Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 12

JUNE/*JUNIE* 2021

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

MARKS/*PUNTE:* **150**

This marking guideline consists of 14 pages./
Hierdie nasienriglyn bestaan uit 14 bladsye.

NOTE/*LET OP*:

- If a candidate answered a question TWICE, mark the FIRST attempt ONLY.
  Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, merk SLEGS die EERSTE poging.
- Consistent accuracy (CA) applies in ALL aspects of the marking guideline.
  Volgehoue akkuraatheid is op 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

$2x(x+1)=0$

$2x=0$ or/of $x+1=0$

$x=0$ or/of $x=-1$

✓ $x=0$

✓ $x=-1$ (2)

1.1.2

$2x(x-3)=1$

$2x^2-6x-1=0$

Penalise 1 mark for incorrect rounding off./ *Penaliseer 1 punt vir verkeerde afronding.*

✓ standard form / *standaardvorm*

$$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$$x=\frac{-(-6)\pm\sqrt{(-6)^2-4(2)(-1)}}{2(2)}$$

✓ substitution / *vervanging*

$$x=\frac{6\pm\sqrt{44}}{4}$$

$\therefore x=3{,}16 \quad or/of \quad x=-0{,}16$

✓✓ x-values / *waardes* (4)

1.1.3

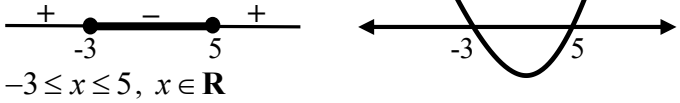
$x^2-2x-15\le 0$

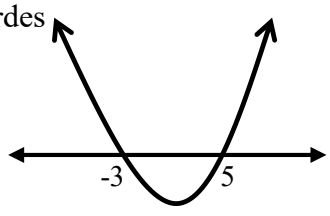
$(x+3)(x-5)\le 0$

✓ factors / *faktore*

critical values/kritieke waardes

$x=-3$ or/of $x=5$





$-3\le x\le 5,\ x\in\mathbf{R}$

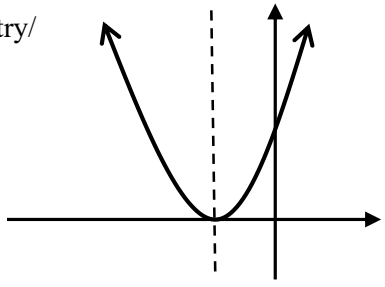
OR/OF

$x\in[-3\ ;\ 5],\ x\in\mathbf{R}$

✓✓ $-3\le x\le 5$ (accuracy/*akkuraatheid*)

OR/OF

$x\in[-3\ ;\ 5]$ (3)

1.1.4	$x=\left(\sqrt{3+a-2\sqrt{a}}\right)^2-\left(\sqrt{a}-1\right)^2$ $=3+a-2\sqrt{a}-\left(a-2\sqrt{a}+1\right)$ $=3+a-2\sqrt{a}-a+2\sqrt{a}-1$ $=2$	✓ $3+a-2\sqrt{a}$ ✓ $a-2\sqrt{a}+1$ ✓ answer / *antwoord* (3)
1.2	$x-2y=3$ .....(1) $4x^2-5xy=3-6y$ .....(2) *From / Vanaf* (1): $x=2y+3$ .....(3) (3) into (2): $4(2y+3)^2-5y(2y+3)=3-6y$ $4(4y^2+12y+9)-10y^2-15y-3+6y=0$ $16y^2+48y+36-10y^2-15y-3+6y=0$ $6y^2+39y+33=0$ $(6y+33)(y+1)=0$ $y=-\frac{33}{6}$ or/of $y=-1$ $y=-\frac{11}{2}$ $x=-8$ or/of $x=1$	✓ $x=2y+3$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ y-values / *waardes* ✓ x-values / *waardes* (6)
1.3.1	*For equal roots / Vir gelyke wortels* $\Delta=0$ $b^2-4ac=0$ $(-p)^2-4(3m)(5)=0$ $p^2-60m=0$ $p^2=60m$ $\therefore m>0 \Rightarrow 3m>0$ $\therefore$ minimum value/*waarde*	✓ $\Delta=0$ ✓ substitution and simplification *vervanging en vereenvoudiging* ✓ $p^2=60$ m ✓ conclusion / *gevolgtrekking* (4)
1.3.2	Consider axis of symmetry/ *Vir simmetrie-as* $x=\frac{-b}{2a}=\frac{-(+)}{2(+)}=-ve$ 	✓ method / *metode* ✓ correct sketch / *korrekte skets* (2)
		[24]

