

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

JUNE/JUNIE 2021

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

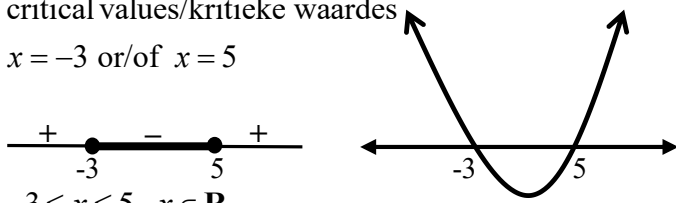
MARKS/PUNTE: 150

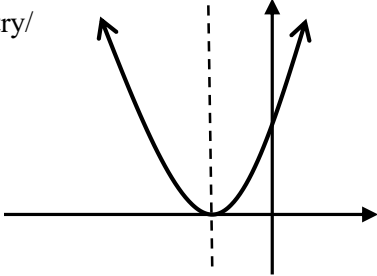
This marking guideline consists of 14 pages./
Hierdie nasienriglyn bestaan uit 14 bladsye.

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 $x = -1$	$\checkmark x = 0$ $\checkmark x = -1$ (2)
1.1.2	$2x(x-3) = 1$ $2x^2 - 6x - 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(2)(-1)}}{2(2)}$ $x = \frac{6 \pm \sqrt{44}}{4}$ $\therefore x = 3,16$ or / of $x = -0,16$	Penalise 1 mark for incorrect rounding off./ Penaliseer 1 punt vir verkeerde afronding. $\checkmark$ standard form / <i>standaardvorm</i> $\checkmark$ substitution / <i>vervanging</i> $\checkmark\checkmark$ x-values / <i>waardes</i> (4)
1.1.3	$x^2 - 2x - 15 \leq 0$ $(x+3)(x-5) \leq 0$ critical values/kritieke waardes $x = -3$ or/of $x = 5$  $-3 \leq x \leq 5, x \in \mathbf{R}$ OR/OF $x \in [-3; 5], x \in \mathbf{R}$	$\checkmark$ factors / <i>faktore</i> $\checkmark\checkmark -3 \leq x \leq 5$ (accuracy/ <i>akkuraatheid</i>) OR/OF $x \in [-3; 5]$ (3)

1.1.4	$x = \left(\sqrt{3+a-2\sqrt{a}} \right)^2 - (\sqrt{a}-1)^2$ $= 3+a-2\sqrt{a} - (a-2\sqrt{a}+1)$ $= 3+a-2\sqrt{a}-a+2\sqrt{a}-1$ $= 2$	✓ $3+a-2\sqrt{a}$ ✓ $a-2\sqrt{a}+1$ ✓ answer / antwoord
		(3)
1.2	$x-2y=3$(1) $4x^2-5xy=3-6y$(2) <i>From / Vanaf (1):</i> $x=2y+3$(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	<i>For equal roots / Vir gelyke wortels</i> $\Delta=0$ $b^2-4ac=0$ $(-p)^2-4(3m)(5)=0$ $p^2-60m=0$ $p^2=60m$ $\therefore m>0 \Rightarrow 3m>0$ $\therefore$ minimum value/waarde	✓ $\Delta=0$ ✓ substitution and simplification <i>vervanging en vereenvoudiging</i> ✓ $p^2=60m$ ✓ conclusion / gevolgtrekking
		(4)
1.3.2	Consider axis of symmetry/ <i>Vir simmetrie-as</i> $x = \frac{-b}{2a} = \frac{-(+)}{2(+)} = -ve$	
		✓ method / metode ✓ correct sketch / korrekte skets
		(2)
		[24]

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

2.3.2	$2a = -2$ $3a + b = 23$ $a + b + c = 25$ $a = -1$ $3(-1) + b = 23$ $(-1) + (26) + c = 25$ $b = 26$ $c = 0$ $\therefore T_n = -n^2 + 26n$	✓ 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	$n = \frac{-b}{2a}$ $T_{13} = -(13)^2 + 26(13)$ $= \frac{-(26)}{2(-1)}$ $= 169$ $= 13$	✓ method / metode ✓ $n = 13$ ✓ answer / antwoord ($T_{13} = 169$) (3)
2.4	$\sum_{k=1}^3 (a \times 2^{k-1}) = 28$ $a + 2a + 4a = 28$ $7a = 28$ $a = 4$ OR/OF $S_n = \frac{a(2^3 - 1)}{2 - 1} = 28$ $7a = 28$ $a = 4$	✓ expanding / uitbreiding ✓ answer / antwoord (2) ✓ substitution / vervanging ✓ answer / antwoord (2)
		[20]

