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GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG DEPARTMENT OF EDUCATION/

GAUTENGSE DEPARTEMENT VAN ONDERWYS

JUNE EXAMINATION/
JUNIE EKSAMEN 2022

MARKING GUIDELINES/
NASIENRIGLYNE

MATHEMATICS/ *WISKUNDE*
(PAPER/ *VRAESTEL* 1) (10611)

BILINGUAL/*TWEETALIG*

17 pages/ *bladsye*

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NOTE/*LET OP*:

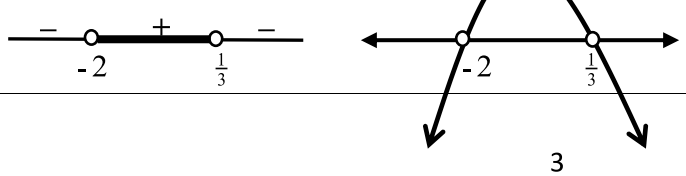
- If a candidate answered a question TWICE, mark the FIRST attempt ONLY.
  Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, merk SLEGS die EERSTE poging.
- Consistent accuracy(CA) applies in ALL aspects of the marking guidelines.
  Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die nasienriglyne.
- 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/*VRAAG* 1

1.1.1	$x^2 = -4x$ $x^2 + 4x = 0$ $x(x+4) = 0$ $x = 0$ or/*of* $x + 4 = 0$ $x = 0$ or/*of* $x = -4$ **OR / *OF*** $x^2 + 4x = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-4 \pm \sqrt{(4)^2 - 4(1)(0)}}{2(1)}$ $x = 0$ or / *of* $x = -4$ Answers only – Full marks *Slegs antwoorde – Volpunte*	✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ both answers / *beide antwoorde* **OR / *OF*** ✓ standard form / *standaardvorm* ✓ correct substitution into correct formula / *korrekte vervanging in korrekte formule* ✓ both answers / *beide antwoorde* (3)

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1.1.2	$x^2+x-1=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-(1)\pm\sqrt{(1)^2-4(1)(-1)}}{2(1)}$ $x=\frac{-1\pm\sqrt{5}}{2}$ $\therefore x=0,62 \quad \text{or/}of \quad x=-1,62$ Penalise 1 mark for incorrect rounding off./ *Penaliseer* 1 *punt vir verkeerde afronding.*	✓ substitution / *vervanging* ✓✓ x-values / *waardes* (3)
1.1.3	$\sqrt{x+4}-\frac{4}{\sqrt{x-2}}=0$ $\sqrt{x+4}=\frac{4}{\sqrt{x-2}}$ $\left(\sqrt{x+4}\right)^2=\left(\frac{4}{\sqrt{x-2}}\right)^2$ $x+4=\frac{16}{x-2}$ $(x+4)(x-2)=16$ $x^2+2x-24=0$ $(x+6)(x-4)=0$ $\therefore x\neq -6 \ \ or/of \ \ x=4$ OR $\sqrt{x+4}=\frac{4}{\sqrt{x-2}}$ $\sqrt{(x+4)(x-2)}=4$ $x^2+2x-8=16$ $x^2+2x-24=0$ $(x+6)(x-4)=0$ $\therefore x\neq -6 \ or \ x=4$	✓ isolating surd / *isoleer wortelvorm* ✓ square both sides / *kwadreer beide kante* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ selection / keuse (5)
1.1.4	$(x+2)(-3x+1)>0$ critical values/*kritieke waardes* $x=-2 \text{ or/}of \ x=\frac{1}{3}$  	✓ critical values / *kritieke waardes*

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	$-2 < x < \frac{1}{3},\ x \in \mathbf{R}$ **OR/*OF*** $x \in \left(-2\ ;\ \frac{1}{3}\right),\ x \in \mathbf{R}$	✓✓ $-2 < x < \frac{1}{3}$ (accuracy / *akkuraatheid*) **OR/*OF*** $x \in \left(-2\ ;\ \frac{1}{3}\right)$ (3)

