



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

SEPTEMBER 2016

**MATHEMATICS P1/WISKUNDE V1
MEMORANDUM**

MARKSPUNTE: 150

This memorandum consists of 16 pages/
Hierdie memorandum bestaan uit 16 bladsye.

NOTE:

- If a candidate answered a question TWICE, mark the FIRST attempt ONLY.
 - Consistent accuracy applies in ALL aspects of the memorandum.
 - If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
 - The mark for substitution is awarded for substitution into the correct formula.
- LET OP:**
- Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, merk SLEGS die EERSTE poging.
 - Volgehoue akkuraasie geld deurgaans in ALLE aspekte van die memorandum.
 - Indien 'n kandidaat 'n poging vir 'n vraag deargetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deargetrek is.
 - Die punt vir substitusie word vir substitusie in die korrekte formule toegeken.

QUESTION 11/VRAG 1

1.1.1	$x^2 - 4x - 12 = 0$ $(x - 6)(x + 2) = 0$ $x = 6$ or/of $x = -2$	✓ standard form/standaard vorm ✓ $x = 6$ ✓ $x = -2$	(3)
1.1.2	$3x^2 + 2x - 6 = 0$ $x = \frac{-2 \pm \sqrt{(2)^2 - 4(3)(-6)}}{2(3)}$ $x = \frac{-2 \pm \sqrt{76}}{6}$ $x = -1,79$ or/of $x = 1,12$	✓ substitution/substitusie ✓ $x = -1,79$ ✓ $x = 1,12$	(3)
1.1.3	$3^{x^2-1} = 27^{-x}$ $3^{x^2-1} = 3^{-3x-1}$ $\therefore x^2 - 1 = -3x - 1$ $x^2 + 3x = 0$ $x(x + 3) = 0$ $x = 0$ or/of $x = -3$ OR/OF $3^{x^2-1} = \frac{27^{-x}}{3}$ $3^{x^2-1} \cdot 3 = 27^{-x}$ $3^{x^2-1+1} = 3^{-3x}$ $\therefore x^2 = -3x$ $x^2 + 3x = 0$ $x(x + 3) = 0$ $x = 0$ or/of $x = -3$	✓ 3^{-3x-1} ✓ equating exponents/gegelykstelling van eksponente ✓ factors/faktore ✓ both x-values/beide x-waardes ✓ $x^2 - 1 + 1 = -3x$ ✓ equating exponents/gegelykstelling van eksponente ✓ factors/faktore ✓ both x-values/beide x-waardes	(4)

Kopiereg voorbehou

Blaai om asseblief

SUT

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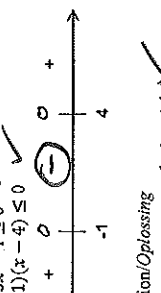
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1.2.1	$1 + \frac{1}{x} = 0$ $\frac{x+1}{x} = 0$ ✓ $x = -1$ ✓ or/ of $x = 0$ ✓ $\neq 0$	$x = -1$ $x = 0$	(2)
1.2.2	$x - \frac{1}{x} = 1$ $\frac{x^2 - 1}{x} = 1$ $x^2 - 1 = x + 1$ $x^2 - x - 2 = 0$ $(x+1)(x-2) = 0$ $x = -1$ or/ of $x = 2$ $x = 2$ only/alleenlik ✓ $x \neq -1$	<ul style="list-style-type: none"> manipulation of equation/ manipulasie van vergelyking standard form/standaard vorm factors/ faktore both x-values/ beide x-waardes choosing $x = 2$ / keuse van $x = 2$ 	(5)

* $1 + \frac{1}{x} = 0$
 $1 + \frac{1}{x} = 0 \quad (\therefore x \neq 0)$
 $x + 1 = 0$
 $x = -1$

