Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 11

NOVEMBER 2019

MATHEMATICS P1/*WISKUNDE V1* MARKING GUIDELINE/*NASIENRIGLYN* EXEMPLAR/*EKSEMPLAAR*

MARKS/*PUNTE*: 150

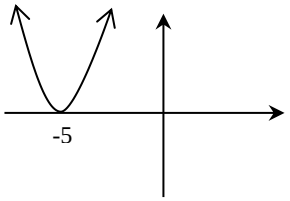
This marking guideline consists of 13 pages./
Hierdie nasienriglyn bestaan uit 13 bladsye.

NOTE/*LET WEL*:

- If a candidate answers a question TWICE, mark the FIRST attempt ONLY.
  Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk SLEGS die EERSTE poging.
- Consistent accuracy applies in ALL aspects of the marking guideline.
  Volgehoue akkuraatheid is in ALLE aspekte van die nasienriglyn van toepassing.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
  Indien 'n kandidaat 'n poging vir 'n vraag deurgetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deurgetrek is.
- The mark for substitution is awarded for substitution into the correct formula.
  Die punt vir substitusie word toegeken vir substitusie in die korrekte formule.

QUESTION 1/*VRAAG 1*

1.1.1	$x^2-5x-6=0$ $(x-6)(x+1)=0$ $\therefore x=6$ or / *of* $x=-1$	✓ method / *metode* ✓ ✓ answers / *antwoorde* (3)
1.1.2	$(2x-3)(x+1)=9$ $2x^2+2x-3x-3-9=0$ $2x^2-x-12=0$ $\therefore x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\dfrac{-(-1)\pm\sqrt{(-1)^2-4(2)(-12)}}{2(2)}$ $=\dfrac{1\pm\sqrt{97}}{4}$ $=2,71$ *or / of* $-2,21$	✓ standard form / *standaardvorm* ✓ substitution / *vervanging* ✓ ✓ answers / *antwoorde* (4)
1.1.3	$x-\sqrt{x-1}=3$ $x-3=\sqrt{x-1}$ $(x-3)^2=x-1$ $x^2-6x+9=x-1$ $x^2-7x+10=0$ $(x-2)(x-5)=0$ $\therefore x\neq 2$ *or / of* $x=5$	✓ squaring both sides *kwadreer beide kante* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ both x values / *beide x-waardes* ✓ selection / keuse (5)

1.1.4	$x(x+10) > -25$ $x^2 + 10x + 25 > 0$ $(x+5)^2 > 0$ $\therefore x \in \mathrm{R}$ but/*maar* $x \neq -5$  	✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ $x \in \mathrm{R}$ ✓ $x \neq -5$ (4)
1.2	$2x - y = 1$ (1) $3x^2 - 4xy + y^2 = 0$ (2) $y = 2x - 1$ (3) Substitute (3) into (2) :*Vervang* (3) *in* (2) $3x^2 - 4x(2x-1) + (2x-1)^2 = 0$ $3x^2 - 8x^2 + 4x + 4x^2 - 4x + 1 = 0$ $-x^2 + 1 = 0$ $1 = x^2$ or / *of* $x^2 - 1 = 0$ $\pm\sqrt{1} = \sqrt{x^2}$ or / *of* $(x-1)(x+1) = 0$ $\therefore x = 1$ or / *of* $x = -1$ $y = 2(1) - 1$ or / *of* $y = 2(-1) - 1$ $= 1$ or / *of* $y = -3$ **OR / *OF*** $2x - y = 1$ (1) $3x^2 - 4xy + y^2 = 0$ (2) $x = \frac{1}{2}(y+1)$ (3) $3[\frac{1}{2}(y+1)]^2 - 4y[\frac{1}{2}(y+1)] + y^2 = 0$ $3(\frac{y^2}{4} + \frac{y}{2} + \frac{1}{4}) - 2y^2 - 4y + y^2 = 0$ $3y^2 + 6y + 3 - 4y^2 - 8y = 0$ $-y^2 - 2y + 3 = 0$ $y^2 + 2y - 3 = 0$ $(y-1)(y+3) = 0$ $\therefore y = 1$ or / *of* $y = -3$ $x = \frac{1}{2}(1+1)$ or / *of* $x = \frac{1}{2}(-3+1)$ $x = 1$ or / *of* $x = -1$	✓ $y = 2x - 1$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ method/factors : *metode/faktore* ✓ both *x*-values / *beide x-waardes* ✓ both *y*-values / *beide y-waardes* (6) ✓ $x = \frac{1}{2}(y+1)$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ both *y*-values / *beide y-waardes* ✓ both *x*-values / *beide x-waardes* (6)