QUESTION 3/VRAAG 3		
3.1	$A_{\text{level } 1} = 1 \times \pi R^2$ $A_{\text{level } 2} = 2 \times \pi \left(\frac{1}{2} R\right)^2 = \frac{1}{2} \pi R^2$ $A_{\text{level } 3} = 4 \times \pi \left(\frac{1}{4} R\right)^2 = \frac{1}{4} \pi R^2$ $A_{\text{level } 4} = 8 \times \pi \left(\frac{1}{8} R\right)^2 = \frac{1}{8} \pi R^2 / 0,39 R^2$ OR / OF $a = \pi R^2 \quad ; \quad r = \frac{1}{2}$ $T_4 = (\pi R^2) \left(\frac{1}{2}\right)^3 = \frac{1}{8} \pi R^2 / 0,39 R^2$ OR / OF $A_{\text{level } 4} = 8 \times \pi \left(\frac{1}{8} R\right)^2$ $= \frac{1}{8} \pi R^2 / 0,39 R^2$	✓✓✓ Areas for levels 1 to 3 <i>Oppervlaktes vir vlakke 1 tot 3</i> ✓ answer / <i>antwoord</i> (4) ✓ value of a / <i>waarde van a</i> ✓ value of r / <i>waarde van r</i> ✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> (4) If this option is given: <i>As hierdie opsie gegee word:</i> ✓ 8 ✓ $\frac{1}{8} R$ ✓✓ answer / <i>antwoord</i> (4)
3.2	$S_{\infty} = \frac{a}{1-r}$ $= \frac{\pi R^2}{1-\frac{1}{2}}$ $= 2\pi R^2 / 6,28 R^2$	✓ formula / <i>formule</i> ✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> (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 / <i>Lengte van ND = 9</i> (from/vanaf 4.2) $y = x + 5$ $= -2 + 5$ $= 3$ $\therefore$ length of TD = 3 / <i>Lengte van TD = 3</i> 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 / <i>koördinate van S</i> ✓ $m = f'(-4)$ ✓ $m = 4$ ✓ substitution / vervanging ✓ answer / <i>antwoord</i> (5)
		[17]

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

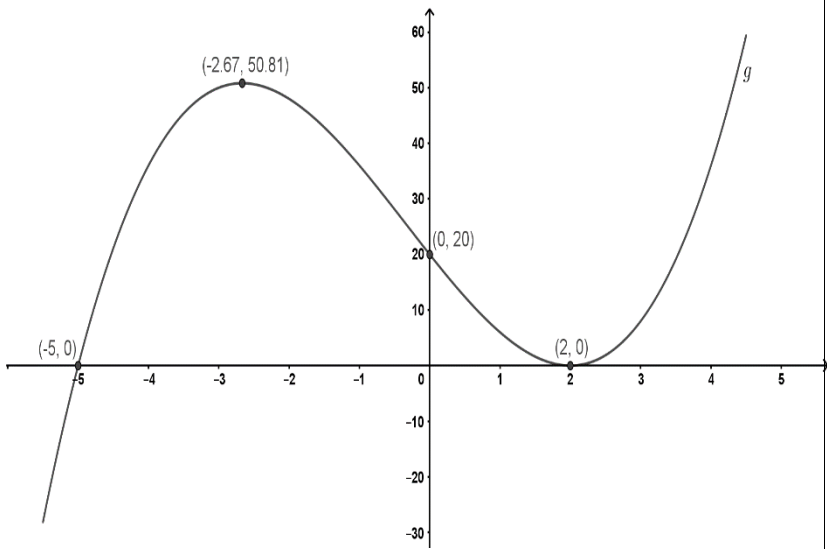
QUESTION 6/VRAAG 6		
6.1	$g(x) = (x+2)(y+3) = k$ $(y+3) = \frac{k}{(x+2)}$ $y = \frac{k}{(x+2)} - 3$ $x = -2$ (vertical asymptote / <i>vertikale asimptoot</i>) $y = -3$ (horizontal asymptote / <i>horisontale asimptoot</i>)	✓ standard form / <i>standaardvorm</i> ✓ $x = -2$ ✓ $y = -3$ (3)
6.2	$-\frac{5}{2} = \frac{k}{0+2} - 3$ $\frac{1}{2} = \frac{k}{2}$ $\therefore k = 1$	✓ substitution / <i>vervang</i> ✓ answer / <i>antwoord</i> (2)
6.3	$y = -(x+2) - 3$ $y = -x - 5$	✓ substitution / <i>vervang</i> ✓ answer / <i>antwoord</i> (2)
[7]		
QUESTION 7/VRAAG 7		
7.1	$1 + i_{\text{eff}} = \left(1 + \frac{i_{\text{nom}}}{n}\right)^n$ $i_{\text{eff}} = \left(1 + \frac{8,9\%}{12}\right)^{12} - 1$ $i_{\text{eff}} = 0,09272172701$ $\therefore$ effective rate / <i>effektiewe koers</i> = 9,27% p.a. OR/OF $A = 100 \left(1 + \frac{8,9}{1200}\right)^{12}$ $= 109,27$ $\therefore$ effective rate / <i>effektiewe koers</i> $= 109,27 - 100$ $= 9,27\%$	✓ formula / <i>formule</i> ✓ substitution / <i>vervang</i> ✓ answer / <i>antwoord</i> (3) ✓ formula / <i>formule</i> ✓ substitution / <i>vervang</i> ✓ answer / <i>antwoord</i> (3)

