basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NASIONALE
SENIOR SERTIFIKAAT**

GRAAD 11
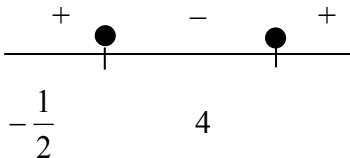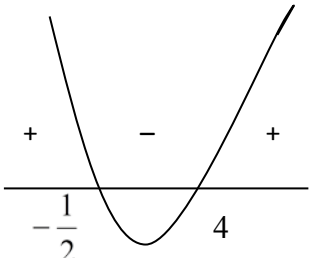
WISKUNDE V1

NOVEMBER 2014

MEMORANDUM

PUNTE: 150

Hierdie memorandum bestaan uit 14 bladsye.

VRAAG 1

1.1.1	$x = -2$ of $x = \dfrac{7}{3}$	$\checkmark\, x = -2$ $\checkmark\, x = \dfrac{7}{3}$ (2)
1.1.2	$x^2 - 5x - 2 = 0$ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \dfrac{5 \pm \sqrt{25 - 4(1)(-2)}}{2}$ $x = \dfrac{5 \pm \sqrt{33}}{2}$ $x = 5,37 \quad$ or $\quad x = -0,37$ **OF** $x^2 - 5x + \left(\dfrac{25}{4}\right) = 2 + \left(\dfrac{25}{4}\right)$ $\left(x - \dfrac{5}{2}\right)^2 = \dfrac{33}{4}$ $x - \dfrac{5}{2} = \pm\dfrac{\sqrt{33}}{2}$ $x = \dfrac{5 + \sqrt{33}}{2} \quad$ or $\quad x = \dfrac{5 - \sqrt{33}}{2}$ $x = 5,37 \qquad\qquad x = -0,37$	$\checkmark$ standaard vorm $\checkmark$ korrekte substitusie in korrekte formule $\checkmark\, x = 5,37$ $\checkmark\, x = -0,37$ (4) $\checkmark$ voltooi die vierkant $\checkmark\, \sqrt{33}$ $\checkmark\, x = 5,37$ $\checkmark\, x = -0,37$ (4)
1.1.3	$\sqrt{x - 3} = 5 + 4$ $\left(\sqrt{x-3}\right)^2 = (9)^2$ $x - 3 = 81$ $x = 84$	$\checkmark$ isoleer $\sqrt{}$ $\checkmark$ kwadreer beide kante $\checkmark$ vereenvoudiging $\checkmark$ antwoord (4)
1.1.4	$2x^2 - 7x - 4 \geq 0$ $(2x + 1)(x - 4) \geq 0$ CV's : $-\dfrac{1}{2} ; 4$ $x \leq -\dfrac{1}{2} \quad$ or $\quad x \geq 4$ **OF** $x \in (-\infty ; -\dfrac{1}{2}] \cup [4 ; \infty)$	$\checkmark$ faktore $\checkmark$ metode $\checkmark$ notasie $\checkmark$ kritieke waardes (4) $\checkmark$ notasie $\checkmark$ kritieke waardes

1.2	$x = 2y + 1$ ......(1)	
	$x^2 - 2y + 3xy = 6$ ....(2)	
	$(2y + 1)^2 - 2y + 3y(2y + 1) = 6$	✓ substitusie van
	$4y^2 + 4y + 1 - 2y + 6y^2 + 3y - 6 = 0$	$x = 2y + 1$
	$10y^2 + 5y - 5 = 0$	✓ vereenvoudiging
	$2y^2 + y - 1 = 0$	✓ standaard vorm
	$(2y - 1)(y + 1) = 0$	✓ faktore
	$y = \dfrac{1}{2}$ of $y = -1$	✓ beide y waardes
	$x = 2 \qquad x = -1$	✓ beide x waardes (6)
	OF	
	$y = \dfrac{x-1}{2}$	✓ substitusie van
	$x^2 - 2\left(\dfrac{x-1}{2}\right) + 3x\left(\dfrac{x-1}{2}\right) = 6$	$y = \dfrac{x-1}{2}$
	$2x^2 - 2x + 2 + 3x^2 - 3x - 12 = 0$	✓ vereenvoudiging
	$5x^2 - 5x - 10 = 0$	✓ standaard vorm
	$x^2 - x - 2 = 0$	
	$(x + 1)(x - 2) = 0$	✓ faktore
	$x = -1 \quad$ or $\quad x = 2$	✓ beide x waardes
	$y = -1 \qquad y = \dfrac{1}{2}$	✓ beide y waardes (6)
		[20]

