Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 11

NOVEMBER 2020

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

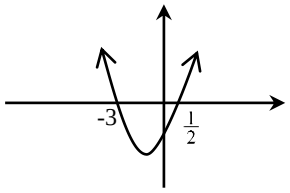
MARKS/*PUNTE*: 150

This marking guideline consists of 15 pages./
Hierdie nasienriglyn bestaan uit 15 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 geld deurgaans in ALLE aspekte van die nasienriglyn.
- 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	$(3x+2)(x-5)=0$ $\therefore x=-\frac{2}{3}$ or / *of* $x=5$	✓ ✓ answers / *antwoorde* (2)
1.1.2	$3x^2-5x-1=0$ $\therefore x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(-5)\pm\sqrt{(-5)^2-4(3)(-1)}}{2(3)}$ $=\frac{5\pm\sqrt{37}}{6}$ $=-0,18$ or / *of* $1,85$	✓ substitution / *vervanging* ✓ ✓ answers / *antwoorde* (3)
1.1.3	$x=4-\sqrt{x-2}$ $\sqrt{x-2}=4-x$ $(x-2)=(4-x)^2$ $x-2=16-8x+x^2$ $x^2-9x+18=0$ $(x-6)(x-3)=0$ $\therefore x=3$ or / *of* $x\neq 6$	✓ squaring both sides/ *kwadreer beide kante* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ both *x*-values / *beide x-waardes* ✓ selection / *keuse* (5)
1.1.4	$2x^2+5x\leq 3$ $2x^2+5x-3\leq 0$ $(2x-1)(x+3)\leq 0$ $\therefore -3\leq x\leq\frac{1}{2}$ 	✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ ✓ $-3\leq x\leq\frac{1}{2}$ (4)

1.2.1	$\left(\frac{8}{27}\right)^{\frac{2}{3}} = \left(\sqrt[3]{\frac{8}{27}}\right)^2$ $= \left(\frac{2}{3}\right)^2$ $= \frac{4}{9}$ **OR/*OF*** $\left[\left(\frac{2}{3}\right)^3\right]^{\frac{2}{3}}$ $= \left(\frac{2}{3}\right)^2$ $= \frac{4}{9}$	✓ $\left(\sqrt[3]{\frac{8}{27}}\right)^2$ ✓ answer / *antwoord* (2) **OR/*OF*** ✓ $\left[\left(\frac{2}{3}\right)^3\right]^{\frac{2}{3}}$ ✓ answer / *antwoord* (2)
1.2.2	$\left(\sqrt{12}+2\right)\left(\sqrt{3}-1\right) = \left(2\sqrt{3}+2\right)\left(\sqrt{3}-1\right)$ $= 2.3 - 2\sqrt{3} + 2\sqrt{3} - 2$ $= 6 - 2$ $= 4$ **OR/*OF*** $\left(\sqrt{12}+2\right)\left(\sqrt{3}-1\right) = \sqrt{36} - \sqrt{12} + 2\sqrt{3} - 2$ $= 6 - 2\sqrt{3} + 2\sqrt{3} - 2$ $= 4$	✓ $2\sqrt{3}$ ✓ $4.3 - 2\sqrt{3} + 2\sqrt{3} - 2$ ✓ answer / *antwoord* (3) **OR/*OF*** ✓ $\sqrt{36}$ ✓ $6 - 2\sqrt{3} + 2\sqrt{3} - 2$ ✓ answer / *antwoord* (3)