1.3	$[x-(-3+2\sqrt{2})][x-(-3-2\sqrt{2})]=0$ $[(x+3)+2\sqrt{2}][(x+3)-2\sqrt{2}]$ $(x+3)^2-(2\sqrt{2})^2=0$ $x^2+6x+9-8=0$ $x^2+6x+1=0$ but y intercept is 4 / (*maar y – afsnit is* 4) $\therefore\ f(x)=4x^2+24x+4$	✓ equation / *vergelyking* ✓ difference of 2 squares *verskil tussen 2 kwadrate* ✓ expanding / *uitbreiding* ✓ x^2+6x+1 ✓ $4x^2+24x+4$ (5)
		[27]

QUESTION 2/*VRAAG 2*

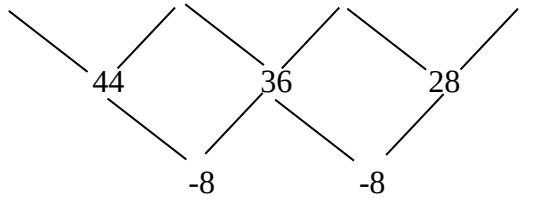
2.1	$\frac{8^{n-3}.32^{-n+1}.6^{2n}}{9^n}=\frac{\left(2^3\right)^{n-3}.\left(2^5\right)^{-n+1}.(2.3)^{2n}}{\left(3^2\right)^n}$ $=\frac{2^{3n-9}.2^{-5n+5}.2^{2n}.3^{2n}}{3^{2n}}$ $=2^{3n-9-5n+5+2n}$ $=2^{-4}$ $=\frac{1}{16}$		✓ $\left(2^3\right)^{n-3}.\left(2^5\right)^{-n+1}.(2.3)^{2n}$ ✓ $\left(3^2\right)^n$ ✓ $\frac{2^{3n-9}.2^{-5n+5}.2^{2n}.3^{2n}}{3^{2n}}$ ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (5)
2.2.1	$x^{\frac{2}{3}}=4$ $\left(x^{\frac{2}{3}}\right)^3=4^3$ $x^2=4^3$ $x^2=64$ $x=8$	**OR / *OF*** $x^{\frac{2}{3}}=4$ $x^{\frac{2}{3}\times\frac{3}{2}}=\left(2^2\right)^{\frac{3}{2}}$ $\therefore\ x=2^3$ $x=8$	✓ method / *metode* ✓ $x^2=64$ or/*of* $x=2^3$ ✓ answer / *antwoord* (3)
2.2.2	$2^{2x}-4^{x-1}=12$ $2^{2x}-2^{2x-2}=12$ $2^{2x}-2^{2x}.2^{-2}=12$ $2^{2x}\left(1-\frac{1}{4}\right)=12$ $2^{2x}.\frac{3}{4}=12$ $2^{2x}=16$ or / *of* $4^x=16$ $2^{2x}=2^4$ *or / of* $4^x=4^2$ $2x=4$ $\therefore\quad x=2$		✓ $2^{2x}-2^{2x-2}=12$ ✓ $2^{2x}\left(1-\frac{1}{4}\right)=12$ ✓ $2^{2x}=2^4$ or / *of* $4^x=4^2$ ✓ $x=2$ (4)

