Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

GRADE / GRAAD 11

NOVEMBER 2012

MATHEMATICS P1 / WISKUNDE V1 MEMORANDUM

MARKS:
PUNTE: 150

This memorandum consists of 12 pages
Hierdie memorandum bestaan uit 12 bladsye.

QUESTION 1 / VRAAG 1		
1.1.1	$(x + 3)(x - 1) = -x + 1$	
	$x^2 + 2x - 3 = -x + 1 \ \ or/of \ \ (x + 3)(x - 1) + (x - 1) = 0$ $x^2 + 3x - 4 = 0 \ \ or/of \ \ \ \ \ \ \ \ (x - 1)(x + 4) = 0$ $(x + 4)(x - 1) = 0$ $\therefore \ x = -4 \ or \ x = 1 \ \ \ \ or/of \ \ \ \ \ \therefore x = 1 \ or/of \ x = -4$	✓ simplify LHS vereenvoudig LK ✓ standard form standaardvorm ✓ factorisation faktorisering ✓ for both values of x vir beide x waardes (4)
1.1.2	$x^2 + 3x - 4 < 0$ $\therefore (x + 4)(x - 1) < 0$ $\therefore \ \ -4 < x < 1$	✓ factorisation faktorisering ✓ -4 and/en 1 ✓ notation/ notasie (3)
1.1.3	$x^2 + 3x = 1 \ \ \ \ \ \ \ \ or/of \ \ \ \ \ \ \ \ \ \ x^2 + 3x = 1$ $x^2 + 3x - 1 = 0 \ \ \ \ \ \ \ \ \ \ x^2 + 3x + \left(\frac{3}{2}\right)^2 = 1 + \left(\frac{3}{2}\right)^2$ $= \frac{-3 \pm \sqrt{(3)^2 - 4(1)(-1)}}{2(1)} \ \ \ \ \ \ \ \ \left(x + \frac{3}{2}\right)^2 = \frac{13}{4}$ $= \frac{-3 \pm \sqrt{13}}{2} \ \ \ \ \ \ \ \ \ \ \ x + \frac{3}{2} = \pm\sqrt{\frac{13}{4}}$ $= -\frac{3}{2} \pm \sqrt{\frac{13}{4}} \ \ \ \ \ \ x = 0,3 \ or \ x = -3,3$ $\therefore x = 0,3 \ or/of \ = -3,3$	✓ standard form standaardvorm ✓ method/Substitution metode/vervanging ✓ simplification vereenvoudiging ✓✓ one mark for each answer een punt vir elke antwoord (5)
1.2	$x = 3 - y$ $2x^2 + 2y^2 = 5xy$ $2(3 - y)^2 + 2y^2 = 5(3 - y)y$ $2(9 - 6y + y^2) + 2y^2 = 15y - 5y^2$ $18 - 12y + 2y^2 + 2y^2 = 15y - 5y^2$ $9y^2 - 27y + 18 = 0$ $y^2 - 3y + 2 = 0$ $(y - 2)(y - 1) = 0$ $\therefore y = 2 \ \ or \ y = 1$ $\therefore \ \ x = 1 \ or \ x = 2$	✓ x = 3 − y ✓ substitution vervanging ✓ simplification vereenvoudiging ✓ simplification vereenvoudiging ✓ factorisation faktorisering ✓ both values of/ albei waardes van y ✓✓ each value of/ elke waarde van x (8)

1.3	$f(x-1) = (x-1)^2 - 2(x-1)$ $= x^2 - 2x + 1 - 2x + 2$ $= x^2 - 4x + 3$ $= (x^2 - 4x + 4) - 1$ $= (x-2)^2 - 1$	✓ substitution vervanging ✓ simplification vereenvoudiging ✓ quadratic expression kwadratiese uitdrukking ✓ completion of square / kwadraatsvoltooiing	(4)
1.4	$2.5^x = 50$ $5^x = 25$ $5^x = 5^2$ $\therefore x = 2$	✓ divide by 2 deel deur 2 ✓ same base selfde basis ✓ answer/ antwoord	(3)
			[27]

QUESTION2 / VRAAG 2			
2.1	(0 ; 1)	✓ y-intercept y-afsnit	(1)

2.2	Asymptotes of : $f(x)$: y = 0 ✓
	                 $h(x)$: x = 0 ✓
	                     y = 5 ✓
		1 mark for each correct answer
		 1 punt vir elke korrekte antwoord
			(3)

2.3	f and h are decreasing ✓✓ f en h verminder		(2)
2.4		1 mark for each correct curve / 1 punt vir elke korrekte kromme 1 mark for asymptote $y = 5$ 1 punt vir asimptoot $y = 5$	(4)
2.5	$y = 5^{x}$ ✓		(1)
2.6	$y = \frac{x}{5} + 5$	✓ answer antwoord	(1)
			[12]

QUESTION 3 / VRAAG 3				
3.1	$T_n = 3n^2 + 2$ $T_2 = 3(2)^2 + 1$ $\quad = 13$ $\therefore T_2 \neq 12$ $\therefore$ False/Vals		✓ substitution in general term vervanging in algemene term ✓ simplification vereenvoudiging ✓ $T_2 \neq 12$ ✓ deduction / afleiding	(4)