1.3	$5y-x=2$ (1) $x^2-3xy+4y=4$ (2) $x=5y-2$ (3) Subst./*Vervang* (3) into/*in* (2): $\therefore (5y-2)^2-3y(5y-2)+4y-4=0$ $25y^2-20y+4-15y^2+6y+4y-4=0$ $10y^2-10y=0$ $10y(y-1)=0$ $\therefore y=0$ or/*of* $y=1$ $x=5y-2$ $x=5(0)-2$ or/*of* $x=5(1)-2$ $\therefore x=-2$ or/*of* $x=3$ **OR / *OF*** $5y-x=2$ (1) $x^2-3xy+4y=4$ (2) $y=\frac{x+2}{5}=\frac{1}{5}(x+2)$ (3) Subst./*Vervang* (3) into/*in* (2), $x^2-3x\left(\frac{1}{5}(x+2)\right)+4\left(\frac{1}{5}(x+2)\right)=4$ $x^2-\frac{3}{5}x(x+2)+\frac{4}{5}(x+2)=4$ $5x^2-3x^2-6x+4x+8-20=0$ $2x^2-2x-12=0$ $x^2-x-6=0$ $(x-3)(x+2)=0$ $\therefore x=-2$ or/*of* $x=3$ $y=\frac{1}{5}(-2+2)$ or/*of* $y=\frac{1}{5}(3+2)$ $\therefore y=0$ or/*of* $y=1$	✓ $x=5x-2$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ method;factors / *metode;faktore* ✓ both *x*-values / *beide x-waardes* ✓ both *y*-values / *beide y-waardes* (6) ✓ $y=\frac{1}{5}(x+2)$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ both *y*-values / *beide y-waardes* ✓ both *x*-values / *beide x-waardes* (6)
1.4.1	Perimeter/*Omtrek* $=2l+2b$ $280=2(2x)+2y$ $2y=280-4x$ $\therefore y=140-2x$ Area/*Oppervlakte* $=lb$ $=2x\times y$ $=2x(140-2x)$ $=280x-4x^2$	✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ $A=2x(140-2x)$ (3)

1.4.2	$A = 280x - 4x^2$ $= -4(x^2 - 70x)$ $= -4(x^2 - 70x + 1225 - 1225)$ $= -4[(x-35)^2 - 1225]$ $= -4(x-35)^2 + 4900$ $\therefore$ The maximum area is $4900\,m^2$ *Die maksimum oppervlakte is* $4900\,m^2$ **OR/*OF*** $x = -\frac{b}{2a}$ $= \frac{-280}{2(-4)}$ $= 35\,m$ $\therefore A = 280(35) - 4(35)$ $= 4900\,m^2$	✓ completing the square / *vierkantsvoltooiing* ✓ $+4900$ ✓ correct conclusion / *korrekte gevolgtrekking* (3) **OR/*OF*** ✓ method/*metode* ✓ 35 *m* ✓ answer / *antwoord* (3) **[31]**

QUESTION 2/*VRAAG 2*

2.1	$\frac{3.2^{x+1} - 2.4^x}{3.2^x - 2^{2x}} = \frac{3.2^x.2 - 2.2^{2x}}{3.2^x - 2^{2x}}$ $= \frac{2.2^x(3 - 2^x)}{2^x(3 - 2^x)}$ $= 2$	✓ $3.2^x.2 - 2.2^{2x}$ ✓ factorisation of numerator / *faktorisering van teller* ✓ factorisation of denominator / *faktorisering van noemer* ✓ answer / *antwoord* (4)
2.2.1	$5x^{\frac{2}{5}} = 20$ $x^{\frac{2}{5}} = 4$ $\left(x^{\frac{2}{5}}\right)^{\frac{5}{2}} = 4$ $\therefore x = \left(2^2\right)^{\frac{5}{2}}$ $= 2^5$ $= 32$	✓ $x^{\frac{2}{5}} = 4$ ✓ $\left(x^{\frac{2}{5}}\right)^{\frac{5}{2}} = 4^{\frac{5}{2}}$ ✓ answer / *antwoord* (3)