2.3.1	*g* is undefined when: *g is ongedefinieerd wanneer* $3-x=0$ $\therefore x=3$	✓✓ answer / *antwoord* (2)
2.3.2	$g(x)=\dfrac{x^2-2x+2}{3-x}$ $=\dfrac{\left((x-2x+1)-1+2\right)}{3-x}$ $=\dfrac{(x-1)^2+1}{3-x}$ For *g* to be equal to 0, the numerator must be equal to 0, but the minimum value for the numerator is 1 $\therefore$ *g* will never be equal to zero. *Vir g om gelyk aan 0 te wees moet die teller gelyk aan 0 wees, maar die minimumwaarde vir die teller is 1.* $\therefore$ *g sal nooit gelyk aan nul wees nie.* **OR/*OF*** For $g(x)$ to be = 0, the numerator must be = 0 *Vir* $g(x)$ *om* $=0$, *moet die teller* $=0$ $x^2-2x+2=0$ but / *maar* : $\Delta=b^2-4ac$ $=(-2)^2-4(1)(2)$ $=-8$ $\therefore$ No solution / *Geen oplossing* Numerator will never be equal to 0. *Teller sal nooit gelyk aan* 0 *wees nie.*	✓ completing the square *voltooiing van kwadraat* ✓ For *g* to be equal to 0, the numerator must be equal to 0 *Vir g om gelyk aan 0 te wees moet die teller gelyk aan 0 wees* ✓ minimum value of numerator = 1 *minimumwaarde van teller* = 1 (3) ✓ For $g(x)$ to be = 0, the numerator must be = 0 *Vir* $g(x)$ *om* $=0$, *moet die teller* $=0$ ✓ -8 ✓ no solution / *geen oplossing* (3)
		[17]

QUESTION 3/*VRAAG 3*

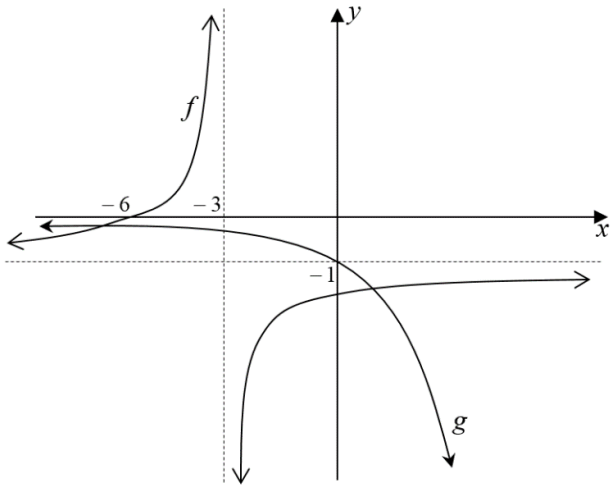
3.1.1	10 ; 7 ; 4 ; 1 ; $-\mathbf{2};-\mathbf{5}$	✓ -2 ✓ -5 (2)
3.1.2	$T_n = 13-3n$	✓ 13 ✓ $-3n$ (2)
3.1.3	$-179 = 13-3n$ $3n = 192$ $\therefore n = 64$	✓ equating -179 to $13-3n$ *stel -179 gelyk aan $13-3n$* ✓ simplifying / *vereenvoudiging* ✓ answer / *antwoord* (3)
3.2	$T_2 - T_1 = T_3 - T_2$ $x+9-(3x-2) = 2x+5-(x+9)$ $x+9-3x+2 = 2x+5-x-9$ $-2x+11 = x-4$ $-3x = -15$ $\therefore x = 5$	✓ substitution / *vervanging* ✓ simplifying / *vereenvoudiging* ✓ $x = 5$ (3)
		[10]

