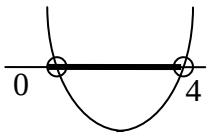
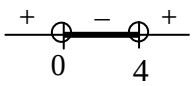
Memo

LET WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging.*
- *Volgehoue akkuraatheid is DEURGAANS op ALLE aspekte van die memorandum van toepassing.*

QUESTION/*VRAAG* 1

1.1.1	$(x-3)(x+1)=0$ $x=3$ or $x=-1$	✓ answer ✓ answer (2)
1.1.2	$\sqrt{x^3}=512$ $x^{\frac{3}{2}}=512$ $\left(x^{\frac{3}{2}}\right)^{\frac{2}{3}}=\left(8^3\right)^{\frac{2}{3}}$ $x=64$ **OR** $\sqrt{x^3}=512$ $x^3=262144$ $x^3=2^{18}$ $x=2^6$ $x=64$	✓ $x^{\frac{3}{2}}$ ✓ $\left(8^3\right)^{\frac{2}{3}}$ ✓ answer (3) ✓ squaring both sides ✓ $x^3=2^{18}$ ✓ answer (3)
1.1.3	$x(x-4)<0$  **OR / OF**  $0<x<4$ **OR / OF** $x\in(0;4)$	✓critical values ✓inequality or interval (2)

1.2.1	$x^2-5x+2=0$ $x=\frac{5\pm\sqrt{(-5)^2-4(1)(2)}}{2(1)}$ $x=\frac{5\pm\sqrt{17}}{2}$ $x = 0{,}44$ or $x = 4{,}56$ **OR** $x^2-5x+2=0$ $x^2-5x=-2$ $x^2-5x+\left(-\frac{5}{2}\right)^2=-2+\left(-\frac{5}{4}\right)^2$ $\left(x-\frac{5}{2}\right)^2=\frac{17}{4}$ $x=\frac{5+\sqrt{17}}{2}$ or $x=\frac{5-\sqrt{17}}{2}$ $x = 0{,}44$ or $x = 4{,}56$	✓ subst correct formula ✓ answer ✓ answer (3) ✓ $\left(x-\frac{5}{2}\right)^2=\frac{17}{4}$ ✓ answer ✓ answer (3)
1.2.2	$f(x)=x^2-5x+2$ $x^2-5x+2=c$ $x^2-5x+2-c=0$ $b^2-4ac<0$ $(-5)^2-4(1)(2-c)<0$ $25-8+4c<0$ $4c<-17$ $c<-\frac{17}{4}$	✓ standard form ✓ $b^2-4ac<0$ ✓ substitution ✓ answer (4)
1.3	$x=2y+2$ $x^2-2xy+3y^2=4$ $(2y+2)^2-2y(2y+2)+3y^2=4$ $4y^2+8y+4-4y^2-4y+3y^2=4$ $3y^2+4y=0$ $y(3y+4)=0$ $y=0$ or $y=-\frac{4}{3}$ $x=2$ $x=-\frac{2}{3}$	✓ substitution ✓ simplification ✓ standard form ✓ factors ✓ $y=0$; $y=-\frac{4}{3}$ ✓ x-values (ca on both x-values) (6)

	OR / OF $x = 2y + 2$ $y = \frac{1}{2}x - 1$ $x^2 - 2xy + 3y^2 = 4$ $x^2 - 2x\left(\frac{1}{2}x - 1\right) + 3\left(\frac{1}{2}x - 1\right)^2 = 4$ $x^2 - x^2 + 2x + 3\left(\frac{1}{4}x^2 - x + 1\right) = 4$ $2x + \frac{3}{4}x^2 - 3x + 3 = 4$ $3x^2 - 4x - 4 = 0$ $(3x + 2)(x - 2) = 0$ $x = 2$ or $x = -\frac{2}{3}$ $y = 0$ $y = -\frac{4}{3}$	✓ substitution ✓ simplification ✓ standard form ✓ factors ✓ $x = 2$; $x = -\frac{2}{3}$ ✓ y-values (ca on both y-values) (6)
1.4	$S = \frac{6}{x^2 + 2}$ For S to be a maximum the denominator needs to be at a minimum. *Vir* S *om 'n maksimum waarde te hê, moet die deler 'n minimum waarde h* Minimum of $x^2 + 2$ is 2 Maximum of $S = \frac{6}{x^2 + 2}$ $= \frac{6}{2}$ $= 3$	✓ Minimum of $x^2 + 2$ is 2 ✓3 (2)
		[22]