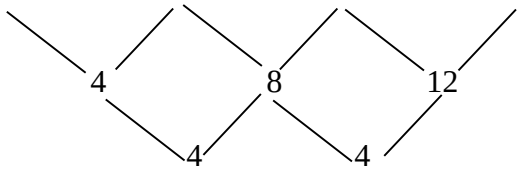
2.2.2	$12^x.3^{x+1} = 648$ $12^x.3^x.3 = 648$ $12^x.3^x = 216$ $(12.3)^x = 216$ $36^x = 216$ $6^{2x} = 6^3$ $2x = 3$ $x = \frac{3}{2}$	✓ $12^x.3^x = 216$ ✓ $6^{2x} = 6^3$ ✓ equating exponents / *gelykstel van eksponente* ✓ answer / *antwoord* (4)
2.3	$f(x) = \frac{3x-2}{x^2+10x+25}$ f is undefined when : *f is ongedefinieerd wanneer* $x^2+10x+25 = 0$ $(x+5)^2 = 0$ $x = -5$ $\therefore f$ is defined *for* : $x \in \mathbb{R}$, but $x \neq -5$ *f is gedefinieerd vir* : $x \in \mathbb{R}$, *maar* $x \neq -5$	✓ $x^2+10x+25 = 0$ for undefined / *vir ongedefinieerd* ✓ $x = -5$ ✓ $x \in \mathbb{R}$ ✓ $x \neq -5$ (4) **[15]**

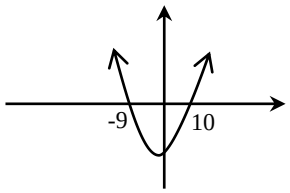
QUESTION 3/*VRAAG 3*

3.1.1	9 ; 5 ; 1; …;−143 $T_n = 13-4n$	✓ 13 ✓ $-4n$ (2)
3.1.2	$T_n = 13-4n$ $T_7 = 13-4(7)$ $= -15$	✓ substitution / *vervanging* ✓ -15 (2)
3.1.3	$T_n = 13-4n$ $-143 = 13-4n$ $-156 = -4n$ $\therefore n = 39$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)

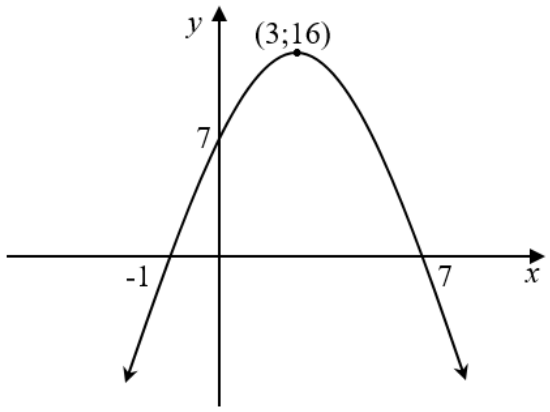
3.2	$T_n = an + b$ $16a + b = 38 \quad (1)$ $41a + b = 113 \quad (2)$ $25a = 75$ $\therefore a = 3$ $16(3) + b = 38$ $48 + b = 38$ $\therefore b = -10$ $T_n = 3n - 10$ $-1 = 3n - 10$ $9 = 3n$ $\therefore n = 3$	✓ $16a + b = 38$ and/*en* $41a + b = 113$ ✓ method / *metode* ✓ $T_n = 3n - 10$ ✓ $n = 3$ (4) **[10]**

QUESTION 4/*VRAAG 4*

4.1	$-12 \quad ; \quad -8 \quad ; \quad 0 \quad ; \quad 12$  28 ; 48	✓ 28 ✓ 48 (2)
4.2	$2a = 4 \quad 3a + b = 4 \quad a + b + c = -12$ $\therefore a = 2 \quad 3(2) + b = 4 \quad 2 - 2 + c = -12$ $b = -2 \quad c = -12$ $\therefore T_n = 2n^2 - 2n - 12$	✓ $a = 2$ ✓ $b = -2$ ✓ $c = -12$ ✓ $T_n = 2n^2 - 2n - 12$ (4)