VRAAG 2

2.1	$\dfrac{3^x(3-3^{-1})}{2.3^x}$	✓ gemeen faktor 3^x
	$=\dfrac{3-\dfrac{1}{3}}{2}$	✓ $3-3^{-1}$
	$=\dfrac{8}{3}\times\dfrac{1}{2}$	
	$=\dfrac{4}{3}$	✓ antwoord $\qquad$ (3)
	OF	
	$\dfrac{3^{x-1}(3^2-1)}{2.3^x}$	✓ gemeen faktor 3^{x-1}
	$=\dfrac{3^x.3^{-1}(8)}{2.3^x}$	✓ vereenvoudiging
	$=\dfrac{1}{3}\times 4$	
	$=\dfrac{4}{3}$	✓ antwoord $\qquad$ (3)
2.2	$(x-2)^{-\frac{3}{2}}=64$	
	$x-2=\left[\left(4^3\right)\right]^{\frac{-2}{3}}$	✓ toepassing van exp. wet
	$x-2=4^{-2}$	✓ 4^3
	$x=2+\dfrac{1}{16}$	✓ vereenvoudiging
	$\therefore x=2\dfrac{1}{16}$	✓ antwoord $\qquad$ (4)
	OF	
	$\sqrt{(x-3)^{-3}}=64$	✓ kwadrering
	$(x-3)^{-3}=4096$	
	$(x-2)^3=\dfrac{1}{4096}$	✓ toepassing van eksp. wet
	$x-2=\dfrac{1}{16}$	✓ vereenvoudiging
	$x=2\dfrac{1}{16}$	✓ antwoord $\qquad$ (4)

| 2.3 | $$\dfrac{x.x^{\frac{1}{2}}.x^{\frac{1}{4}}.x^{\frac{1}{8}}}{\sqrt[8]{x^7}}$$ $$=\dfrac{x^{\frac{7}{8}}}{x^{\frac{7}{8}}}$$ $$= x$$ | ✓toepassing van wortel wet
✓toepassing van wortel wet

✓vereenvoudiging

✓antwoord (4)

 [11] |

VRAAG 3

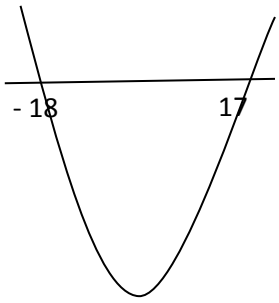| 3 | $AC.(x-2) = x^2 + 2x - 8$
$AC.(x-2) = (x+4)(x-2)$
$AC = (x+4)\,\text{cm}$
$\therefore FD = (x+4)\,\text{cm}$
$\therefore ED = x+4-(x-2)$
$ED = 6\,\text{cm}$ | ✓ stelling
✓ faktore
✓ AC $=(x+4)$ cm

✓ metode
✓ antwoord (6)

 [6] |

VRAAG 4

| 4.1 | $\begin{array}{cccc} -7 & 0 & 9 & 20 \\ & 7 & 9 & 11 \\ & 2 & 2 & \end{array}$