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1.2	$3-y+2x=0$ $y=2x+3$ .....(1) $6x+4y^2=3+5xy$ .....(2) (1) into/*in* (2): $6x+4(2x+3)^2=3+5x(2x+3)$ $6x+4(4x^2+12x+9)=3+5x(2x+3)$ $6x+16x^2+48x+36=3+10x^2+15x$ $6x^2+39x+33=0$ $2x^2+13x+11=0$ $(2x+11)(x+1)=0$ $x=-\frac{11}{2}$ or/*of* $x=-1$ $y=-8$ or/*of* $y=1$ **OR / *OF*** $3-y+2x=0$ .....(1) $6x+4y^2=3+5xy$ .....(2) $x=\frac{y-3}{2}$ .....(3) Subst./*Verv.* (3) into/*in* (2): $6\left(\frac{y-3}{2}\right)+4y^2=3+5y\left(\frac{y-3}{2}\right)$ $6(y-3)+8y^2=6+5y(y-3)$ $6y-18+8y^2=6+5y^2-15y$ $3y^2+21y-24=0$ $y^2+7y-8=0$ $(y-1)(y+8)=0$ $y=1$ or/*of* $y=-8$ $x=-1$ or/*of* $x=-\frac{11}{2}$	✓ $y=2x+3$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ *x*-values / *waardes* ✓ *y*-values / *waardes* **OR / *OF*** ✓ $x=\frac{y-3}{2}$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ y-values / *waardes* ✓ x-values / *waardes* (6)
1.3	$9x^2-12px+4p^2=0$	✓ standard form / *standaardvorm*

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	For equal roots/*Vir gelyke wortels*: $\Delta = 0$ $\therefore b^2 - 4ac = 0$ $(-12p)^2 - 4(9)(4p^2) = 0$ $144p^2 - 144p^2 = 0$ $0 = 0$ $\Rightarrow$For all Real values / *Vir alle Reële waardes* $p \in \mathbb{R}$	✓ $\Delta = 0$ ✓ answer / *antwoord* ✓ conclusion / *gevolgtrekking* (4)
		[24]

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QUESTION/*VRAAG* 2

2.1.1	$r=\frac{T_3}{T_2}=\frac{18}{9}=2$	✓ answer / *antwoord* (1)
2.1.2	$T_n=a.r^{n-1}$ $2304=\left(\frac{9}{2}\right)(2)^{n-1}$ $2^{n-1}=512$ $=2^9$ $\therefore n-1=9$ $n=10$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
2.2	$S_\infty=\frac{a}{1-r}$ $12=\frac{6}{1-m}$ $12-12m=6$ $-12m=-6$ $m=\frac{1}{2}$	✓ substitution / vervanging ✓ answer / antwoord (2)
2.3	$\frac{T_5}{T_3}=\frac{ar^4}{ar^2}=\frac{162}{18}$ $r^2=9$ $r=\pm 3$ $a.(-3)^2=18$ $a=2$ $S_7=\frac{2\left((-3)^7-1\right)}{-3-1}$ $=1094$	✓ setting up both equations *opstel van beide vergelykings* ✓ value(s) of r / *waarde(s) van r* ✓ value of a / *waarde van a* ✓ substitution into S_n / *vervanging in* S_n ✓ answer / *antwoord* (5)

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2.4.1	$T_1 = 8$ *and / en* $t_n = 4n - 2$ $t_1 = 4(1) - 2 = 2$ $t_2 = 4(2) - 2 = 6$ $\therefore\ T_2 = 10\ ;\ T_3 = 16$	✓ *finding* t_1 *and* t_2 */ berekening van* t_1 *en* t_2 ✓ $T_2 = 10$ ✓ $T_3 = 16$ (3)

2.4.2	8 ; 10 ; 16 ; 26 2 ; 6 ; 10 4 ; 4 $2a = 4 \quad 3a + b = 2 \quad a + b + c = 8$ $a = 2 \quad 3(2) + b = 2 \quad (2) + (-4) + c = 8$ $b = -4 \quad c = 10$ $\therefore\ T_n = 2n^2 - 4n + 10$ **OR/OF** $T_n = T_1 + s_{n-1}$ $= 8 + \frac{n-1}{2}\left(2(2) + (n-2)4\right)$ $= 8 + \frac{n-1}{2}\left(4n - 4\right)$ $= 8 + (n-1)(2n-2)$ $= 8 + 2n^2 - 4n + 2$ $= 2n^2 - 4n + 10$	✓ value of *a* / *waarde van a* ✓ value of *b* / *waarde van b* ✓ value of *c* / *waarde van c* (3) **OR/OF** ✓ method /metode ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (3)
2.4.3	$2n^2 - 4n + 10 = 3050$ $2n^2 - 4n - 3040 = 0$ $n^2 - 2n - 1520 = 0$ $(n - 40)(n + 38) = 0$ $n = 40$ or / *of* $n \neq -38$	✓ equating / *gelyk stel* ✓ factors / *faktore* ✓ selection / *keuse* $(n = 40)$ (3)
		[19]