QUESTION 2/VRAG 2

2.1	$x - y = 3$; $xy = 28$ $x - y = 3$ (1) $xy = 28$ (2) From/vanaf (1) $x = y + 3$ ✓ Substitute in (2)/vervang in (2) $y(y + 3) = 28$ ✓ $y^2 + 3y - 28 = 0$ ✓ $(y - 4)(y + 7) = 0$ ✓ $y = 4$ or/ of $y = -7$ ✓ $x = 7$ or/ of $x = -4$ ✓ OR/OF From/vanaf (1) $y = x - 3$ Substitute in (2)/vervang in (2) $x(x - 3) = 28$ $x^2 - 3x - 28 = 0$ $(x + 4)(x - 7) = 0$ $x = -4$ or/ of $x = 7$ $y = -7$ or/ of $y = 4$	<ul style="list-style-type: none"> $x = y + 3$ substitute in (2)/vervang in (2) standard form/standaardvorm factors/faktore y-values/y-waardes x-values/x-waardes 	(6)
2.2	$x^2 \leq 4 + 3x$; $x > 0$ $x^2 - 3x - 4 \leq 0$ ✓ $(x + 1)(x - 4) \leq 0$ ✓ 	<ul style="list-style-type: none"> standard form/standaardvorm factors/faktore solution/oplossing final answer/finale antwoord 	(4) [10]

QUESTION 3/VR44G3

<p>3.1</p> <p> $T_n = an^2 + bn + c$ $2a = 2$ $a = 1$ $3a + b = 2$ $3 + b = 2$ $b = -1$ $a + b + c = 1$ $1 - 1 + c = 1$ $c = 1$ $T_n = n^2 - n + 1$ Row/Ry 80 Term 1 $T_{80} = 80^2 - 80 + 1$ $T_{80} = 6321$ </p>	<p> $a = 1$ $b = -1$ $c = 1$ $T_n = n^2 - n + 1$ 6321 </p>	<p>(5)</p>
<p>3.2</p> <p> $6321 \quad 6323 \quad 6325 \quad 6327 \quad \dots$ $S_n = \frac{n}{2}[2(a) + (n-1)d]$ $S_{80} = \frac{80}{2}[2(6321) + (80-1)(2)]$ Row 80/Ry 80 $S_{80} = 512000$ OR/OF Row/Ry 80 Term 80 $T_{80} = 6321 + (79 \times 2)$ $T_{80} = 6479$ $S_n = \frac{n}{2}[a + l]$ $S_{80} = \frac{80}{2}[6321 + 6479]$ Row 80/Ry 80 $S_{80} = 512000$ </p>	<p> $n = 80$ $d = 2$ sub into correct formula/ vervang in korrekte formule answer/antwoord calculating term 80 of row 80/bepaling van term 80 van ry 80 6479 sub into correct formula/ vervang in korrekte formule answer/antwoord </p>	<p>(4)</p>

<p>OR/OF</p> <p> $2a = 2$ $a = 1$ $3a + b = 4$ $3 + b = 4$ $b = 1$ $a + b + c = 1$ $1 + 1 + c = 1$ $c = -1$ $T_n = n^2 + n - 1$ $T_n = n^2 + n - 1$ $T_{80} = 80^2 + 80 - 1$ $T_{80} = 6479$ $S_n = \frac{n}{2}[a + l]$ $S_{80} = \frac{80}{2}[6321 + 6479]$ Row 80/Ry 80 $S_{80} = 512000$ </p>	<p> $T_n = n^2 + n - 1$ $T_{80} = 6479$ sub into formula/sub in korrekte formule answer/antwoord </p>	<p>(4)</p>
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QUESTION 4/VRAAG 4

4.1.1	$T_{10} = S_{10} - S_9$ $T_{10} = 10(11)(12) - 9(10)(11)$ $T_{10} = 330$ $\rightarrow 1320 - 990$	✓ setting up of equation/ opstel van vergelyking ✓ substitution/vervangings ✓ answer/antwoord	(3)
4.2	$p; 3p; 5p; \dots$ $d = 2p$ $S_n = \frac{n}{2}[2a + (n-1)d]$ $S_p = \frac{p}{2}[2p + (p-1)2p]$ $S_p = \frac{p}{2}(2p + 2p^2 - 2p)$ $S_p = p^3$ OR/OF $a = p$ $l = 2p^2 - p$ $S_n = \frac{n}{2}(a + l)$ $S_p = \frac{p}{2}[p + 2p^2 - p]$ $S_p = p^3$	✓ first three terms/ eerste drie terme $d = 2p$ ✓ substitution/vervangings ✓ answer/antwoord $a = p$ $l = 2p^2 - p$ ✓ substitution/vervangings ✓ answer/antwoord	(4) [7]