$2a = 2$
$a = 1$
$3(1) + b = 7$
$b = 4$
$(1) + (4) + c = -7$
$c = -12$
$\therefore T_n = n^2 + 4n - 12$
OF
$2a = 2$
$a = 1$
$T_2 = 2^2 + b(2) + c = 0$
$\qquad 2b + c = -4 \qquad (1) \quad 3(1) + b = 7$
$T_3 = 3^2 + b(3) + c = 9 \qquad OF\ b = 4$
$\qquad 3b + c = 0 \qquad (2) \quad 1 + a + c = -7$
$\qquad\qquad\qquad\qquad\qquad c = -12$
$(2) - (1) \quad b = 4$
$\therefore c = -4 - 2(4) = -12$
$T_n = n^2 + 4n - 12$ | ✓ $2a = 2$
✓ a waarde

✓ b waarde

✓ c waarde (4)

✓ $2a = 2$
✓ a waarde

✓ b waarde
✓ c waarde (4) |

	OF $$T_n = T_1 + (n-1)d_1 + \frac{(n-1)(n-2)}{2}.d_2$$ $$= -7 + (n-1).7 + \frac{(n-1)(n-2)}{2}.2$$ $$= -7 + 7n - 7 + n^2 - 3n + 2$$ $$= n^2 + 4n - 12$$	✓formula ✓✓substitusie ✓vereenvoudiging (4)
4.2	$$n^2 + 4n - 12 = 128$$ $$n^2 + 4n - 140 = 0$$ $$(n+14)(n-10) = 0$$ $$n \neq -14 \text{ or } n = 10$$ $$\text{ongeldig} \quad \therefore n = 10$$	✓ vergelyking ✓faktore ✓antwoords vir n ✓$n = 10$ (keuse) (4)
4.3	$-7 ; 0 ; 9 ; 20 ; \dots$ eerste verskil 7 9 11 tweede verskil 2 2 $F_n = 2n + c$ $F_1 = 2(1) + c = 7$ $\therefore c = 5$ $F_n = 2n + 5$	✓eerste verskil Slegs antwoord: Vol Punte ✓$c = 5$ (3)
4.4	$F_n = 2n + 5 = 599$ $2n = 594$ $\therefore n = 297$ hierdie verskil sal tussen term 297 term 298 wees	✓ stel gelyk ✓297 ✓298(3) **[14]**

VRAAG 5

5.1	Patroon	1	2	3	
	Wit vierkante	4	12	24	
	40				✓✓antwoord(2)
5.2	$W_n = 2n^2 + 2n$ $W_{157} = 2(157)^2 + 2(157)$ $\quad = 49612$				✓W_n ✓substitusie ✓ antwoord (3)

5.3	$2n^2 + 2n + 1 < 613$	✓ stel ongelykheid op
	$2n^2 + 2n - 612 < 0$	✓ faktore
	$n^2 + n - 306 < 0$	
	$(n - 17)(n + 18) < 0$	✓ metode
		✓ antwoord (4)
	$\therefore n = 16$	
5.4	$P_n = 4n^2 + 4n + 1$	✓ $P_n = 4n^2 + 4n + 1$
	$= (2n)^2 + 2(2n) + 1$	✓ herskryf P_n
	$2n$ is ewe vir alle $n \in Z$	✓ afleiding
	$\therefore$ Totale aantal vierkante in die n^{de} patroon sal altyd onewe wees.	(3)
	OF	
	$P_n = 4n^2 + 4n + 1$	✓ $P_n = 4n^2 + 4n + 1$
	$= 2(2n^2 + 2n) + 1$	✓ herskryf P_n
	$2(2n^2 + 2n)$ is onewe vir alle $n \in Z$	
	$2(2n^2 + 2n) + 1$ is onewe vir alle $n \in Z$	✓ afleiding
	$\therefore$ Totale aantal vierkante in die n^{de} patroon sal altyd onewe wees.	(3) **[12]**

