ $= D_x \left[ -3x + x^{-\frac{8}{5}} \right]$ $= -3 - \frac{8}{5}x^{-\frac{13}{5}}$	✓ $\sqrt[5]{x^2} = x^{\frac{2}{5}}$  ✓ $-\frac{8}{5}x^{-\frac{13}{5}}$ ✓ 3 ✓ $-\frac{8}{5}x^{-\frac{13}{5}}$ (4)
6.2.3	$y = \frac{8x^3 - 125}{2x - 5}$ $= \frac{(2x - 5)(4x^2 + 10x + 25)}{2x - 5}$ $= 4x^2 + 10x + 25$ $\frac{dy}{dx} = 8x + 10$	✓ factorisation/faktoriserings ✓ answer  ✓ derivative/afgeleide (3)
		<b>[14]</b>

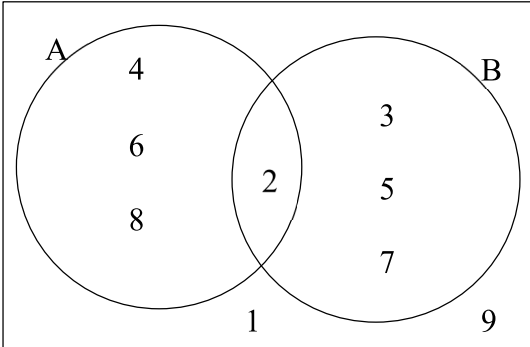
QUESTION 7 / VRAAG 7

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

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

**QUESTION 8 / VRAAG 8**

8.1.1		<p>✓ 2</p> <p>✓ 4; 6; 8</p> <p>✓ 3; 5; 7</p> <p>✓ 1; 9</p> <p style="text-align: right;">(4)</p>
8.1.2	No, $A \cup B \neq 1$	<p>✓ No</p> <p>✓ reason (2)</p>
8.1.3	$n(A \cup B)' = 2$	✓ answer (1)
8.1.4	$P(\text{Even and prime}) = \frac{1}{9}$	✓ answer (1)
8.2	$P(\text{Male and Speeding}) = \frac{398}{1000} = 0,398$ $P(\text{Male}) \times P(\text{Speeding}) = \frac{615}{1000} \times \frac{603}{1000} = 0,37$ $P(\text{Male and Speeding}) \neq P(\text{Male}) \times P(\text{Speeding})$ $\therefore \text{Not independent / nie onafhanklik}$	<p>✓ <math>\frac{398}{1000} = 0,398</math></p> <p>✓ 0,37</p> <p>✓ <math>\neq</math></p> <p>✓ conclusion / gevolgtrekking (4)</p>
		<b>[12]</b>

**TOTAL / TOTAAL: 150**