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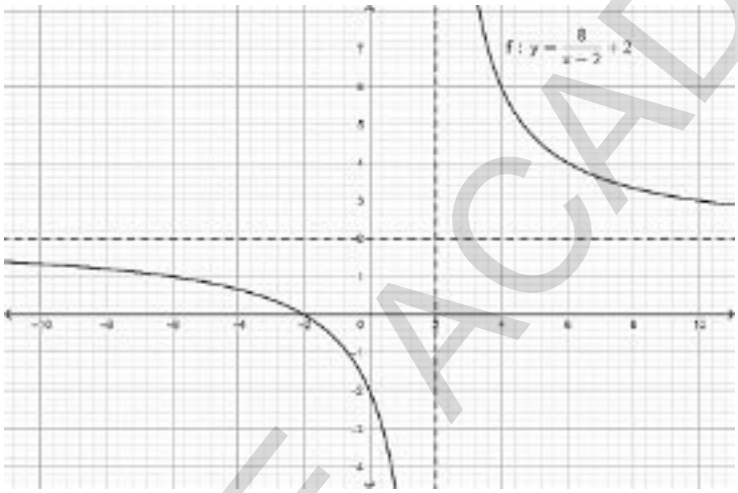
QUESTION/*VRAAG* 3

3.1	$Area\ \Delta_1 = \frac{1}{2}b \times h$ $= \frac{1}{2}(4)(1)$ $= 2\ \ units^2 / eenhede^2$	✓ answer / *antwoord* (1)
3.2	$Area\ \Delta_{26} = \frac{1}{2}b \times h$ $= \frac{1}{2}(4)(26)$ $= 52\ \ units^2 / eenhede^2$	✓ $h = 26$ ✓ answer / *antwoord* (2)
3.3	*Area of* rectangle/*Area van reghoek* $= l \times b$ $= 104 \times 26$ $= 2704\ \ units^2 / eenhede^2$ *Sum of Areas of Triangles / Som van Areas van Driehoeke* $= \frac{26}{2}[2 + 52]$ $= 702\ \ units^2 / eenhede^2$ *Area of unshaded part / Area van nie – gearseerde deel* $= 2704 - 702$ $= 2002\ \ units^2 / eenhede^2$	✓ answer / *antwoord* ✓ substitution / *vervanging* ✓ answer / *antwoord* ✓ method / *metode* ✓ answer / *antwoord* (5)
		[8]

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QUESTION/*VRAAG* 4

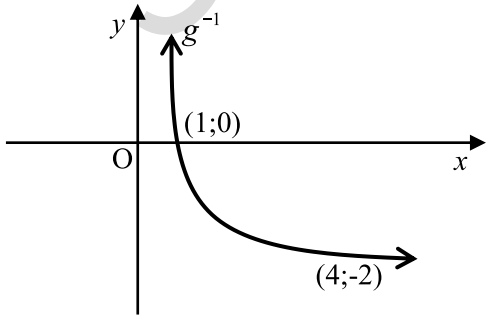
4.1	$x \in \mathbb{R}; x \neq 2$	✓✓ answer / *antwoord* (2)
4.2	$y = \frac{8}{0-2} + 2 = -2$	✓ answer / *antwoord* (1)
4.3	$\frac{8}{x-2} + 2 = 0$ $\frac{8}{x-2} = -2$ $-2x + 4 = 8$ $-2x = 4$ $x = -2$	✓ equating to 0 / *stel gelyk aan* 0 ✓ answer / *antwoord* (2)
4.4		✓ both intercepts / *beide afsnitte* ✓ asymptotes / *asimptote* ✓ shape / *vorm* (3)
4.5	$y = -(x-2) + 2$ $y = -x + 4$ $\therefore\ k = 4$ OR / *OF* $y = -x + k$ $2 = -2 + k$ $\therefore\ k = 4$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
4.6	$y = \frac{8}{(x-5)} + 2$ $y = -\left[\frac{8}{(x-5)} + 2\right]$ $y = -\frac{8}{(x-5)} - 2$	✓ shift 3 units to the right *skuif 3 eenhede na regs* ✓ reflection in the x-axis *refleksie in die x-as* ✓ answer / *antwoord* (3)

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		[13]