VRAAG 6

6.1	$x = 2$	✓ $x = 2$
	$y = 3$	✓ $y = 3$ (2)
6.2	$x.\text{int} : \dfrac{8}{x - 2} + 3 = 0$	✓ $\dfrac{8}{x - 2} + 3 = 0$
	$8 + 3(x - 2) = 0$	
	$3x + 2 = 0$	✓ $\left(-\dfrac{2}{3} ; 0\right)$
	$\therefore x = -\dfrac{2}{3}$	
	$\therefore x - \text{int}\left(-\dfrac{2}{3} ; 0\right)$	
	$y = \dfrac{8}{0 - 2} + 3$	✓ $(0 ; -1)$ (3)
	$y = -1$	
	$y.\text{int} : (0 ; -1)$	

6.3		✓asimptote ✓afsnitte met asse ✓vorm (3)
6.4	$3 = 2 + k$ $k = 1$ **OF** $y = (x - 2) + 3$ $y = x + 1$ $\therefore \quad k = 1$	✓ substitusie ✓ antwoord (2) ✓ $y = x + 1$ ✓antwoord (2) **[10]**

VRAAG 7

7.1	$q = -6$	✓antwoord (1)
7.2	$-5\dfrac{1}{4} = a.2^{-1-1} - 6$ $\dfrac{3}{4} = \dfrac{1}{4}a$ $a = 3$	✓vervang x ✓vervang y ✓vereenvoudiging ✓antwoord (4)
7.3	$x\,\text{int}: 2^{x-1} = 2 \quad \therefore x = 2 \therefore (2;0)$ $y\,\text{int}: y = 3.2^{-1} - 6 = -4\dfrac{1}{2} \quad \therefore \left(0; -4\dfrac{1}{2}\right)$ Gemiddelde Gradient $= \dfrac{0 + 4\dfrac{1}{2}}{2 - 0}$ $= \dfrac{9}{4}$ of $2\dfrac{1}{4}$	✓ $2^{x-1} = 2$ ✓ $x = 2$ ✓ $y = -4\dfrac{1}{2}$ ✓subst. in gradient formule ✓antwoord (5)
7.4	$y = 3.2^{x-3} - 6$	✓✓antwoord (2) **[12]**

VRAAG 8

8.1	C(– 1 ; 0)	✓ C(– 1 ; 0) (1)
8.2	$y = (x-3)(x+1)$ $y = x^2 - 2x - 3$	✓ $(x-3)$ ✓ $(x+1)$ ✓ $y = x^2 - 2x - 3$ (3)
8.3	TP : $y = (1)^2 - 2(1) - 3$ $y = -4$ R: $y \in [-4;\infty)$ **OF** $y \geq -4$	✓ $y = -4$ ✓ $[-4;\infty)$ (2) ✓ $y \geq -4$
8.4	$m = \dfrac{0+4}{3-1} = 2$ $y - 0 = 2(x-3)$ $y = 2x - 6$	✓substitusie in gradient formule ✓$m = 2$ ✓ vergelyking (3)
8.5.1	$x \leq -1$ of $x \geq 3$ **OF** $x \in (-\infty;-1] \cup [3;\infty)$	✓ $x \leq -1$ ✓ $x \geq 3$ (2) ✓ $(-\infty;-1]$ ✓ $[3;\infty)$ (2)
8.5.2	$-1 < x < 3$ of $x > 3$ **OF** $x > -1$; $x \neq 3$ **OF** $(-1;3) \cup (3;\infty)$	✓ kritieke waardes ✓ notasie (2) ✓ $x > -1$ ✓ $x \neq 3$ (2) ✓ $(-1;3)$ ✓ $(3;\infty)$ (2)
8.5.3	$-1 < x < 0$ of $x > 3$ **OF** $(-1;0) \cup (3;\infty)$	✓ kritieke waardes ✓ notasie (2) ✓ $(-1;0)$ ✓ $(3;\infty)$ (2)