3.2.1

Shape number, n Patroon nommer	1	2	3	4	5
Number of white triangles Aantal wit driehoeke	1	3	6	*10*	*15*
Number of black triangles Aantal swart driehoeke	0	1	3	*6*	*10*
Total number of triangles Totale aantal driehoeke	1	4	9	*16*	*25*

1 mark per correct entries
1 punt per korrekte inskrywing
✓✓✓✓✓ (6)

3.2.2	$12^2 = 144$ triangles/driehoeke		✓ 12^2 ✓ answer/ antwoord	(2)

3.2.3	There is a common second difference of 1, so the sequence is quadratic. Daar is 'n tweede gemene verskil van 1, daarom is die reeks kwadraties. $T = an^2 + bn + c$	✓ $d = 1$	
	$a = \dfrac{cd}{2}$ $ = \dfrac{1}{2}$	✓ value of a waarde van a	
		✓ equation / vergelyking	
	$b = T_2 - T_1 - 3a \quad$ OR/OF $\dfrac{1}{2} + b + c = 0$ $ = 1 - 0 - \dfrac{3}{2}$ $ = -\dfrac{1}{2} \qquad\qquad 2 + 2b + c = 1$	✓ value of b waarde van b ✓ equation / vergelyking	
	$c = T_1 - a - b$ $ = 0 - \dfrac{1}{2} - \left(-\dfrac{1}{2}\right)$ $ = 0$	✓ value of c waarde van c	
	$\therefore T_n = \dfrac{1}{2}n^2 - \dfrac{1}{2}n \ or/of \ \dfrac{1}{2}n(n-1)$	✓ general term algemene term	(7)

3.2.4	$\dfrac{1}{2}n(n-1) = 190$
	$n(n-1) = 380$
	$n^2 - n - 380 = 0$
	$(n-20)(n+19) = 0$
	$n = 20$
		✓ equating to 190
		  gelykstel aan 190
		✓ simplification
		  vereenvoudiging
		✓ standard form
		  standaardvorm
		✓ factorisation
		  faktorisering
		✓ $n = 20$
			(5)

			[24]

QUESTION 4 / VRAAG 4				
4.1	$A = P(1 - in)$ $A = \text{R15 000}\left(1 - \dfrac{12}{100}.6\right)$ $= \text{R4 200}$		✓ substitution of 12% and 6 vervanging van 12% en 6 ✓ substitution of R15 000 vervanging van R15 000 ✓ answer antwoord	(3)
4.2	4.2.1	$\dfrac{15\%}{12} = 1,25\%$ per month / per maand	✓ answer antwoord	(1)
	4.2.2	$1 + i_{e} = \left(1 + \dfrac{(i)m}{m}\right)^{m}$ $1 + i_{e} = \left(1 + \dfrac{15}{1\,200}\right)^{12}$ $i_{e} = \left(1 + \dfrac{15}{1\,200}\right)^{12} - 1$ $= 0,16075$ $r = i_{e} \times 100$ $= 16.08\%$ p.a	✓ substituting into correct formula vervanging in die korrekte formule ✓ simplifying vereenvoudiging ✓ 0,16075 ✓ value of r waarde van r	(4)
	4.2.3	$A = P(1 + i)^{n}$ $= \text{R2 500}(1 + \dfrac{15}{1\,200})^{84}$ $\qquad$ OR/OF $2500(1 + 0,16075)^{7}$ $= \text{R2 500}(1,0125)^{84}$ $= \text{R7 097,78}$ OR/OF R7 097,59	✓✓ substitution vervanging ✓ simplifying vereenvoudiging ✓ answer antwoord	(4)
4.3	4.3.1	$P = \dfrac{A}{(1 - i)^{n}}$ $= \dfrac{183\,680}{(1 - 0,18)^{1}}$ $= \text{R224 000}$	✓✓ substitution vervanging ✓ simplifying vereenvoudiging ✓ answer antwoord	(4)
	4.3.2	$A = P(1 - i)^{n}$ $= \text{R224 000}(1 - 0,18)^{1}(1 - 0,15)^{1}(1 - 0,12)^{2}$ $= \text{R120 905,5232}$ $= \text{R120 906}$	✓✓ substituting vervanging ✓ simplifying vereenvoudiging ✓ answer antwoord	(4)

4.4	$A = P_1(1+i)^n + P_2((1+i)^n$ $= R550\,000\left(1+\frac{0,18}{4}\right)^{7x4} \checkmark + R560\,000\left(1+\frac{0,18}{4}\right)^{3x4} \checkmark$ $= R1\,886\,335,00\checkmark + R949\,693,60\checkmark$ $= R2\,836\,028,60\checkmark$	$\checkmark$ sub.ver $P_1(1+i)^n$ $\checkmark$ sub.ver $P_2(1+i)^n$ $\checkmark$ method / metode $\checkmark\checkmark$ answer antwoord	(5)
			[25]