QUESTION/*VRAAG* 2

2.1	For geometric: $-\frac{1}{4}\ ;\ b\ ;-1;\ .....$ $\frac{b}{-\frac{1}{4}}=-\frac{1}{b}$ $b^2=\frac{1}{4}$ $b=\pm\frac{1}{2}$ **OR** $b=\pm\sqrt{\left(-\frac{1}{4}\right)(-1)}$ $b=\pm\frac{1}{2}$	✓ $\frac{b}{-\frac{1}{4}}=-\frac{1}{b}$ ✓ $b=\frac{1}{2}$ ✓ $b=-\frac{1}{2}$ (3) ✓ $b=\pm\sqrt{\left(-\frac{1}{4}\right)(-1)}$ ✓ $b=\frac{1}{2}$ ✓ $b=-\frac{1}{2}$ (3)
2.2	$-\frac{1}{4};\ \frac{1}{2};\ -1;\ .....$ $r=-2$ $T_{19}=ar^{18}$ $=\left(-\frac{1}{4}\right)(-2)^{18}$ $=\left(-\frac{2^{18}}{2^2}\right)$ $=-2^{16}$ $=-65536$ **OR / OF** $T_{19}=ar^{18}$ $=\left(-\frac{1}{4}\right)(-2)^{18}$ $=\left(-2^{-2}\right)\left(2^{18}\right)$ $=-2^{16}$ $=-65536$	✓$r=-2$ ✓subst. into correct formula ✓-65536 / -2^{16} (3) ✓$r=-2$ ✓subst. into correct formula ✓-65536 / -2^{16} (3)

2.3	The series is: $-\frac{1}{4}; \frac{1}{2}; -1; 2; -4; 8; .....$ The new positive term series: $\frac{1}{2}$; 2 ; 8 ; 32 ; 128 ; …… $a = \frac{1}{2}$ $r = 4$ $\sum_{n=1}^{20}\left(\frac{1}{2}\right)(4)^{n-1}$ **OR/*OF*** $\sum_{p=0}^{19}\left(\frac{1}{2}\right)(4)^{p}$ **etc.**	✓ $a = \frac{1}{2}$ ✓ $r = 4$ ✓ $\sum_{n=1}^{20}$ or $\sum_{p=0}^{19}$ ✓ correct formula (4)
2.4	No, the series is not convergent / *Nee, die reeks konvergeer nie* $r = 4$ and for convergence $-1 < r < 1$ $r = 4$ *en vir konvergering* $-1 < r < 1$	✓no ✓reason (2)
		[12]