8.6	$x^2 - 2x - p = 0$	
	$\Delta = (-2)^2 - 4(1)(-p)$	
	$\quad = 4 + 4p$	
	vir nie-rieele wortels $\Delta < 0$	$\checkmark 4 + 4p < 0$
	$4 + 4p < 0$	
	$4p < -4$	$\checkmark p < -1 \ (2)$
	$\therefore p < -1$	
	OF	
	$A(1; -4)$	
	$x^2 - 2x - 3 = 0$	
	$x^2 - 2x - p = 0$	$\checkmark -p > 1$
	$-p > 1$	$\checkmark p < -1 \ (2)$
	$\therefore p < -1$	
8.7	$PM = (2x - 6) - (x^2 - 2x - 3)$	$\checkmark$aftrekking
	$\quad = -x^2 + 4x - 3$	$\checkmark$kwadratiese uitdrukking
	$x = -\dfrac{b}{2a}$	$\checkmark$ metode
	$\quad = -\dfrac{4}{2(-1)} = 2$	
	$Max.PM = -(2)^2 + 4(2) - 3 = 1$ eenheid	$\checkmark$maks waarde (4)
	OF	
	$PM = (2x - 6) - (x^2 - 2x - 3)$	$\checkmark$aftrekking
	$\quad = -x^2 + 4x - 3$	$\checkmark$kwadratiese uitdrukking
	$\quad = -(x^2 - 4x + 4 - 4 + 3)$	
	$\quad = -[(x - 2)^2 - 1]$	$\checkmark$metode
	$\quad = -(x - 2)^2 + 1$	
	$Max.PM = 1$ eenheid	$\checkmark$maks waarde (4)
		[21]

VRAAG 9

9.1	$A = P(1 - i)^n$	$\checkmark$substitusie
	$11090,41 = 120000(1 - i)^{12}$	
	$\therefore i = 1 - \sqrt[12]{\dfrac{11090,41}{120000}}$	$\checkmark$maak i onderwerp
	Dus $i = 0,179999...$	$\checkmark i$ waarde as desimaal
	Depresiasie-koers $= 18\%$	$\checkmark$antwoord (4)

9.2	$i_{eff} = \left(1 + \dfrac{i}{m}\right)^m - 1$ $= \left(1 + \dfrac{0,098}{12}\right)^{12} - 1$ $= 0,10252.....$ koers $= 10,25\%$	✓formula ✓substitusie in formule ✓10,25% (3)
9.3	$A = P(1+i_1)^{n_1}(1+i_2)^{n_2}$ $= 80\,000\left(1 + \dfrac{0.075}{4}\right)^{16}\left(1 + \dfrac{0,092}{12}\right)^{36}$ $= R141768,60$ **OF** $A_1 = 80000\left(1 + \dfrac{0,075}{4}\right)^{16}$ $= 107689,1465..$ $A_2 = 107689,1465\left(1 + \dfrac{0,092}{12}\right)^{36}$ $= R141768,60$	✓$\left(1 + \dfrac{0.075}{4}\right)^{16}$ ✓$\left(1 + \dfrac{0,092}{12}\right)^{36}$ ✓vermenigvuldiging ✓antwoord (4) ✓$\left(1 + \dfrac{0,075}{4}\right)^{16}$ ✓A_1 ✓$\left(1 + \dfrac{0,092}{12}\right)^{36}$ ✓antwoord (4)
9.4.1	Belegging : einde van derde jaar : $A = P(1+i)^n$ $= 30\,000\left(1 + \dfrac{0,065}{12}\right)^{96}$ $= R50390,07$	✓$\dfrac{0,065}{12}$ ✓subst. in korrekte formule ✓antwoord (3)
9.4.2	$\underset{30000}{T_0} \qquad \underset{-10000}{T_3} \qquad \underset{+10000}{T_5} \qquad \overline{\underset{}{T_8}}$ $A = 30000\left(1 + \dfrac{0,65}{12}\right)^{96} - 10000\left(1 + \dfrac{0,65}{12}\right)^{60} + 10000\left(1 + \dfrac{0,65}{12}\right)^{36}$ $A = R48708,61$ $\therefore$ verskil $= 48708,61 - 50390,07$ $\qquad\qquad = -R1681,46$	✓$30000\left(1 + \dfrac{0,65}{12}\right)^{96}$ ✓$-10000\left(1 + \dfrac{0,65}{12}\right)^{60}$ ✓$10000\left(1 + \dfrac{0,65}{12}\right)^{36}$ ✓R48708,61 ✓aftrek ✓antwoord (7)

| Belegging : einde van derde jaar :