7.2	$A = P(1+i)^n$ $2 = 1\left(1 + \frac{12,6\%}{12}\right)^{n \times 12}$ $\log 2 = 12n \log\left(1 + \frac{12,6\%}{12}\right)$ $12n = \frac{\log 2}{\log\left(1 + \frac{12,6\%}{12}\right)}$ $12n = 66,36$ 67 months / maande OR / OF $n = 5 \text{ years } 7 \text{ months} / 5 \text{ jaar } 7 \text{ maande}$	✓ substitution / vervanging ✓ use of logs / gebruik van logs ✓ solving for n / los op vir n ✓ answer / antwoord
7.3	7% p.a. compounded quarterly/kwartaalliks saamgestel 5% p.a. compounded monthly/maandeliks saamgestel	
	$A = 60\,000\left(1 + \frac{7\%}{4}\right)^6 \left(1 + \frac{5\%}{12}\right)^{42} - 5\,000\left(1 + \frac{5\%}{12}\right)^{24}$ $= R73\,762,19$ OR/OF $A = 60\,000\left(1 + \frac{7\%}{4}\right)^6$ $= R66\,582,14$ $A = 66\,582,14\left(1 + \frac{5\%}{12}\right)^{18}$ $= R71\,756,65$ Balance after withdrawal / Balans na onttrekking $R71\,756,65 - R5\,000 = R66\,756,65$ $A = 66\,756,65\left(1 + \frac{5\%}{12}\right)^{24}$ $= R73\,762,18$	✓ $n = 6$ ✓ $n = 42$ and/en $n = 24$ ✓ $\frac{7\%}{4}$ and/en $\frac{5\%}{12}$ ✓ $60\,000\left(1 + \frac{7\%}{4}\right)^6$ ✓ $60\,000\left(1 + \frac{7\%}{4}\right)^6 \left(1 + \frac{5\%}{12}\right)^{42}$ ✓ $-5\,000\left(1 + \frac{5\%}{12}\right)^{24}$ ✓ answer / antwoord (7) ✓ $n = 6$ ✓ $R66\,582,14$ ✓ $n = 18$ and/en $n = 24$ ✓ $\frac{7\%}{4}$ and/en $\frac{5\%}{12}$ ✓ $R71\,756,65$ ✓ subtraction / aftrekking ✓ final answer / finale antwoord (7)

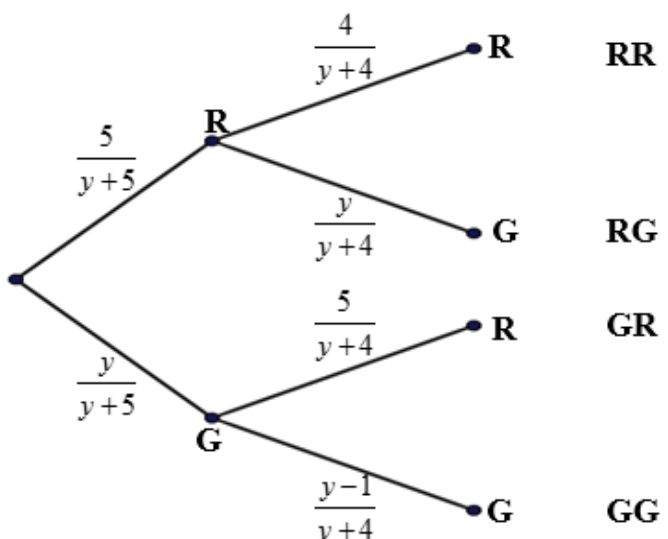
Penalise 1 mark for incorrect notation in the question
 Penaliseer 1 punt vir verkeerde notasie in die vraag