QUESTION/*VRAAG* 3

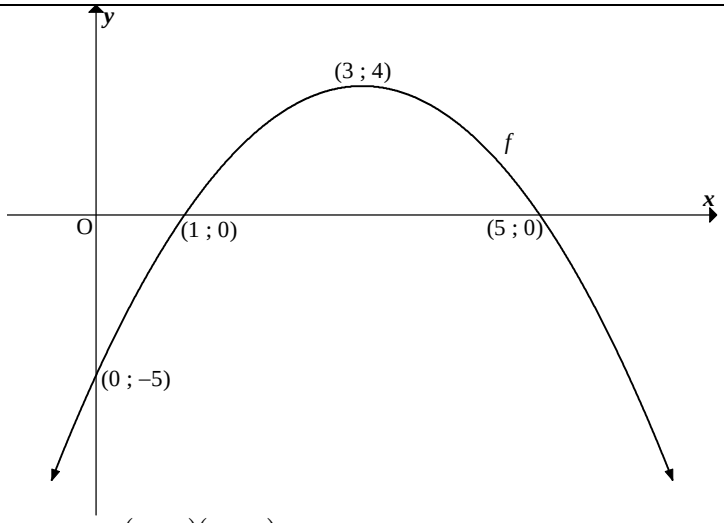
3.1.1	24	✓ 24 (1)
3.1.2	**6** **6** **9** **15** **0** **3** **6** **3** **3** $2a = 3$ $3a + b = 0$ $a + b + c = 6$ $a = \frac{3}{2}$ $b = -\frac{9}{2}$ $c = 9$ $T_n = \frac{3}{2}n^2 - \frac{9}{2}n + 9$ **OR/OF** $T_n = T_1 + (n-1)d_1 + \frac{(n-1)(n-2)d_2}{2}$ $= 6 + (n-1)(0) + \frac{(n-1)(n-2)(3)}{2}$ $= 6 + \frac{n^2 - 3n + 2}{1}\left(\frac{3}{2}\right)$ $= 6 + \frac{3}{2}n^2 - \frac{9}{2}n + 3$ $= \frac{3}{2}n^2 - \frac{9}{2}n + 9$	✓ $a = \frac{3}{2}$ ✓ $b = -\frac{9}{2}$ ✓ $c = 9$ ✓ $T_n = \frac{3}{2}n^2 - \frac{9}{2}n + 9$ (4) ✓formula ✓substitution ✓simplifying ✓ $T_n = \frac{3}{2}n^2 - \frac{9}{2}n + 9$ (4)
3.1.3	$\frac{3}{2}n^2 - \frac{9}{2}n + 9 = 3249$ $3n^2 - 9n + 18 = 6498$ $3n^2 - 9n - 6480 = 0$ $n^2 - 3n - 2160 = 0$ $(n + 45)(n - 48) = 0$ $n \neq -45$ *or* $n = 48$	✓ equating general term to 3249 ✓ standard form ✓ factors ✓ $n \neq -45$ or $n = 48$ (4)
3.2	$-1\ ;\ 2\sin 3x\ ;\ 5;\ .....$ $2\sin 3x + 1 = 5 - 2\sin 3x$ $4\sin 3x = 4$ $\sin 3x = 1$ $3x = 90^\circ$ $x = 30^\circ$	✓ $2\sin 3x + 1 = 5 - 2\sin 3x$ ✓ $\sin 3x = 1$ ✓ $3x = 90^\circ$ ✓ $x = 30^\circ$ (4) **[13]**

QUESTION/*VRAAG* 4

4.1	$U(1;0)$	✓ $(1;0)$ (1)
4.2	$x=1$ $y=1$	✓ $x=1$ ✓ $y=1$ (2)
4.3	$\frac{2}{x-1}+1=0$ $2=-x+1$ $x=-1$ $T(-1;0)$	✓ $y=0$ ✓ $x=-1$ (2)
4.4	$f(x)=\log_5 x$ $h:\ x=\log_5 y$ $y=5^x$	✓ change x and y ✓ $y=5^x$ (2)
4.5	$y=0$	✓ answer (1)
4.6	$V(\sqrt{2}+1;\sqrt{2}+1)$ $V(2{,}41;2{,}41)$ **OR / OF** $x=\frac{2}{x-1}+1$ $x^2-x=2+x-1$ $x^2-2x-1=0$ $x=\frac{2\pm\sqrt{4-4(1)(-1)}}{2}$ $=\frac{2\pm\sqrt{8}}{2}$ $=\frac{2\pm2\sqrt{2}}{2}$ $=1\pm\sqrt{2}$ $V(1+\sqrt{2}\ ;1+\sqrt{2})$ **OR / OF** $x-1=\frac{2}{x-1}$ $(x-1)^2=2$ $x=1\pm\sqrt{2}$ $V(1+\sqrt{2}\ ;1+\sqrt{2})$	✓✓ $\sqrt{2}+1$ ✓✓ $\sqrt{2}+1$ (4) ✓ $x=\frac{2}{x-1}+1$ ✓subs into correct formula ✓ $x=\sqrt{2}+1$ ✓ $y=\sqrt{2}+1$ (4) ✓ $x-1=\frac{2}{x-1}$ ✓ $(x-1)^2=2$ ✓ $x=\sqrt{2}+1$ ✓ $y=\sqrt{2}+1$ (4)
4.7	$T^{/}(3;2)$	✓ $x=3$ ✓ $y=2$ (2) **[14]**