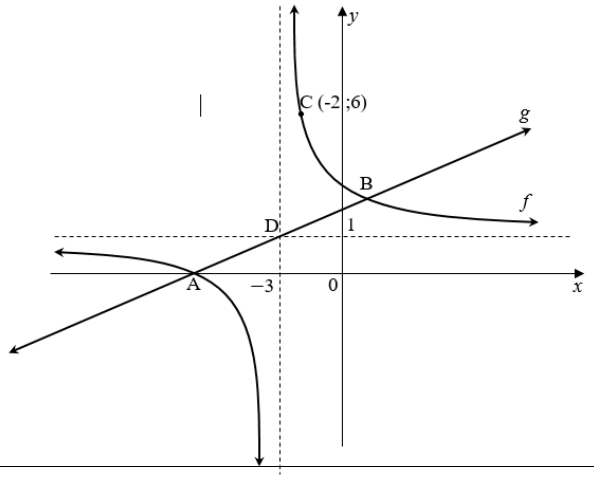
4.3	For first differences: / *Vir eerste verskille* $4;8;12;\ldots$ $T_n = 4n$ $192 = 4n$ $\therefore n = 48$ $\therefore 192$ lies between T_{48} and T_{49} 192 *lê tussen* T_{48} *en* T_{49} **OR/*OF*** $T_{n+1} - T_n = 192$ $2(n+1)^2 - 2(n+1) - 12 - (2n^2 - 2n - 12) = 192$ $2(n^2 + 2n + 1) - 2n - 2 - 12 - 2n^2 + 2n + 12 = 192$ $2n^2 + 4n + 2 - 2n - 2 - 12 - 2n^2 + 2n + 12 = 192$ $\therefore 4n = 192$ $n = 48$ $\therefore 192$ lies between T_{48} *and* T_{49} 192 *lê tussen* T_{48} *en* T_{49}	✓ $T_n = 4n$ ✓ $n = 48$ ✓ answer / *antwoord* (3) **OR/*OF*** ✓ $2(n+1)^2 - 2(n+1) - 12 - (2n^2 - 2n - 12) = 192$ ✓ $4n = 192$ ✓ answer / *antwoord* (3)
4.4	$P_n < 0 \Rightarrow T_n - 168 < 0$ $T_n < 168$ $2n^2 - 2n - 12 < 168$ $2n^2 - 2n - 180 < 0$ $n^2 - n - 90 < 0$ $(n-10)(n+9) < 0$ $-9 < n < 10$ but / *maar*: $n > 0$ $\therefore$ *N*umber of terms $= 9$ *Aantal terme* $= 9$ 	✓ $2n^2 - 2n - 12 < 168$ ✓ standard form / *standaardvorm* ✓ factorisation / *faktorisering* ✓ $-9 < n < 10$ ✓ answer / *antwoord* (5)
4.5	$T_n = 2n^2 - 2n - 12$ $= 2(n^2 - n - 6)$ $\therefore 2 \times$ any $n > 0$ is always even, so T_n will always be even $2 \times$ enige $n > 0$ *is altyd ewe, so* T_n *sal altyd ewe wees.*	✓ $T_n = 2(n^2 - n - 6)$ ✓ explanation / *verduideliking* (2) **[16]**

QUESTION 5/*VRAAG 5*

5.1	At TP/*By Draaipunt*: $x = -\frac{b}{2a}$ $= -\frac{6}{2(-1)}$ $= 3$ $\therefore y = -(3)^2 + 6(3) + 7$ $= 16$ **OR/*OF*** $f(x) = -x^2 + 6x + 7$ $= -(x^2 - 6x - 7)$ $= -[(x^2 - 6x + 9) - 9 - 7]$ $= -[(x-3)^2 - 16]$ $= -(x-3)^2 + 16$ $\therefore$ Turning point / *Draaipunt* : $(3;16)$	✓ method / *metode* ✓ *x*-coordinate / *x-koördinaat* ✓ *y*-coordinate / *y-koördinaat* (3) ✓ completing the square / *vierkantsvoltooiing* ✓ *x*-coordinate / *x-koördinaat* ✓ *y*-coordinate / *y-koördinaat* (3)
5.2	$-x^2 + 6x + 7 = 0$ $x^2 - 6x - 7 = 0$ $(x-7)(x+1) = 0$ $\therefore x = 7$ or / *of* $x = -1$	✓ $f(x) = 0$ ✓ answers / *antwoorde* (2)
5.3		✓ *y*-intercept / *y-afsnit* ✓ *x*-intercepts / *x-afsnitte* ✓ turning point / *draaipunt* ✓ shape / *vorm* (4)
5.4	$x = 3$	✓answer / *antwoord* (1)