	QUESTION 5 / VRAAG 5		
5.1	$\dfrac{-2}{x-1} - 1 = 0$ $\therefore -2 - (x - 1) = 0$ $\therefore x = -1$ $y = \dfrac{-2}{0-1} - 1 = 1$	✓simplify vereenvoudig ✓ $x = -1$ ✓(0 ; 1)	(3)
5.2	$\dfrac{1}{2}(x-4)^2 - 2 = 0$ $\therefore (x - 4)^2 = 4$ $\therefore x - 4 = \pm 2$ $\therefore x = 2 \; or \; 6$	✓ $y = 0$ ✓ $(x - 4)^2 = 4$ ✓both answers/ albei antwoorde	(3)
5.3		✓ f: *x*-intercepts *x*-afsnitte ✓ *y*-intercept *y*-afsnit ✓ turning point draaipunt ✓ shape / vorm ✓ g: intercepts afsnitte ✓ asymptotes asimptote ✓ shape / vorm	
			(7)
5.4	$y \in \mathbb{R}$✓; $y \neq -1$✓		(2)
5.5	-2	✓ -2	(1)
5.6	$x > 4$	✓ 4 ✓ >	(2)
			[18]

QUESTION 6 / VRAAG 6		
6.1 $f(x) = 1 + a.2^x$ $(0 ; 0)$ $\quad 0 = 1 + a.2^0$ $\qquad 0 = 1 + a.1$ $\qquad \therefore a = -1$	✓ substitution vervanging ✓ simplifying vereenvoudiging	(2)
6.2 $f(x) = 1 - 2^x$ $f(-15) = 1 - 2^{-15}$ $\qquad = 0,99997$	✓ substitution vervanging ✓ answer antwoord	(2)
6.3 $f(x) = 1 - 2^x$ $(x ; 0,5)$ $\quad \therefore 0,5 = 1 - 2^x$ $\qquad 2^x = 1 - 0,5$ $\qquad 2^x = 0,5 = \frac{1}{2}$ $\qquad 2^x = 2^{-1}$ $\qquad \therefore x = -1$	✓ substitution vervanging ✓ express with same base uitdruk met dieselfde basis ✓ answer antwoord	(3)
6.4 $h(x) = f(x-2)$ $\qquad = 1 - 2^{x-2}$	✓✓ $h(x)$	(2)
		[9]

QUESTION 7 / VRAAG 7		
7.1	$-x^2 - 2x + 3 = 0$ $\therefore x^2 + 2x - 3 = 0$ $\therefore (x + 3)(x - 1) = 0$ $\therefore x = -3$ or $x = 1$ AB = 4 units/eenhede OC = 3 units/eenhede	✓ equating to 0 gelykstel aan 0 ✓ factors /faktore ✓ $x = -3$ $x = 1$ ✓ AB = 4 units/eenhede ✓ OC = 3 units/eenhede (5)
7.2	$x = -1$	✓✓ x = -1 (2)
7.3	$f(-1) = -(-1)^2 -2(-1) + 3$ $= -1 + 2 + 3$ $= 4$	✓ substituting vervanging ✓ simplification vereenvoudiging ✓ answer antwoord (3)
7.4.1	$m_{AC} = \frac{3}{3}$ $= 1$	✓ numerator teller ✓ denominator noemer ✓ answer / antwoord (3)
7.4.2	$m = 1$ subs/verv. (1;0) in $y = x + c$ $\therefore 0 = 1 + c$ $\therefore c = -1$ $\therefore y = x - 1$	✓ m = 1 ✓ $y = x + c$ ✓ 0 = 1 + c ✓ c = -1 (4)
		[17]

QUESTION 8 / VRAAG 8		
8.1	$\begin{aligned} x &\leq 35 \\ y &\leq 20 \\ x + y &\leq 50 \\ 40x + 50y &\geq 2\,000 \\ x, y &\in \mathbb{N}_0 \end{aligned}$	✓ $x \leq 35$ ✓ $y \leq 20$ ✓ $x + y \leq 50$ ✓ $40x + 50y \geq 2\,000$ (4)
8.2	 Number of wall models Getal muurmodelle	✓ $x = 35$ ✓ $y = 20$ ✓ $x + y = 50$ ✓ $4x + 5y = 200$ ✓ feasible region gangbare gebied (5)
8.3	(25 ; 20) (30 ; 20) (35 ; 15) (35 ; 12)	✓ (25 ; 20) ✓ (30 ; 20) ✓ (35 ; 15) ✓ (35 ; 12) (4)
8.4	P = 20x+ 10y	✓P = 20x + 10y (1)
8.4	Max. profit: R850 for 35 wall models and 15 table models Mak. wins: R850 vir 35 muurmodelle en 15 tafelmodelle Min. profit : R700 for 25 wall models and 20 table models Min, wins : R700 vir 25 muurmodelle en 20 tafelmodelle	✓✓ for max profit vir mak. wins ✓✓ for min profit vir mak. wins (4)
		[18]
		TOTAL/TOTAAL: **150**