QUESTION 2/*VRAAG 2*		
2.1	$23\ ;\ 21\ ;\ 19\ ;\ \ldots\ ;\ -47$ $a = 23$ and/en $d = -2$ $T_n = a + (n-1)d$ $-47 = 23 + (n-1)(-2)$ $-47 = 25 - 2n$ $2n = 72$ $n = 36$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
2.2.1	$T_2 - T_1 = T_3 - T_2$ $(x+5) - (3x-1) = (2x-4) - (x+5)$ $x + 5 - 3x + 1 = 2x - 4 - x - 5$ $-2x + 6 = x - 9$ $15 = 3x$ $\therefore x = 5$	✓ method / *metode* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
2.2.2	$T_1 = 14\ \ ;\ \ T_2 = 10\ \ ;\ \ T_3 = 6$ $d = -4$ $S_n = \frac{n}{2}\left[2a + (n-1)d\right]$ $0 = \frac{n}{2}\left[2(14) + (n-1)(-4)\right]$ $0 = \frac{n}{2}\left[32 - 4n\right]$ $0 = -2n^2 + 16n$ $0 = -2n(n-8)$ $\therefore n \neq 0$ or / *of* $n = 8$	✓ first term and common difference / *eerste term en gemene verskil* ✓ substituting S_n, a and d / *vervanging* S_n, a en d ✓ standard form / *standaardvorm* ✓ answer / *antwoord* (4)
2.3.1	$25\ ;\ 48\ ;\ 69\ ;\ 88\ ;\ x\ ;\ y$ 1^{st} *difference pattern* / 1^{ste} *verskille patroon*: $23\ ;\ 21\ ;\ 19\ ;\ 17\ ;\ 15...$ $\therefore x = 105$ *and* / *en* $y = 120$	✓ $x = 105$ ✓ $y = 120$ (2)

2.3.2	$2a=-2 \quad 3a+b=23 \quad a+b+c=25$ $a=-1 \quad 3(-1)+b=23 \quad (-1)+(26)+c=25$ $b=26 \quad c=0$ $\therefore\ T_n=-n^2+26n$	✓ value of a / *waarde van a* ✓ value of b / *waarde van b* ✓ value of c / *waarde van c* ✓ answer / *antwoord* **(✓✓✓✓ can be awarded at formula / *kan by formule toegeken word*)** (4)
2.3.3	$n=\frac{-b}{2a} \quad T_{13}=-(13)^2+26(13)$ $=\frac{-(26)}{2(-1)} \quad =169$ $=13$	✓ method / *metode* ✓ $n = 13$ ✓ answer / *antwoord* ($T_{13} = 169$) (3)
2.4	$\sum_{k=1}^{3}\left(a\times 2^{k-1}\right)=28$ $a+2a+4a=28$ $7a=28$ $a=4$ **OR/OF** $S_n=\frac{a\left(2^3-1\right)}{2-1}=28$ $7a=28$ $a=4$	✓ expanding / *uitbreiding* ✓ answer / *antwoord* (2) ✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
		[20]

QUESTION 3/*VRAAG 3*		
3.1	$A_{level1} = 1 \times \pi R^2$ $A_{level2} = 2 \times \pi \left(\frac{1}{2}R\right)^2 = \frac{1}{2}\pi R^2$ $A_{level3} = 4 \times \pi \left(\frac{1}{4}R\right)^2 = \frac{1}{4}\pi R^2$ $A_{level4} = 8 \times \pi \left(\frac{1}{8}R\right)^2 = \frac{1}{8}\pi R^2 \ / \ 0,39R^2$ **OR / OF** $a = \pi R^2 \quad ; \quad r = \frac{1}{2}$ $T_4 = (\pi R^2)\left(\frac{1}{2}\right)^3 = \frac{1}{8}\pi R^2 \ / \ 0,39R^2$ **OR / OF** $A_{level4} = 8 \times \pi \left(\frac{1}{8}R\right)^2$ $= \frac{1}{8}\pi R^2 \ / \ 0,39R^2$	✓✓✓ Areas for levels 1 to 3 *Oppervlaktes vir vlakke 1 tot 3* ✓ answer / *antwoord* (4) ✓ value of a / *waarde van a* ✓ value of r / *waarde van r* ✓ substitution / *vervanging* ✓ answer / *antwoord* (4) If this option is given: *As hierdie opsie gegee word:* ✓ 8 ✓ $\frac{1}{8}R$ ✓✓ answer / *antwoord* (4)
3.2	$S_\infty = \frac{a}{1-r}$ $= \frac{\pi R^2}{1-\frac{1}{2}}$ $= 2\pi R^2 \ / \ 6,28R^2$	✓ formula / *formule* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
		[7]