5.5	$f(x) = -x^2 + 6x + 7$ $f(-3) = -(-3)^2 + 6(-3) + 7$ $= -20$ $f(1) = -(1)^2 + 6(1) + 7$ $= 12$ Average/*Gemiddelde* $m = \frac{12-(-20)}{1-(-3)}$ $= \frac{32}{4}$ $= 8$	✓ $f(-3) = -20$ ✓ $f(1) = 12$ ✓ substituting into gradient formula / *vervanging in gradiënt-formule* ✓ answer / *antwoord* (4)
5.6	$f(x) = -x^2 + 6x + 7$ $= -(x-3)^2 + 16$ $\therefore h(x) = \left((x-3)+4\right)^2 - 16$ $= (x+1)^2 - 16$	✓ $a = 1$ and/*en* $q = -16$ ✓ $p = 1$ (2) **[16]**

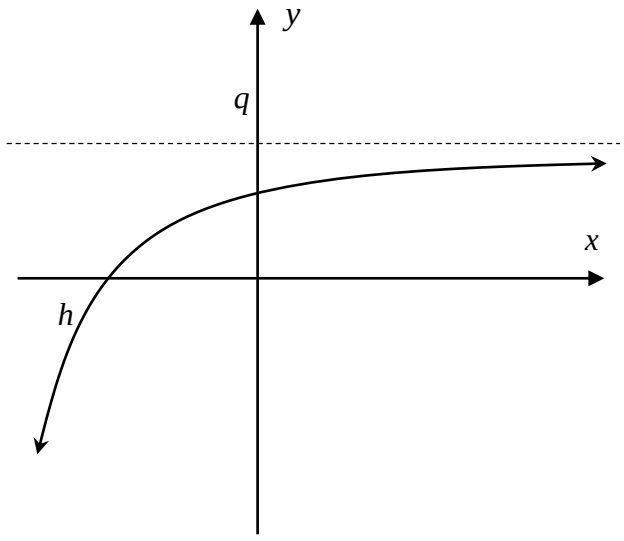
QUESTION 6/*VRAAG 6*

		
6.1	$f(x) = \frac{a}{x+p} + q$ $= \frac{a}{x+3} + 1$	✓ $p = 3$ ✓ $q = 1$ (2)
6.2	$f(x) = \frac{a}{x+3} + 1$ $6 = \frac{a}{-2+3} + 1$ $\therefore a = 5$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)

6.3	$f(x)=\frac{5}{x+3}+1$ $0=\frac{5}{x+3}+1$ $-1=\frac{5}{x+3}$ $-x-3=5$ $x=-8$ $\therefore A(-8;0)$	✓ $y=0$ ✓ $x=-8$ (2)
6.4	A(–8;0) and/*en* D(–3;1) $m_{AD}=\frac{y_2-y_1}{x_2-x_1}$ $=\frac{1-0}{-3-(-8)}$ $\therefore b=\frac{1}{5}$ $g(x)=bx+c$ $=\frac{1}{5}x+c$ $0=\frac{1}{5}(-8)+c$ or / *of* $1=\frac{1}{5}(-3)+c$ $\therefore c=\frac{8}{5}$ $g(x)=\frac{1}{5}x+\frac{8}{5}$	✓ substitution / *vervanging* ✓ m_{AD} ✓ substitution / *vervanging* ✓ equation / *vergelyking* (4)
6.5	$x\in(-\infty;\infty)$ but / *maar* $x\neq -3$ **OR / *OF*** $x\in\mathbb{R},\ x\neq -3$	✓ $x\in(-\infty;\infty)$ ✓ $x\neq -3$ (2) ✓ $x\in\mathbb{R}$ ✓ $x\neq -3$ (2)
6.6	$f(x)=g(x)$ $\frac{5}{x+3}+1=\frac{1}{5}x+\frac{8}{5}$ $25+5(x+3)=x(x+3)+8(x+3)$ $25+5x+15=x^2+3x+8x+24$ $x^2+6x-16=0$ $(x+8)(x-2)=0$ $x=-8$ *or* $x=2$ $y=\frac{5}{2+3}+1$ $=2$ $\therefore B(2;2)$	✓ $\frac{5}{x+3}+1=\frac{1}{5}x+\frac{8}{5}$ ✓ standard form / *standaardvorm* ✓ *x*-values / *x-waardes* ✓ coordinates / *koördinate* (4)