$A = P(1+i)^n$

$= 30\,000\left(1 + \dfrac{0,065}{12}\right)^{36}$

$= R\,36\,440,14881$

Bedrag(nuut) : $R\,36\,440,14881 - R\,10\,000,00 = R\,26\,440,14881$

Belegging : einde van vyfde jaar :

$A = P(1+i)^n$

$= 26440.14881\left(1 + \dfrac{0,065}{12}\right)^{24}$

$= R\,30100,2304$

Bedrag (Nuut) : $R\,30100,2304 + R\,10\,000,00 = R\,40100,2304$

Belegging : einde van agste jaar :

$A = P(1+i)^n$

$= 40100,2304\left(1 + \dfrac{0,065}{12}\right)^{24}$

$= R\,48708,61$

Tashil hed `n verskil van R1681,46 gehad | ✓subst. in formule
✓antwoord

✓subst. in formule
✓antwoord

✓subst. in formule
✓antwoord
✓afleiding   (7)

[21] |

VRAAG10

10.1	5 klante	✓antwoord (1)
10.2	P(C en B) $\neq 0$ Dus gebeure B en C is nie onderling uitsluitend nie	✓P(C and B) $\neq 0$ ✓ afleiding (2)
10.3.1	P(slegs V) = $\dfrac{58}{240} = \dfrac{29}{120}$	✓ antwoord (1)
10.3.2	P(C en B) = $\dfrac{29}{240}$	✓ antwoord (1)
10.3.3	P(nie C) = 1 – P(C) $= 1 - \dfrac{122}{240} = \dfrac{59}{120}$ **OF** P(nie C) $= \dfrac{52 + 3 + 58 + 5}{240}$ $= \dfrac{118}{240} = \dfrac{59}{120}$	✓ formule ✓ substitusie ✓antwoord (3) ✓✓noemer en teller ✓antwoord (3)

10.3.4	P(B of V) = P(B) + P(V) − P(B en V) $$= \frac{84}{240} + \frac{82}{240} - \frac{15}{240}$$ $$= \frac{151}{240}$$ **OF** $$P(\text{B of V}) = \frac{17+52+12+3+9+58}{240}$$ $$= \frac{151}{240}$$	✓ $\dfrac{84}{240}$ ✓ $\dfrac{82}{240}$ ✓ $\dfrac{15}{240}$ ✓ $\dfrac{151}{240}$ (4) ✓✓teller en noemer ✓✓antwoord (4) **[12]**

VRAAG 11

	$P(A \text{ of } B) = P(A) + P(B) - P(A \cap B)$ $0,428 = 0,12 + 0,35 - P(A \cap B)$ $P(A \cap B) = 0,042$ $P(A) \times P(B) = 0,12 \times 0,35 = 0,042$ $\therefore P(A \cap B) = P(A) \times P(B)$ Dus is A en B onafhanklike gebeure	✓substitusie ✓waarde van $P(A \cap B)$ ✓waarde van $P(A) \times P(B)$ ✓afleiding (4) **[4]**

VRAAG 12

12.1	Daar is 100% – 60% – 10% = 30% rooi albasters $$\therefore \frac{30}{100} \times 80 = 24 \text{ rooi albasters}$$	✓30% ✓24 (2)
12.2		✓eerste tak ✓tweede tak ✓waardes op diagram (3)
12.3	P(G en Y) = P(G, Y) + P(Y, G) $$= \frac{48}{80} \times \frac{8}{79} + \frac{8}{80} \times \frac{48}{79}$$ $$= \frac{48}{395}$$	✓ vermenigvuldig reel ✓ optel ✓antwoord (3) **[8]**
		TOTAAL: 150