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*3 $x; x+2; \frac{(x+2)^2}{x}$
 $x = 4; 4; 6; 9 \quad r = \frac{3}{2} \therefore \text{reject}$
 $x = -4; -4; -2; -1 \quad r = \frac{1}{2}$
 but $-1 < r < 1$
 $\therefore x = -4$ only

QUESTION 5/VRAAG 5

5.1	$r = \frac{x+2}{x}$ $T_3 = \frac{(x+2)^2}{x}$	✓ ratio/verhouding ✓ answer/antwoord	(2)
5.2	$S_{\infty} = \frac{a}{1-r}$ $-8 = \frac{x}{1 - \frac{x+2}{x}}$ $-8 = \frac{x^2}{x-x-2}$ $x^2 = 16$ $x = -4$	✓ substitution/vervangings ✓ simplification/ vereenvoudiging $x^2 = 16$ $x = -4$	(4) [6]

2

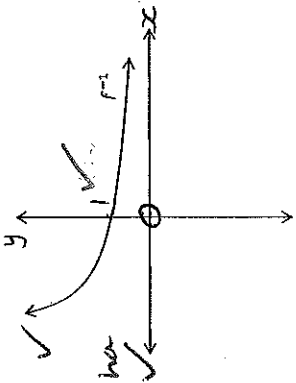
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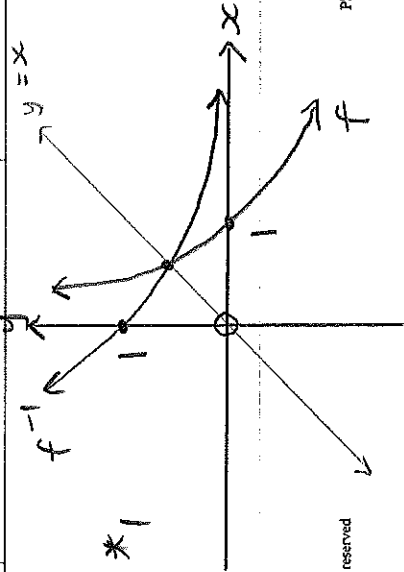
*1 Geo seq: $T_3 = x+2 = \frac{x^2}{x}$
 $\therefore T_3 = \frac{x^2 + 4x + 4}{x}$
 $= \frac{x^2}{4} + x + 1$
 $\frac{x}{1 - \frac{x+2}{x}} = \frac{x}{\frac{x-x-2}{x}} = \frac{x^2}{-2}$
 $= -x \cdot \frac{x}{2} = -\frac{x^2}{2}$

QUESTION 6/VR4AAG 6

6.1	$A = P(1+i)^n$ $A = 635000 \left(1 + \frac{15}{100}\right)^5$ $A = 281752,87$	✓ $i = \frac{15}{100}$ and/en $n = 5$ ✓ sub into correct formula/ vervinging in korrekte formule ✓ answer/antwoord	(3)
6.2.1	$P_0 = \frac{x[1 - (1+i)^{-n}]}{i}$ $50000 = \frac{x \left[1 - \left(1 + \frac{15,75}{100}\right)^{-48}\right]}{\frac{15,75}{100}}$ $x = R 1436,29$	✓ $i = \frac{15,75}{100}$ ✓ $n = 48$ ✓ sub into correct formula/ vervinging in korrekte formule ✓ answer/antwoord	(4)
6.2.2	$P_0 = \frac{x[1 - (1+i)^{-n}]}{i}$ $P_0 = \frac{1436,29 \left[1 - \left(1 + \frac{15,75}{100}\right)^{-48}\right]}{\frac{15,75}{100}}$ $P_0 = R 22721,97704$ $P_0 = R 22722$	✓ $n = 48$ ✓ $i = \frac{15,75}{100}$ ✓ substitution/substitusie ✓ answer/antwoord ✓ rounding/afroning	(5)
6.3	ORIOF Outstanding balance/Uitstaande balans (OB) $OB = 50000 \left(1 + \frac{15,75}{100}\right)^{30} - \left[\frac{1436,29 \left(1 + \frac{15,75}{100}\right)^{30} - 1}{\frac{15,75}{100}} \right]$ $OB = R 22722,14$ $OB = R 22722$	✓ $n = 30$ ✓ $i = \frac{15,75}{100}$ ✓ sub into both formulae/ verving in beide formules ✓ answer/antwoord ✓ rounding/afroning	(5)
6.3	$A = P(1+i)^n$ $A = 2x$ and/en $P = x$ $2x = x \left(1 + \frac{14,75}{100}\right)^n$ $n = \frac{\log 2}{\log \left(1 + \frac{14,75}{100}\right)}$ $n = 5,0$ years/jare	✓ $A = 2x$ and/en $P = x$ ✓ sub into correct formula/ vervinging in korrekte formule ✓ using of logs/gebruik van logaritmes ✓ answer/antwoord	(4)