QUESTION/*VRAAG* 5

5.1	$x=-1$	✓ answer / *antwoord* ,,, (1)
5.2	$R(-1\,;\,-8)$	✓ answer / *antwoord* (1)
5.3	$2(x+1)^2-8=0$ $(x+1)^2=4$ $x+1=\pm 2$ $\therefore\ x=1$ or / *of* $x=-3$ $P(-3;0)$ and / *en* $Q(1;0)$ **OR / *OF*** $2(x+1)^2-8=0$ $2(x^2+2x+1)-8=0$ $2x^2+4x-6=0$ $x^2+2x-3=0$ $(x-1)(x+3)=0$ $x=1$ or / *of* $x=-3$ $P(-3;0)$ and / *en* $Q(1;0)$	✓ equating to 0 / *gelyk stel aan* 0 ✓ simplification / *vereenvoudiging* ✓ x-values / x-*waardes* ✓ coordinates / *koördinate* **OR / *OF*** ✓ equating to 0 / *gelyk stel aan* 0 ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ coordinates / *koördinate* (4)
5.4	$g:\ y=\left(\frac{1}{2}\right)^x$ $g^{-1}:x=\left(\frac{1}{2}\right)^y$ $\therefore\ g^{-1}: y=\log_{\frac{1}{2}} x$ Answer only – Full marks *Slegs antwoord – Volpunte*	✓ interchanging x and y *omruil van x en y* ✓ answer / *antwoord* (2)
5.5		✓ x-intercept / x-*afsnit* ✓ other point / *ander punt* ✓ shape / *vorm* (3)

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5.6.1	$0 < x \leq 4 \quad \text{OR / } OF \quad x \in (0;4]$	✓ ✓ answer / *antwoord* (2)
5.6.2	$x < -3$ or / *of* $0 < x < 1$ OR / *OF* $(0;-3) \quad (0;1)$	✓ $x < -3$ ✓ $0 < x < 1$ ✓ / or / *of* (3)
		[16]

QUESTION/*VRAAG* 6

6.1	$A = P(1+in)$ $100\,000 = 50\,000(1+0,085n)$ $2 = 1+0,085n$ $1 = 0,085n$ $\therefore n = 11,7647...$ $n = 11$ years / *jaar* 10 months / *maande* (since: $0,7647... \times 12 = 9,17$ *months we round up*)	✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ value of n / *waarde van n* ✓ answer / *antwoord* (4)
6.2	$A = P(1-i)^n$ $A = 24\,000(1-0,18)^3$ $A = R13\,232,83$	✓ formula / *formule* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
6.3	$x\left(1+\frac{12\%}{12}\right)^{84} + 2x\left(1+\frac{12\%}{12}\right)^{48} = R276\,558,75$ $x\left[\left(1+\frac{12\%}{12}\right)^{84} + 2\left(1+\frac{12\%}{12}\right)^{48}\right] = 276\,558,75$ $x = \frac{276\,558,75}{\left(1+\frac{12\%}{12}\right)^{84} + 2\left(1+\frac{12\%}{12}\right)^{48}}$ $x = R50\,000,00$	✓ 84 ✓ 48 ✓ $x\left(1+\frac{12\%}{12}\right)^{84} + 2x\left(1+\frac{12\%}{12}\right)^{48} = R276\,558,75$ ✓ common factor x / *gemene faktor x* ✓ $x = \frac{276\,558,75}{\left(1+\frac{12\%}{12}\right)^{84} + 2\left(1+\frac{12\%}{12}\right)^{48}}$ ✓ answer / *antwoord* (6)
		[13]

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Penalise 1 mark for incorrect notation in this question
Penaliseer 1 punt vir verkeerde notasie in hierdie vraag