[14]

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

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

9.5	$g''(x) = 6x + 2$ $g''(0) = 6(0) + 2$ $= 2 > 0$ $\therefore$ concave up / <i>konkaaf opwaarts</i> OR / OF $g''(x) = 6x + 2 = 0$ $x = -\frac{1}{3}$ (x-coordinate of point of inflection) <i>(x – koördinaat van die infleksiepunt)</i> <i>but/maar: $0 > -\frac{1}{3} \Rightarrow$ concave up to the right of $-\frac{1}{3}$</i> <i>konkaaf opwaarts regs van $-\frac{1}{3}$</i>	$\checkmark g''(x)$ $\checkmark$ substitution / <i>vervang</i> $\checkmark$ conclusion / <i>gevolgtrekking</i> $\checkmark g''(x)$ $\checkmark x = -\frac{1}{3}$ $\checkmark$ conclusion / <i>gevolgtrekking</i> (3)
9.6	$x \in \left[-\frac{8}{3}; 0\right]$ or / of $x \in [2; \infty)$ OR/OF $-\frac{8}{3} \leq x \leq 0$ or / of $x \geq 2$	$\checkmark x \in \left[-\frac{8}{3}; 0\right]$ $\checkmark x \in [2; \infty)$ $\checkmark$ or / of $\checkmark -\frac{8}{3} \leq x \leq 0$ $\checkmark x \geq 2$ $\checkmark$ or / of (3)
		[18]
QUESTION 10/VRAAG 10		
10.1	<i>Money raised / Geld ingesamel</i> $= x \times \left(47 - \frac{1}{3}x\right)$ $= 47x - \frac{1}{3}x^2$	$\checkmark$ multiplication / <i>vermenigvuldiging</i> $\checkmark$ answer / <i>antwoord</i> (2)
10.2	<i>Profit / Wins</i> $= \left(47x - \frac{1}{3}x^2\right) - \left(\frac{1}{5}x^2 + 15x + 10\right)$ $= 47x - \frac{1}{3}x^2 - \frac{1}{5}x^2 - 15x - 10$ $= -\frac{8}{15}x^2 + 32x - 10$ $P'(x) = -\frac{16}{15}x + 32 = 0$ $\therefore x = 30$	$\checkmark$ method / <i>metode</i> $\checkmark$ substitution and simplification <i>vervang en vereenvoudiging</i> $\checkmark$ answer / <i>antwoord</i> $\checkmark P'(x) = 0$ $\checkmark$ answer / <i>antwoord</i> (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 / <i>vervanging</i> ✓ answer / <i>antwoord</i> (3)
11.1.2	$P(A \text{ and/en } B) = 0,2$ $P(A) \times P(B)$ $= 0,5 \times 0,4$ $= 0,2$ $\therefore \text{Agree / Stem saam :}$ $P(A \text{ and/en } B) = P(A) \times P(B)$	✓ $P(A) \times P(B) = 0,2$ ✓ answer / <i>antwoord</i> ✓ reason / <i>rede</i> (Use of independent rule) (Gebruik van onafhankelijkheidsreël) (3)
11.2.1	$P(R \text{ or/of } G) = 1$ OR/OF (100%)	✓ answer / <i>antwoord</i> (1)
11.2.2		✓ first branch with labels <i>eerste tak met byskrifte</i> ✓ second branch with labels <i>tweede tak met byskrifte</i> ✓ third branch with labels <i>derde tak met byskrifte</i> ✓ outcomes / <i>uitkomst</i> (4)
11.2.3	$\left(\frac{5}{y+5} \times \frac{4}{y+4} \right) + \left(\frac{y}{y+5} \times \frac{y-1}{y+4} \right) = \frac{31}{66}$ $\frac{20}{(y+5)(y+4)} + \frac{y(y-1)}{(y+5)(y+4)} = \frac{31}{66}$ $\frac{y^2 - y + 20}{y^2 + 9y + 20} = \frac{31}{66}$ $66y^2 - 66y + 1320 = 31y^2 + 279y + 620$ $35y^2 - 345y + 700 = 0$ $(35y + 100)(y - 7) = 0$ $y \neq -\frac{100}{35} \text{ or/of } y = 7$	✓ method / <i>metode</i> ✓ multiplying / <i>vermenigvuldiging</i> ✓ standard form / <i>standaardvorm</i> ✓ factors / <i>faktore</i> ✓ answer / <i>antwoord</i> (5)
		[16]
		TOTAL/TOTAAL: 150