7.1.1	$x = 0$	✓ answer/antwoord	(1)
7.1.2	$x > -2$; $x \neq 0$	✓ $x > -2$ ✓ $x \neq 0$	(2)
7.1.3	$y = -4$	✓ answer/antwoord	(1)
7.1.4	$y = b^2 - 4$ $5 = b^2 - 4$ $b^2 = 9$ $b = \pm 3$ $y = 3^2 - 4$	✓ sub of van -4 ✓ sub of point (2;5) vervinging van punt (2;5) ✓ $b = \pm 3$ ✓ answer with correct b value/ antwoord met korrekte b waarde	(4)
7.1.5	$x = -2$ $y = -1$	✓ $x = -2$ ✓ $y = -1$	(2)
7.1.6	$y = \frac{a}{x+2} - 1$ $-3 = \frac{a}{0+2} - 1$ $a = -4$ $y = \frac{-4}{x+2} - 1$	✓ sub of asymptotes/ vervinging van asymptote ✓ sub of point/vervang van punt (0;-3) ✓ $a = -4$	(3)
7.1.7	$y = x + 2 - 1$ $y = x + 1$ $y = -(x + 2) - 1$ $y = -x - 3$	✓ $y = x + 1$ ✓ $y = -(x + 2) - 1$ ✓ $y = -x - 3$	(3)

7.2.1	$y = \log_{\frac{1}{2}} x$ $f^{-1}: x = \log_{\frac{1}{2}} y$ $y = \left(\frac{1}{2}\right)^x$ OR/OF $y = 2^{-x}$	✓ swapping of x and y / omsuiling van x en y ✓ answer/antwoord
7.2.2		✓ Shape/vorm ✓ y-intercept/y-gfsmit ✓ ha
7.2.3	$g(x) = \left(\frac{1}{2}\right)^{-x}$ OR/OF $g(x) = 2^x$	✓✓ Answer/antwoord ✓✓ Answer/antwoord
7.2.4	$x > 1$	✓✓ $x > 1$