QUESTION/*VRAAG* 7

7.1	$f(x)=-2x^2+x$ $f(x+h)=-2(x+h)^2+(x+h)$ $=-2x^2-4xh-2h^2+x+h$ $\frac{f(x+h)-f(x)}{h}=\frac{-2x^2-4xh-2h^2+x+h-(-2x^2+x)}{h}$ $=\frac{-4xh-2h^2+h}{h}$ $=\frac{h(-4x-2h+1)}{h}$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim_{h\to 0}(-4x-2h+1)$ $=-4x+1$ Answer ONLY: 0 marks *SLEGS antwoord*: 0 *punte*	✓ $-2x^2-4xh-2h^2+x+h$ ✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ factorisation / *faktorisering* (dividing by h / *deel deur* h) ✓ answer / *antwoord* (5)
7.2.1	$[\frac{-5x}{\sqrt{x}}-\frac{x^2}{5}]$ $=D_x[-5x^{\frac{1}{2}}-\frac{x^2}{5}]$ $=-\frac{5}{2}x^{\frac{1}{2}}-\frac{2x}{5}$	✓ $-5x^{\frac{1}{2}}$ ✓ $-\frac{5}{2}x^{-\frac{1}{2}}$ ✓ $-\frac{2x}{5}$ (3)
7.2.2	$\frac{d}{dx}\left[\left(x+\frac{2}{x}\right)\left(x-\frac{2}{x}\right)\right]$ $\frac{d}{dx}\left[x^2-\frac{4}{x^2}\right]$ $\frac{d}{dx}\left[x^2-4x^{-2}\right]$ $=2x+8x^{-3}$	✓ $x^2-\frac{4}{x^2}$ ✓ $-4x^{-2}$ ✓ $2x$ ✓ $+8x^{-3}$ (4)
		[12]

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QUESTION/*VRAAG* 8

8.1	$f'(x)=3x^2+2bx+c$ $2b=-10$ $b=-5$ $c=-8$ $f(x)=x^3-5x^2-8x+d$ $f(2)=(2)^3-5(2)^2-8(2)+d=-16$ $8-20-16+d=-16$ $\therefore\ d=12$ OR $f(x)=3x^2-10x-8$ $3x^2-10x-8=0$ $(3x+2)(x-4)=0$ $x=-\frac{2}{3}\quad or\quad x=4$ $f'(-\frac{2}{3})=0\quad f'(4)=0$ $3(-\frac{2}{3})^2+2b(-\frac{2}{3})+c=0$ $\frac{4}{3}-\frac{4b}{3}+c=0$ $4-4b+3c=0\quad \ldots\ldots\ldots 1$ $3(4)^2+2b(4)+c=0$ $48+8b+c=0\quad \ldots\ldots\ldots 2$ $8b-6c=8\quad \ldots\ldots\ldots 3$ $8b+c=-48\quad \ldots\ldots\ldots 2$ *Equation 3 – equation 2* $-7c=56$ $c=-8$ $8b-8=-48$ $b=-5$ $f(x)=x^3-5x^2-8x+d$ $f(2)=(2)^3-5(2)^2-8(2)+d=-16$ $8-20-16+d=-16$ $\therefore\ d=12$	✓ $f'(x)=3x^2+2bx+c$ ✓ $2b=-10$ ✓ $c=-8$ ✓ substitution of point (2 ; -16) *vervanging van punt* (2 ; -16) ✓ $x=-\frac{2}{3}\quad or\quad x=4$ ✓ showing $b=-5$ ✓ showing $c=-8$ ✓ substitution of point (2 ; -16) *vervanging van punt* (2 ; -16)

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8.2	$f'(x) = 3x^2 - 10x - 8 = 0$ $(3x + 2)(x - 4) = 0$ $x = -\frac{2}{3}$ or / *of* $x = 4$ $y = \frac{400}{27}$ or / *of* $y = -36$ $L\left(-\frac{2}{3}; \frac{400}{27}\right)$ & $M(4; -36)$	✓ $f'(x) = 0$ ✓ factors / *faktore* ✓ *x*-values / *x-waardes* ✓ *y*-values / *y-waardes* ✓ correct coordinates / *korrekte koördinate* (5)
8.3	$m = \frac{0+16}{6-2} = 4$ $y - y_1 = m(x - x_1)$ $y - 0 = 4(x - 6)$ $y = 4x - 24$ **OR / *OF*** $m = \frac{0+16}{6-2} = 4$ $y = mx + c$ $y = 4x + c$ $-16 = 4(2) + c$ $\therefore\ c = -24$ $y = 4x - 24$	✓ gradient / *gradiënt* ✓ substitution / *vervanging* ✓ answer / *antwoord* **OR / *OF*** ✓ gradient / *gradiënt* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)

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8.4	$y = 4x - 24$ $-36 = 4x - 24$ $-12 = 4x$ $\therefore x = -3$ $\Rightarrow AM = 7$ units / *eenhede*	✓ substitution of (x ; -36) / *vervanging van* (x ; -36) ✓ $x = -3$ ✓ answer / *antwoord* (3)
8.5.1	$\left(-\infty; -\frac{2}{3}\right) \quad (4; \infty)$	✓✓ answer / *antwoord* (2)
8.5.2	$f''(x) = 6x - 10 = 0$ $\therefore x = \frac{5}{3}$ $\Rightarrow$ Concave down / *Konkaaf af* : $x < \frac{5}{3}$	✓ method / *metode* ✓ answer /*antwoord* (2)
		[19]