QUESTION 4/*VRAAG 4*

4.1	-128 ; - 84 ; - 48 ; -20  0 ; 12	✓ 0 ✓ 12 (2)
4.2	$2a = -8$ $3a+b = 44$ $a+b+c = -128$ $\therefore a = -4$ $3(-4)+b = 44$ $-4+56+c = -128$ $b = 56$ $c = -180$ $\therefore T_n = -4n^2+56n-180$	✓ $a = -4$ ✓ $b = 56$ ✓ $c = -180$ ✓ $T_n = -4n^2+56n-180$ (4)

4.3	$T_n = -4n^2 + 56n - 180$ $= -4(n^2 - 14n + 45)$ $= -4\left(n^2 - 14n + 49 - 49 + 45\right)$ $= -4\left[(n-7)^2 - 4\right]$ $= -4(n-7)^2 + 16$ $\therefore$ biggest value for T_n is 16 *grootste waarde vir* T_n *is* 16 **OR / *OF*** $T_n = -4n^2 + 56n - 180$ max at/*maks by* : $n = -\frac{b}{2a}$ $= \frac{-56}{2.(-4)}$ $= 7$ $\therefore T_7 = -4(7)^2 + 56(7) - 180$ $= 16$	✓ common factor / *gemene faktor* ✓ completing the square *voltooiing van vierkant* ✓ $(n-7)^2 - 4$ ✓ $+16$ ✓ identifying the biggest T_n value *identifiseer die grootste* T_n *waarde* (5) ✓ $-\frac{b}{2a}$ ✓ substitution / *vervanging* ✓ $n = 7$ ✓ substituting n = 7 into T_n *vervang n = 7 in* T_n ✓ answer / *antwoord* (5)
4.4	$k \leq -16$	✓ ✓ answer / *antwoord* (1 mark if/*punt as* $k < -16$) (2)
		[13]

QUESTION 5/*VRAAG 5*

5.1	$g(x) = -a^x$ $-3 = -a^1$ $a = 3$	✓ substituting -3 and 1 *vervang –3 en 1* ✓ answer / *antwoord* (2)
5.2	$x = -3$ and / *en* $y = -1$	✓ $x = -3$ ✓ $y = -1$ (2)
5.3	$y < 0$; $y \in \mathbf{R}$	✓ answer / *antwoord* (1)
5.4	$\frac{-3}{x+3} - 1 = 0$ $\frac{-3}{x+3} = 1$ $-3 = x + 3$ $\therefore x = -6$ $\frac{-3}{0+3} - 1 = y$ $\therefore y = -2$	✓ substituting $y = 0$ *vervang* $y = 0$ ✓ $x = -6$ ✓ $y = -2$ (3)
5.5		*f:* ✓ x and y-intercepts *x- en y-afsnitte* ✓ asymptotes / *asimptote* ✓ shape / *vorm* *g*: ✓ y-intercept / *y-afsnit* ✓ asymptote / *asimptoot* ✓ shape / *vorm* (6)
5.6	$y = x + k$ $-1 = -3 + k$ $\therefore k = 2$ $\therefore y = x + 2$ **OR / *OF*** $y = (x - (-3)) - 1$ $= (x + 3) - 1$ $\therefore y = x + 2$	✓ substituting $(-3;-1)$ *vervang (–3 ; –1)* ✓ $y = x + 2$ (2) ✓ substituting $(-3;-1)$ *vervang (–3 ; –1)* ✓ $y = x + 2$ (2)
5.7	$b = 1$	✓✓ answer / *antwoord* (2)
		[18]