6.7	$-8 \le x < -3$ or $x \ge 0$ **OR / *OF*** $x \in \left[[-8;-3) \cup [0;\infty)\right]$	✓✓ $-8 \le x < -3$ ✓ $x \ge 0$ **OR / *OF*** $x \in \left[[-8;\ -3)$ ✓✓ $\cup\ [0;\infty)\right]$ ✓ (3) **[19]**

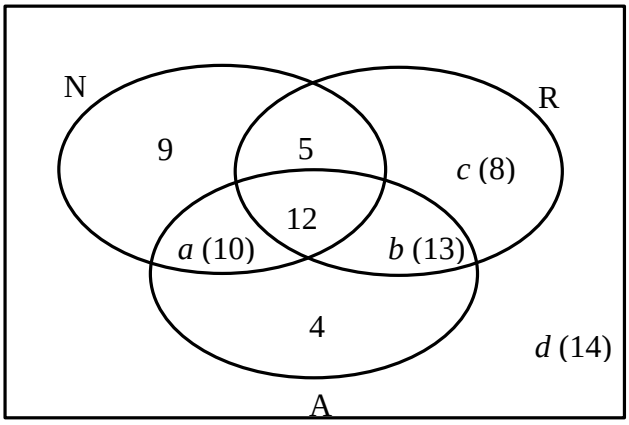
QUESTION 7/*VRAAG 7*

7.1.1	$y = -4$	✓ answer / *antwoord* (1)
7.1.2	$y \in (-4;\infty)$ **OR / *OF*** $y > -4$	✓ answer / *antwoord* (1) **OR / *OF*** ✓ answer / *antwoord* (1)
7.1.3	$g(x) = \left(\frac{1}{2}\right)^x - 4$ $y = \left(\frac{1}{2}\right)^0 - 4$ $= -3$ $0 = \left(\frac{1}{2}\right)^x - 4$ $4 = \left(2^{-1}\right)^x$ $2^2 = 2^{-x}$ $\therefore 2 = -x$ $x = -2$ Intercepts / *Afsnitte*: $(0;-3)$ and / *en* $(-2;0)$	✓ *y*-value / *y-waarde* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
7.1.4	$x > -2$	✓ answer / *antwoord* (1)
7.2		✓ asymptote above *x*-axis *asimptoot bo x-as* ✓ *y*-intercept positive *y-afsnit positief* ✓ shape / *vorm* (3) **[9]**