QUESTION 4/*VRAAG 4*		
4.1	$-x^2-4x+5=0$ $x^2+4x-5=0$ $(x+5)(x-1)=0$ $x=-5$ *or / of* $x=1$ M(0 ; 5) E(-5 ; 0) P(1 ; 0)	✓ solving for *x*-intercepts / *oplossing vir x-afsnitte* ✓ M(0 ; 5) ✓ E(-5 ; 0) ✓ P(1 ; 0) (4)
4.2	$x=\frac{(-5+1)}{2}=-2$ *or / of* $x=\frac{-(-4)}{2(-1)}=-2$ $y=-(-2)^2-4(-2)+5=9$ $\therefore\ N(-2;9)$	✓ *x*-value / x-waarde ✓ substitution / *vervanging* ✓ *y*-value / *y-waarde* (3)
4.3	$a=1$ and/*en* $q=5$	✓ $a=1$ ✓ $q=5$ (2)
4.4	Length of ND = 9 / *Lengte van* ND = 9 (from/*vanaf* 4.2) y = *x* + 5 = -2 + 5 = 3 ∴ length of TD = 3 / *Lengte van* TD = 3 NT = ND – TD = 9 – 3 = 6	✓ ND = 9 ✓ TD = 3 ✓ NT = 6 (3)
4.5	S(-4 ; 5) $m=f'(-4)$ $=-2(-4)-4$ $=4$ $y-5=4(x+4)$ $y=4x+21$	✓ coordinates of S / *koördinate van S* ✓ $m=f'(-4)$ ✓ $m=4$ ✓ substitution / *vervanging* ✓ answer / *antwoord* (5)
		[17]

QUESTION 5/*VRAAG 5*		
5.1	A(1 ; 0)	✓ answer / *antwoord* (1)
5.2	$f(x)=\frac{k}{x}$ $\quad g(x)=\log_p x$ $2=\frac{k}{3}$ $\quad 2=\log_p 9$ $k=6$ $\quad p^2=9 \Rightarrow p=3$	✓ $k=6$ ✓ $p^2=9$ ✓ $p=3$ (3)
5.3	$y=\log_3 x$ $g^{-1}: x=\log_3 y$ $\therefore\ y=3^x$ Answer only: Full marks *Slegs antwoord: Volpunte*	✓ interchanging x and y *omruil van x en y* ✓ answer / *antwoord* (2)
5.4	Range of / *Terrein van* g^{-1} $y>0\ ;\ y\in\mathbf{R}$	✓✓ answer / *antwoord* (2)
5.5	$\frac{6}{x}=\log_3 x+1$ (3 ; 1) will be a point on *g / sal 'n punt op g wees* $g(x)+1$ will intersect f at (3 ; 2) / $g(x)+1$ *sny f by (3 ; 2)* $\therefore x=3$	✓ (3 ; 1) point on *g / punt op g* ✓ answer / *antwoord* (2)
		[10]

QUESTION 6/*VRAAG 6*		
6.1	$g(x)=(x+2)(y+3)=k$ $(y+3)=\frac{k}{(x+2)}$ $y=\frac{k}{(x+2)}-3$ x = -2 (vertical asymptote / *vertikale asimptoot*) y = -3 (horizontal asymptote / *horisontale asimptoot*)	✓ standard form / *standaardvorm* ✓ x = -2 ✓ y = -3 (3)
6.2	$-\frac{5}{2}=\frac{k}{0+2}-3$ $\frac{1}{2}=\frac{k}{2}$ $\therefore k=1$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
6.3	$y=-(x+2)-3$ $y=-x-5$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
		[7]

QUESTION 7/*VRAAG 7*		
7.1	$1+i_{eff}=\left(1+\frac{i_{nom}}{n}\right)^n$ $i_{eff}=\left(1+\frac{8,9\%}{12}\right)^{12}-1$ $i_{eff}=0,09272172701$ $\therefore effective\,rate\,/\,effektiewe\,koers=9,27\%\,p.a.$ **OR/OF** $A=100\left(1+\frac{8,9}{1200}\right)^{12}$ $=109,27$ $\therefore effective\,rate\,/\,effektiewe\,koers$ $=109,27-100$ $=9,27\%$	✓ formula / *formule* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3) ✓ formula / *formule* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)