QUESTION 6/*VRAAG 6*

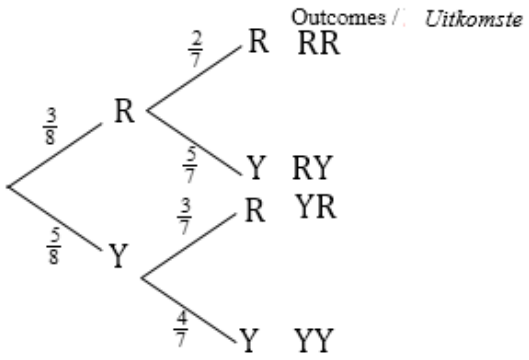
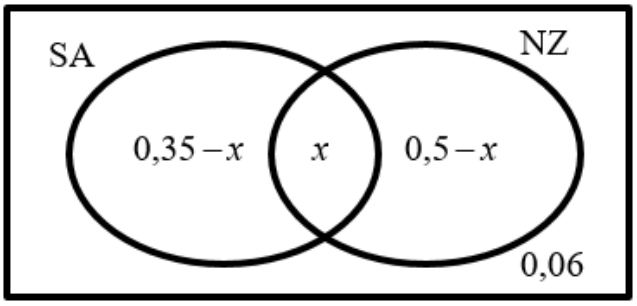
6.1	$g(x) = x + 4$ $0 = x + 4$ $\therefore x = -4$ $P(-4;0)$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
6.2	$Q(2;0)$	✓✓ answer / *antwoord* (2)
6.3	Average gradient / *Gemiddelde gradiënt* $= \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{9-0}{-1-(-4)}$ $= 3$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
6.4	$f(x) = ax^2 + bx + c$ $y = a(x - x_1)(x - x_2)$ $= a(x+4)(x-2)$ $9 = a(-1+4)(-1-2)$ $9 = -9a$ $\therefore a = -1$ $\Rightarrow y = -(x+4)(x-2)$ $= -(x^2 + 2x - 8)$ $= -x^2 - 2x + 8$ $\therefore b = -2$ $c = 8$	✓ substituting -4 and 2 *vervanging van* -4 *en* 2 ✓ substituting / *vervang* $(-1;9)$ ✓ $a = -1$ ✓ substituting -1 and expanding *vervang* -1 *en uitbreiding* ✓ $b = -2$ ✓ $c = 8$ (6)
	OR / *OF*	
	$y = a(x+p)^2 + q$ $y = a(x+1)^2 + 9$ $0 = a(-4+1)^2 + 9$ or / *of* $0 = a(2+1)^2 + 9$ $-9a = 9$ $\therefore a = -1$ $\Rightarrow y = -(x+1)^2 + 9$ $= -(x^2 + 2x + 1) + 9$ $= -x^2 - 2x - 1 + 9$ $= -x^2 - 2x + 8$ $\therefore b = -2$ $c = 8$	✓ substituting / *vervang* $(-1;9)$ ✓ substituting / *vervang* $(-4;0)$ or/*of* $(2;0)$ ✓ $a = -1$ ✓ substituting -1 and expanding *vervang* -1 *en uitbreiding* ✓ $b = -2$ ✓ $c = 8$ (6)