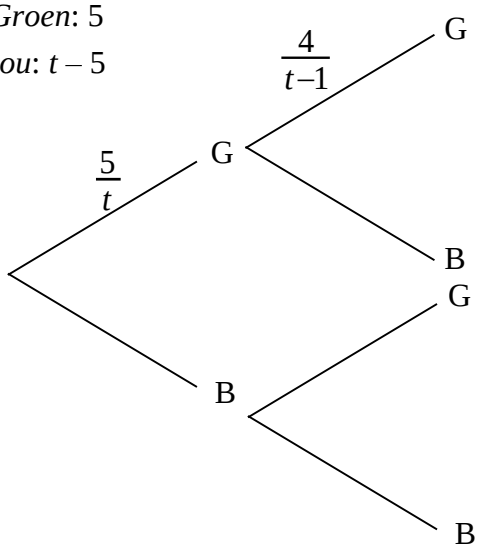
QUESTION 8/*VRAAG 8*

8.1	$i_{eff} = \left(1+\frac{i_{nom}}{m}\right)^{m} - 1$ $= \left(1+\frac{0.095}{12}\right)^{12} - 1$ $= 0{,}099247\ldots$ $\therefore r = 9{,}92\%$	✓ formula / *formule* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
8.2	$A = P(1+i)^n$ $\text{R}764\,050{,}60 = P(1+0{,}08)^5$ $P = \frac{764050.60}{(1+0.08)^5}$ $= \text{R}520\,000$	✓ $A = \text{R}764050{,}60$ ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
8.3.1	$A = \left[28\,000\left(1+\frac{0{,}075}{12}\right)^{48} - \text{R}7\,300\right]\left(1+\frac{0{,}11}{4}\right)^{12}$ $= (\text{R}37\,760{,}78 - \text{R}7\,300)\left(1+\frac{0{,}11}{4}\right)^{12}$ $= \text{R}30\,460{,}78\left(1+\frac{0{,}11}{4}\right)^{12}$ $= \text{R}42\,181{,}59$	✓ $28000\left(1+\frac{0{,}075}{12}\right)^{48}$ ✓ $-\text{R}7\,300$ ✓ $\times\left(1+\frac{0{,}11}{4}\right)^{12}$ ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (5)
8.3.2	$A = P(1+i)^n$ $A = \text{R}42181{,}59\left(1+\frac{0{,}08}{12}\right)^{60}$ $= \text{R}62\,844{,}06$ $\text{R}80\,000 - R62\,844{,}06$ $= \text{R}17155{,}94$ $\therefore A = P(1+i)^n$ $\text{R}17155{,}94 = P\left(1+\frac{0{,}08}{12}\right)^{60}$ $P = \frac{17155{,}94}{\left(1+\frac{0{,}08}{12}\right)^{60}}$ $= \text{R}11515{,}25$ ∴ He needs to deposit R11 515 / *Hy moet* R11 515 *deponeer*	✓ substitution into correct formula *vervanging in korrekte formule* ✓ R62 844,06 ✓ R17 155,964 ✓ method / *metode* ✓ answer / *antwoord* (5) **[16]**

QUESTION 9/*VRAAG 9*

9.1	If A and B are independent, then: *As A en B onafhanklik is, dan*: P(A and/*en* B) = P(A) × P(B) P(A) = 1 – P(not/*nie* A) = 1 – 0,45 = 0,55 $= \frac{11}{20}$ P(A or/*of* B) = P(A) + P(B) – P(A and/*en* B) 0,685 = 0,55 + 0,3 – P(A and/*en* B) ∴P(A and/*en* B) = 0,165 $= \frac{33}{200}$ P(A) × P(B) = 0,55 × 0,3 = 0,165 $= \frac{33}{200}$ ∴ A and B are independent events. / A *en* B *is onafhanklike gebeurtenisse*.	✓ 0,55 ✓ substitution / *vervanging* ✓ answer / *antwoord* ✓ P(A) × P(B) ✓ conclusion / *gevolgtrekking* (5)
9.2.1	 *a* = 10 ; *b* = 13 ; *c* = 8 ; *d* = 14	✓ *a* = 10 ✓ *b* =13 ✓ *c* = 8 ✓ *d* =14 (4)
9.2.2	$\text{P}(\text{A or/}of\ (\text{N and/}en\ \text{R})) = \frac{39}{75} + \frac{5}{75}$ $= \frac{44}{75}$ $\approx 0,59$	✓ $\frac{39}{75}$ ✓ $+\frac{5}{75}$ ✓ answer / *antwoord* (3) **[12]**

QUESTION 10/*VRAAG 10*

10	Let the total number of balls be *t*. *Laat die totale aantal balle t wees.* Green/*Groen*: 5 Blue/*Blou*: $t-5$  $P(GG) = P(G) \times P(G)$ $\frac{5}{t} \times \frac{4}{t-1} = \frac{5}{18}$ $\frac{20}{t(t-1)} = \frac{5}{18}$ $5t^2 - 5t = 360$ $5t^2 - 5t - 360 = 0$ $t^2 - t - 72 = 0$ $(t-9)(t+8) = 0$ $\therefore t = 9$ *or* $t \neq -8$ $\therefore$ There are 9 balls. *Daar is 9 balle.*	✓ $\frac{5}{t}$ ✓and/*en* $\frac{4}{t-1}$ ✓ equation / *vergelyking* ✓ standard form / *standaardvorm* ✓ factorisation / *faktorisering* ✓ $t = 9$ (6)

TOTAL / TOTAAL: 150