7.2

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

$2 = 1\left(1+\frac{12,6\%}{12}\right)^{n\times 12}$ ✓ substitution / *vervanging*

$\log 2 = 12n\log\left(1+\frac{12,6\%}{12}\right)$ ✓ use of logs / *gebruik van logs*

$12n = \frac{\log 2}{\log\left(1+\frac{12,6\%}{12}\right)}$ ✓ solving for n / *los op vir n*

$12n = 66,36$

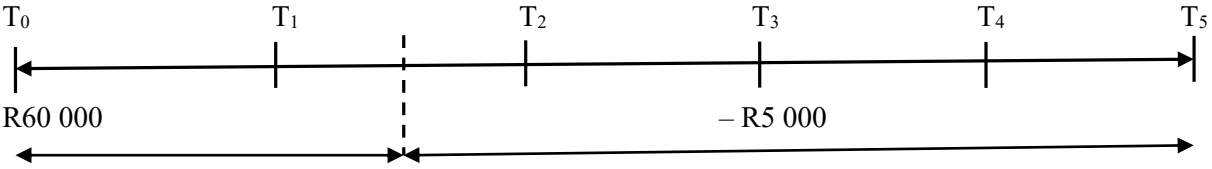
$67\ months$ / $maande$

OR / OF

✓ answer / *antwoord*

$n = 5\ years\ 7\ months$ / $5\ jaar\ 7 maande$ (4)

7.3



$A = 60000\left(1+\frac{7\%}{4}\right)^6\left(1+\frac{5\%}{12}\right)^{42} - 5000\left(1+\frac{5\%}{12}\right)^{24}$

$= R73762,19$

✓ $n = 6$ ✓ $n = 42$ and/*en* $n = 24$

✓ $\frac{7\%}{4}$ and/*en* $\frac{5\%}{12}$

✓ $60000\left(1+\frac{7\%}{4}\right)^6$

✓ $60000\left(1+\frac{7\%}{4}\right)^6\left(1+\frac{5\%}{12}\right)^{42}$

✓ $-5000\left(1+\frac{5\%}{12}\right)^{24}$

✓ answer / *antwoord* (7)

OR/OF

$A = 60000\left(1+\frac{7\%}{4}\right)^6$

$= R66582,14$

$A = 66582,14\left(1+\frac{5\%}{12}\right)^{18}$

$= R71756,65$

✓ $n = 6$

✓ $R66582,14$

✓ $n = 18$ and/*en* $n = 24$

✓ $\frac{7\%}{4}$ and/*en* $\frac{5\%}{12}$

✓ $R71756,65$

Balance after withdrawal / *Balans na onttrekking*

$R71756,65 - R5000 = R66756,65$

✓ subtraction / *aftrekking*

✓ final answer / *finale antwoord* (7)

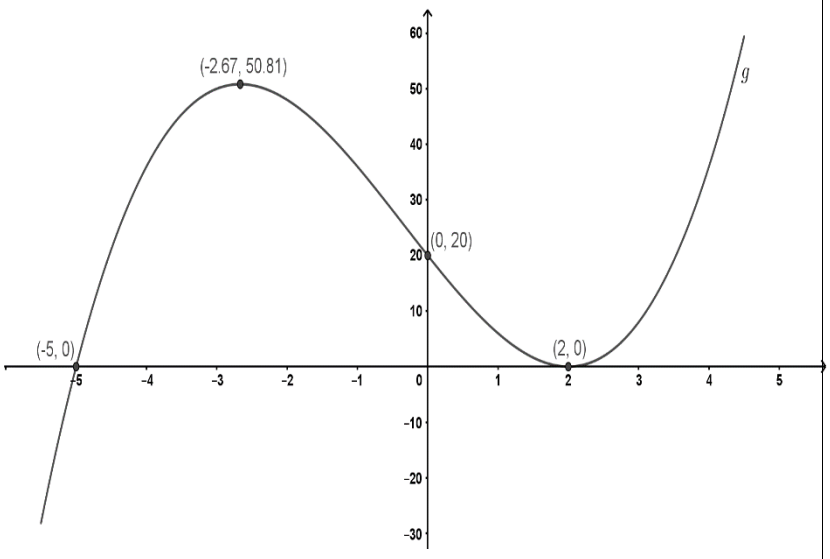
$A = 66756,65\left(1+\frac{5\%}{12}\right)^{24}$