QUESTION/*VRAAG* 9

9.1	$x + h = 10 \Rightarrow h = (10 - x)\ m$ Let width of rectangle $= y$ / *Laat die breedte van reghoek* $= y$ $\therefore 2x + 2y = 32$ $y = (16 - x)\ m$ Area of figure / *Oppervlakte van figuur* : = Area of Triangle + Area of Rectangle (*Oppervlakte van Driehoek + Oppervlakte van* Re*ghoek*) $= \frac{1}{2}(b \times h) + (l \times b)$ $= \frac{1}{2}(x)(10 - x) + x(16 - x)$ $= 5x - \frac{1}{2}x^2 + 16x - x^2$ $= -\frac{3}{2}x^2 + 21x$	✓ $h = (10 - x)$ ✓ $y = (16 - x)$ ✓ $\frac{1}{2}(x)(10 - x)$ ✓ $x(16 - x)$ ✓ simplification / *vereenvoudiging* (5)
9.2	$A'(x) = -3x + 21 = 0$ $-3x = -21$ $x = 7$	✓ $A'(x) = -3x + 21$ ✓ $A'(x) = 0$ ✓ answer / antwoord (3)

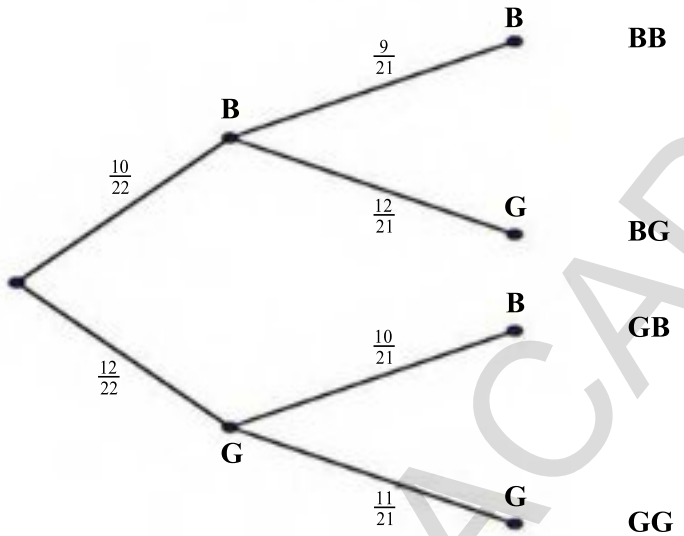
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9.3	$A = -\frac{3}{2}(7)^2 + 21(7)$ $= 73,5\ m^2$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
		[10]

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QUESTION/*VRAAG* 10

10.1.1	$a = 450$ $b = 319$ $c = 298$ $d = 748$	✓ value of a / *waarde van a* ✓ value of b / *waarde van b* ✓ value of c / *waarde van c* ✓ value of d / *waarde van d* (4)
10.1.2	$P(F / Not) = \frac{298}{1530}$	✓✓ answer / *antwoord* (2)
10.2	 **BB** **BG** **GB** **GG**	
10.2.1	$\frac{12}{22} \times \frac{11}{21} = \frac{2}{7} \approx 0,29$	✓ answer / *antwoord* (2)
10.2.2	$\left(\frac{10}{22} \times \frac{12}{21}\right) + \left(\frac{12}{22} \times \frac{10}{21}\right)$ $= \frac{40}{77} \approx 0,52$	✓ $\left(\frac{10}{22} \times \frac{12}{21}\right)$ ✓ $\left(\frac{12}{22} \times \frac{10}{21}\right)$ ✓ answer / *antwoord* (3)

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10.3.1	P(M) × P(N) $= (0,12 + x)(0,57)$ $= 0,57x + 0,0684$ For independent events/*Vir onafhanklike gebeurtenisse* P(M) × P(N) = P(M∩N) $0,57x + 0,0684 = 0,12$ $0,57x = 0,0516$ $x = 0,09$	✓ $0,57x + 0,0684$ ✓ $0,57x + 0,0684 = 0,12$ ✓ answer / *antwoord* (3)
10.3.2	$y = 1 - (0,09 + 0,12 + 0,45)$ $= 0,34$	✓ $1 - (0,09 + 0,12 + 0,45)$ ✓ answer / *antwoord* (2)
		[16]
		TOTAL/*TOTAAL*: 150

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