6.5	$x+4=-x^2-2x+8$ $x^2+3x-4=0$ $(x+4)(x-1)=0$ $\therefore x=-4$ or / *of* $x=1$ $\Rightarrow \quad y=1+4$ $=5$ $\therefore S(1;5)$	✓ $g(x)=f(x)$ ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ choosing / *kies* $x=1$ ✓ $y=5$ (5)
6.6	Length of TV at max / *Lengte van* TV *by maks*: $=y_T-y_V$ $=-x^2-2x+8-(x+4)$ $=-x^2-3x+4$ $=-(x^2+3x-4)$ $=-(x^2+3x+\frac{9}{4}-\frac{9}{4}-4)$ $=-\left[(x+\frac{3}{2})^2-\frac{25}{4}\right]$ $=-(x+\frac{3}{2})^2+\frac{25}{4}$ $\therefore$ Length TV at max / *Lengte* TV *by maks*: $=6,25$ units / *eenhede* **OR / *OF*** Length of TV at max / *Lengte van* TV *by maks*: $=y_T-y_V$ $=-x^2-2x+8-(x+4)$ $=-x^2-3x+4$ $x=-\frac{b}{2a}$ $=-\frac{(-3)}{2(-1)}=-\frac{3}{2}$ Length of TV at max / *Lengte van* TV *by maks*: $y=-(\frac{3}{2})^2-3(-\frac{3}{2})+4$ $=6,25$ units / *eenhede*	✓ $-x^2-2x+8-(x+4)$ ✓ factoring out -1 / *gemene faktor* -1 ✓ completing the square *voltooiing van vierkant* ✓ $-(x+\frac{3}{2})^2+\frac{25}{4}$ ✓ answer / *antwoord* (5) ✓ $-x^2-2x+8-(x+4)$ ✓ $x=-\frac{b}{2a}$ ✓ $x=-\frac{3}{2}$ ✓ substitution / *vervanging* ✓ answer / *antwoord* (5)
6.7	$-4<x<0$ or / *of* $x>2$ **OR / *OF*** $x\in[(-4;0)\cup(2;\infty)]$	✓✓ $-4<x<0$ ✓ $x>2$ ✓ $x\in$ ✓✓ $[(-4;0)\cup(2;\infty)]$ (Accuracy / *Akkuraatheid*) (3)
		[25]

QUESTION 7/*VRAAG 7*

7.1	$A = P(1-i)^n$ $7\,210 = P(1-0{,}134)^5$ $7\,210 = 0{,}4870678P$ $\therefore P = R14\,802{,}87$	✓ formula / *formule* ✓ $n = 5$ ✓ substitution into correct formula *vervanging in korrekte formule* ✓ answer / *antwoord* (4)
7.2	$i_{eff} = \left(1 + \frac{i_{nom}}{n}\right)^n - 1$ $= \left(1 + \frac{0{,}082}{4}\right)^4 - 1$ $\approx 0{,}0846$ $\therefore r_{eff} \approx 8{,}46\%$	✓ $n = 4$ ✓ substitution/*vervanging* ✓ answer / *antwoord* (3)
7.3.1	$A = P(1+i)^n$ $= R20\,000\left(1 + \frac{0{,}103}{12}\right)^{12}$ $\approx R22\,160{,}09$	✓ $i = \frac{0{,}103}{12}$ and/*en* ✓ $n = 12$ ✓ substitution into correct formula *vervanging in korrekte formule* ✓ answer / *antwoord* (4)
7.3.2	Let the money that he withdrew be x / *Laat die geld wat hy onttrek het x wees* Balance at start of 2nd year / *Balans aan die begin van 2de jaar* $R22\,160{,}09 + R15\,000 = R37\,160{,}09$ $\left[\left(R37\,160{,}09\left(1 + \frac{0{,}115}{12}\right)^{24}\right) - x\right]\left[\left(1 + \frac{0{,}168}{4}\right)^8\right] = R30\,183{,}64$ $(46\,718{,}49558 - x) = \frac{30\,183{,}64}{\left(1 + \frac{0{,}168}{4}\right)^8}$ $-x = \frac{30\,183{,}64}{\left(1 + \frac{0{,}168}{4}\right)^8} - 46\,718{,}49558$ $-x = -24\,999{,}9939$ $\therefore x = R25\,000{,}00$	✓ $R22\,160{,}09 + R15\,000$ ✓ $\left(R37\,160{,}09\left(1 + \frac{0{,}115}{12}\right)^{24}\right)$ ✓ subtracting x / *trek x af* ✓ $\left[\left(R37\,160{,}09\left(1 + \frac{0{,}115}{12}\right)^{24}\right) - x\right]\left[\left(1 + \frac{0{,}168}{4}\right)^8\right]$ ✓ equating to / *stel gelyk aan* R 30 183,64 ✓ answer / *antwoord* (6)
		[17]