$= R73762,18$

Penalise 1 mark for incorrect notation in the question
Penaliseer 1 punt vir verkeerde notasie in die vraag

[14]

QUESTION 8/*VRAAG 8*		
8.1	$f(x) = -7x^2$ $f(x+h) = -7(x+h)^2$ $= -7(x^2 + 2xh + h^2)$ $= -7x^2 - 14xh - 7h^2$ $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h\to 0} \frac{-7x^2 - 14xh - 7h^2 + 7x^2}{h}$ $= \lim_{h\to 0} \frac{-14xh - 7h^2}{h}$ $= \lim_{h\to 0} \frac{h(-14x - 7h)}{h}$ $= \lim_{h\to 0} (-14x - 7h)$ $= -14x$ Answer ONLY: 0 marks *SLEGS antwoord: 0 punte*	✓ $-7x^2 - 14xh - 7h^2$ ✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (4)
8.2.1	$y = -\frac{1}{x^4} + \sqrt{x}$ $y = -x^{-4} + x^{\frac{1}{2}}$ $\therefore \frac{dy}{dx} = 4x^{-5} + \frac{1}{2}x^{-\frac{1}{2}}$	✓ $-x^{-4} + x^{\frac{1}{2}}$ ✓ $4x^{-5}$ ✓ $\frac{1}{2}x^{-\frac{1}{2}}$ (3)
8.2.2	$y = \frac{x-4}{x^{\frac{1}{2}} - 2}$ $= \frac{\left(x^{\frac{1}{2}} + 2\right)\left(x^{\frac{1}{2}} - 2\right)}{\left(x^{\frac{1}{2}} - 2\right)}$ $= \left(x^{\frac{1}{2}} + 2\right)$ $\frac{dy}{dx} = \frac{1}{2}x^{-\frac{1}{2}}$	✓ $\left(x^{\frac{1}{2}} + 2\right)\left(x^{\frac{1}{2}} - 2\right)$ ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (3)
		[10]

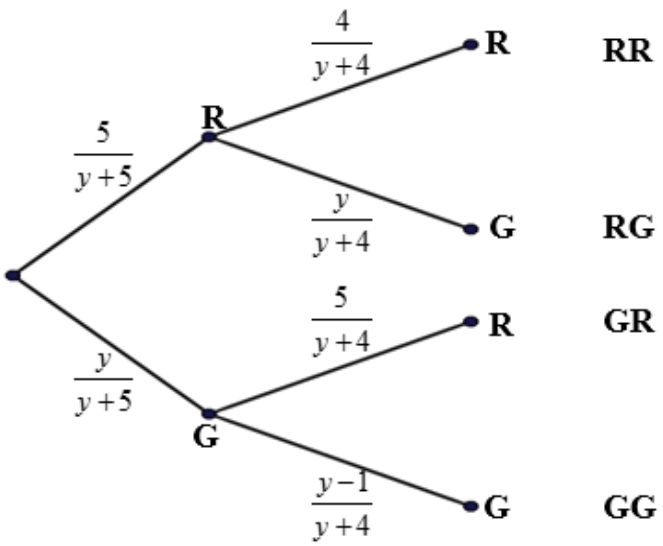
QUESTION 9/*VRAAG 9*		
9.1	$g(-5)=(-5)^3+(-5)^2-16(-5)+20$ $=-125+25+80+20$ $=0$ $\therefore (x+5)$ *is a factor / is 'n faktor*	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
9.2	$g(x)=x^3+x^2-16x+20$ $=(x+5)(x^2-4x+4)$ $=(x+5)(x-2)(x-2)$ $\therefore x=-5$ or / *of* $x=2$ or / *of* $x=2$	✓ (x^2-4x+4) ✓ $(x-2)(x-2)$ ✓ x-intercepts / x-afsnitte (3)
9.3	$g'(x)=3x^2+2x-16=0$ $(3x+8)(x-2)=0$ $3x+8=0$ or/of $x-2=0$ $x=-\frac{8}{3}$ or / *of* $x=2$ $y=50,81$ or / *of* $y=0$	✓ $g'(x)$ ✓ factors / *faktore* ✓ x-values / x-waardes ✓ y-values / y-waardes (4)
9.4		✓ intercepts with the axes *afsnitte met die asse* ✓ turning points / *draaipunte* ✓ shape / *vorm* (3)