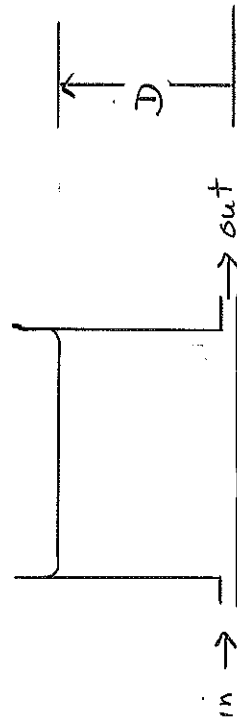
QUESTION 8/VR 44G 8

8.1	$x = -3$	✓ $x = -3$
8.2	$y = a(x+3)^2 - 5$ $4 = a(9) - 5$ $9a = 9$ $a = 1$ $y = x^2 + 6x + 9 - 5$ $y = x^2 + 6x + 4$ $a = 1$ and $b = 6$	✓ sub of turning point (-3; 5) / substitusie van draaipunt (-3; 5) ✓ sub of (0; 4) / vervanging van (0; 4) ✓ simplification/ vereenvoudiging
8.3	$\Delta = b^2 - 4ac$ $\Delta = 36 - 4(1)(4)$ $\Delta = 20$ Roots are: \bullet real \bullet unequal \bullet irrational ✓	✓ $\Delta = 20$ ✓ irrational/irrasionaal ✓ unequal/ongelyk
8.4	$g(x) = 2x$ $x^2 + 6x + 4 = 2x$ $x^2 + 4x + 4 = 0$ $(x+2)^2 = 0$ $x = -2$ $g(-2) = -4$ Point/punt (-2; -4) OR/OF $f(x) = x^2 + 6x + 4$ $f'(x) = 2x + 6$ and $m = 2$ $2x + 6 = 2$ $2x = -4$ $x = -2$ $y = -4$ Point/punt (-2; -4)	✓ $g(x) = 2x$ ✓ equating equations/ gelykstelling van vergelykings ✓ $x = -2$ ✓ $y = -4$ ✓ derivative/afgeleide ✓ $f'(x) = 2x + 6$ ✓ equating to gradient of g/ gelykstelling aan gradiënt van g. ✓ x-value/x-waarde ✓ y-value/y-waarde

QUESTION 11/VR44G 11

11.1	$D(0) = 3 + \frac{1}{2}(0)^2 - \frac{1}{4}(0)^3$ $D(0) = 3 \text{ m}$	$\checkmark D(0) = 3 \text{ m}$	(1)
11.2	$D'(t) = t - \frac{3}{4}t^2$ $D'(3) = 3 - \frac{3}{4}(3)^2$ $= 3 - \frac{27}{4}$ $= -\frac{15}{4} \text{ m/h}$	$\checkmark D'(t)$ $\checkmark D'(3)$ $\checkmark -\frac{15}{4}$ or/of -3.75	(1)
11.3	Decreasing/vermindering	\checkmark decreasing/vermindering	(3)
11.4	$D'(t) = 0$ $t - \frac{3}{4}t^2 = 0$ $4t - 3t^2 = 0$ $t(4 - 3t) = 0$ $t = 0$ or/of $t = \frac{4}{3}$ $\frac{4}{3} = 1\text{h}20\text{min}$ Time: at 08h00 or 9h20 / Tyd: 08h00 of 9h20	$\checkmark D'(t) = 0$ \checkmark factors/faktore \checkmark t - values / t - waardes \checkmark answer/antwoord	(4)

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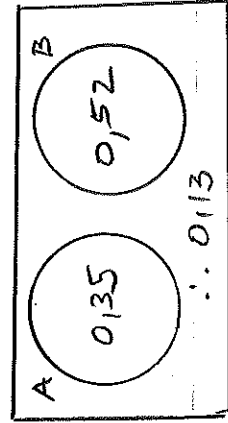


t since 08:00
 8:00 t = 0
 11:00 t = 11 - 8 = 3

QUESTION 12/VR44G 12

12.1	$P(A) = 1 - P(A)$ $= 1 - 0.35$ $= 0.65$	$\checkmark P(A) = 1 - P(A)$ \checkmark answer/antwoord	(2)
12.1.1	$P(A) = 1 - P(A)$ $= 1 - 0.35$ $= 0.65$	$\checkmark P(A) = 1 - P(A)$ \checkmark answer/antwoord	(2)
12.1.2	$P(A \text{ and } B) = 0$ $P(A \text{ en } B) = 0$	\checkmark answer/antwoord	(1)
12.1.3	$P(A \text{ or } B) = 0.35 + 0.52$ $= 0.87$	$\checkmark P(A \text{ or } B) = P(A) + P(B)$ \checkmark answer/antwoord	(2)
12.2	$6! = 720$	$\checkmark 6!$ or/of 720	(1)
12.2.1	$4!$ $= 24$	$\checkmark 4!$ $\checkmark 24$	(2)
12.2.2	$2!$ $= 2$ $5!$ $= 120$ $6!$ $= 720$	$\checkmark 2!$ $\checkmark 5!$ $\checkmark 6!$ \checkmark answer/antwoord	(4)
12.2.3	$\frac{2! \cdot 5!}{6!} = \frac{2 \cdot 120}{720} = \frac{1}{3}$ OR/OF 0.333	$\checkmark \frac{2! \cdot 5!}{6!} = \frac{1}{3}$ OR/OF 0.333	(12)

2 1 2 1 2 4



S = 1

4!

4!

4!

4!

5 x 4! x 2!

6 2!