QUESTION 8/*VRAAG 8*

8.1.1	Let Red balls be R and Yellow be Y *Laat Rooi balle R en Geel balle Y wees*  	✓ first branch / *eerste tak* ✓ probabilities of first branch *waarskynlikhede van eerste tak* ✓ second branches / *tweede takke* ✓ probabilities of second branches *waarskynlikhede van tweede takke* ✓ outcomes / *uitkomste* (5)
8.1.2	P(different colours/ *verskillende kleure*) $= \text{P(RY) or / } of \text{ P(YR)}$ $= \text{P(RY)} + \text{P(YR)}$ $= \left(\frac{3}{8}\times\frac{5}{7}\right)+\left(\frac{5}{8}\times\frac{3}{7}\right)$ $= \frac{15}{28}$ or / *of* $0,54$ **OR / *OF*** P(different colors) $= 1 - \text{P(same colour)}$ *P*(*verskillende kleure*) $= 1 - P(dieselfde\ kleur)$ $= 1-\left(\text{P(RR)} + \text{P(YY)}\right)$ $= 1-\left(\left(\frac{3}{8}\times\frac{2}{7}\right)+\left(\frac{5}{8}\times\frac{4}{7}\right)\right)$ $= 1-\frac{13}{28}$ $= \frac{15}{28}$ or / *of* $0,54$	✓ $\text{P(RY)} + \text{P(YR)}$ ✓ $\frac{3}{8}\times\frac{5}{7}$ ✓ $\frac{5}{8}\times\frac{3}{7}$ ✓ answer / *antwoord* (4) ✓ $1-\left(\text{P(RR)}+\text{P(YY)}\right)$ ✓ $\frac{3}{8}\times\frac{2}{7}$ ✓ $\frac{5}{8}\times\frac{4}{7}$ ✓ answer / *antwoord* (4)
8.2.1	Let x be the probability that both SA & NZ reach finals *Laat x die waarskynlikheid wees dat beide SA& NZ die finaal haal*  	✓ 0,06 ✓ $0,35-x$ & $0,5-x$ ✓ x (3)
8.2.2	$0,35-x+x+0,5-x+0,06=1$ $\therefore x = 0,09$	✓ equation/*vergelyking* ✓ answer/*antwoord* (2)
		[14]

QUESTION 9/*VRAAG 9*

9.1	$a = 83 \qquad b = 240$	✓ $a = 83$ ✓ $b = 240$ (2)
9.2	If M and F are independent, then *As* M *en* F *onafhanklik is, dan is*: $P(M) \times P(F) = P(M \text{ and/}en \text{ F})$ $P(M) \times P(F) = \frac{125}{500} \times \frac{260}{500}$ $= \frac{13}{100}$ *or* 0,13 $P(M \text{ and/}en \text{ F}) = \frac{65}{500} = \frac{13}{100}$ or / *of* 0,13 $\therefore P(M) \times P(F) = P(M \text{ and/}en \text{ F})$ $\therefore$ M and F are independent events. M *en* F *is onafhanklike gebeurtenisse.*	✓ correct rule / *korrekte reël* ✓ $P(M) = \frac{125}{500} \times P(F) = \frac{260}{500}$ ✓ $\frac{13}{100}$ or / *of* 0,13 ✓ $P(M \text{ and/}en \text{ F}) = \frac{65}{500}$ or / *of* 0,13 and conclusion / *en gevolgtrekking* (4)
9.3	$P(M/F \text{ or/}of \text{ PS/F}) = P(M/F) + P(PS/F) - P(M/F \text{ and/}en \text{ PS/F})$ $= \frac{65}{500} + \frac{114}{500} - 0$ $= \frac{179}{500}$ *or / of* 0,36	✓ correct rule / *korrekte reël* ✓ $\frac{65}{500} + \frac{114}{500}$ ✓ answer / *antwoord* (3)
		[9]

TOTAL/*TOTAAL*: 150