9.5	$g''(x) = 6x + 2$ $g''(0) = 6(0) + 2$ $= 2 > 0$ $\therefore$ concave up / *konkaaf opwaarts* **OR / OF** $g''(x) = 6x + 2 = 0$ $x = -\frac{1}{3}$ (x-coordinate of point of inflection) $(x - koördinaat\ van\ die$ infleksiepunt$)$ *but*/maar: $0 > -\frac{1}{3} \Rightarrow$ *concave up to the right of* $-\frac{1}{3}$ *konkaaf opwaarts regs van* $-\frac{1}{3}$	✓ $g''(x)$ ✓ substitution / *vervanging* ✓ conclusion / *gevolgtrekking* ✓ $g''(x)$ ✓ $x = -\frac{1}{3}$ ✓ conclusion / *gevolgtrekking* (3)
9.6	$x \in \left[-\frac{8}{3}\ ;\ 0\right]$ *or / of* $x \in [2\ ;\ \infty)$ **OR/OF** $-\frac{8}{3} \le x \le 0$ or/*of* $x \ge 2$	✓ $x \in \left[-\frac{8}{3}\ ;\ 0\right]$ ✓ $x \in [2\ ;\ \infty)$ ✓ *or / of* ✓ $-\frac{8}{3} \le x \le 0$ ✓ $x \ge 2$ ✓ *or / of* (3)
		[18]

QUESTION 10/*VRAAG 10*

10.1	*Money raised / Geld ingesamel* $= x \times \left(47 - \frac{1}{3}x\right)$ $= 47x - \frac{1}{3}x^2$	✓ multiplication / *vermenigvuldiging* ✓ answer / *antwoord* (2)
10.2	Profit / *Wins* $= \left(47x - \frac{1}{3}x^2\right) - \left(\frac{1}{5}x^2 + 15x + 10\right)$ $= 47x - \frac{1}{3}x^2 - \frac{1}{5}x^2 - 15x - 10$ $= -\frac{8}{15}x^2 + 32x - 10$ $P'(x) = -\frac{16}{15}x + 32 = 0$ $\therefore\ x = 30$	✓ method / *metode* ✓ substitution and simplification *vervanging en vereenvoudiging* ✓ answer / *antwoord* ✓ $P'(x) = 0$ ✓ answer / *antwoord* (5)
		[7]

QUESTION 11/*VRAAG 11*

11.1.1	$P(A \text{ or/}of\ B) = P(A) + P(B) - P(A \text{ and/en } B)$ $= 0,5 + 0,4 - 0,2$ $= 0,7$	✓ P(B) = 0,4 ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
11.1.2	$P(A \text{ and/}en\ B) = 0,2$ $P(A) \times P(B)$ $= 0,5 \times 0,4$ $= 0,2$ $\therefore$ *Agree / Stem saam*: $P(A \text{ and/}en\ B) = P(A) \times P(B)$	✓ P(A) x P(B) = 0,2 ✓ answer / *antwoord* ✓ reason / *rede* (Use of independent rule) (*Gebruik van onafhanklikheidsreël*) (3)
11.2.1	P(R or/of G) = 1 **OR/OF** (100%)	✓ answer / *antwoord* (1)
11.2.2		✓ first branch with labels *eerste tak met byskrifte* ✓ second branch with labels *tweede tak met byskrifte* ✓ third branch with labels *derde tak met byskrifte* ✓ outcomes / *uitkomste* (4)
11.2.3	$\left(\frac{5}{y+5} \times \frac{4}{y+4}\right) + \left(\frac{y}{y+5} \times \frac{y-1}{y+4}\right) = \frac{31}{66}$ $\frac{20}{(y+5)(y+4)} + \frac{y(y-1)}{(y+5)(y+4)} = \frac{31}{66}$ $\frac{y^2 - y + 20}{y^2 + 9y + 20} = \frac{31}{66}$ $66y^2 - 66y + 1320 = 31y^2 + 279y + 620$ $35y^2 - 345y + 700 = 0$ $(35y + 100)(y - 7) = 0$ $y \neq -\frac{100}{35}$ or/*of* $y = 7$	✓ method / *metode* ✓ multiplying / *vermenigvuldiging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ answer / *antwoord* (5)
		[16]
		TOTAL/*TOTAAL*: 150