QUESTION 5

5.1.1	C(0 ; –3)	✓ C(0 ; –3) (1)
5.1.2	$f(x)=x^2-2x-3$ $(x-3)(x+1)=0$ $x=-1$ or $x=3$ AB = 3 – (–1) AB = 4 units	✓ factors ✓ x-value ✓ other x-value ✓ answer (4)
5.1.3	$x=\frac{2}{2(1)}$ or $2x-2=0$ or $x=\frac{-1+3}{2}$ $=1$ $y=(1)^2-2(1)-3$ $=-4$ $D(1;-4)$	✓ $x=1$ ✓ y value (2)
5.1.4	C(0 ; –3) D(1 ; – 4) Average gradient / *Gemiddelde gradiënt* $=\frac{-4+3}{1-0}$ or $\frac{-3+4}{0-1}$ $=-1$	✓ $\frac{-4+3}{1-0}$ or $\frac{-3+4}{0-1}$ ✓ – 1 (2)
5.1.5	OC = OB = 3 $O\hat{C}B=45°$ isosceles right angled triangle *Gelykbenige reghoekige driehoek* **OR / OF** $\tan\beta=m_g$ $\tan\beta=1$ $\beta=45°$ $O\hat{B}C=45°$ $O\hat{C}B=45°$	✓equal lengths ✓ 45° (2) ✓ $\tan\beta=1$ ✓ 45° (2)
5.1.6	$-4<k<-3$ **OR** (–4 ; –3)	✓–4 ✓ –3 ✓ notation (3)
5.1.7	$f^{/}(x)\ .\ f^{//}(x)>0$ $(2x-2).2>0$ $2x-2>0$ $x>1$	✓ $2x-2$ ✓ 2 ✓ $x>1$ (3)

5.2	 $f(x) = a(x-1)(x-5)$ $4 = a(3-1)(3-5)$ $4 = -4a$ $a = -1$ $f(x) = -x^2 + 6x - 5$	TP ✓ $x = 3$ ✓ $y = 4$ ✓ x – intercepts ✓ y-intercept ✓ shape (5)
		[22]

QUESTION/*VRAAG* 6

6.1.1	$A = 150\,000(1-0{,}2)^2$ $= R96\,000$	✓ $n = 2$ ✓ 150 000 in correct formula ✓ 96 000 (3)
6.1.2	$150\,000(1-0{,}2)^n = 49\,152$ $(0{,}8)^n = \frac{1024}{3125}$ $n\log(0{,}8) = \log\frac{1024}{3125}$ $n = 5$ The machine will need to be replaced at the beginning of 2020 / *Masjien moet aan die begin van 2020 vervang word* **OR / OF** $150\,000(1-0{,}2)^n = 49\,152$ $(0{,}8)^n = \frac{1024}{3125}$ $n = \log_{0{,}8}\frac{1024}{3125}$ $n = 5$ The machine will need to be replaced at the beginning of 2020 / *Masjien moet aan die begin van 2020 vervang word*	✓ $150\,000(1-0{,}2)^n = 49\,152$ ✓ $n\log(0{,}8) = \log\frac{1024}{3125}$ ✓ $n = 5$ ✓ 2020 (4) ✓ $150\,000(1-0{,}2)^n = 49\,152$ ✓ $n = \log_{0{,}8}\frac{1024}{3125}$ ✓ $n = 5$ ✓ 2020 (4)

6.1.3	R280 000 – R49 152 =R230 848 $230\ 848 = \dfrac{x\left[\left(1+\dfrac{0{,}085}{4}\right)^{20}-1\right]}{\dfrac{0{,}085}{4}}$ $x = \text{R}9\,383{,}26$	✓ R230 848 ✓ $i = \dfrac{0{,}085}{4} = 0{,}02125$ and $n = 20$ ✓ subs into correct formula ✓ R 9 383,26 (4)
6.2	$\text{P}_v = \dfrac{x[1-(1+i)^{-n}]}{i}$ $= \dfrac{9\ 000\left[1-\left(1+\dfrac{0{,}11}{12}\right)^{-180}\right]}{\dfrac{0{,}11}{12}}$ $= \text{R}791\ 837{,}43$ Lerato qualifies for a loan of R 791 000 under the given conditions / *Lerato kwalifiseer vir 'n lening van* R 791 000 *gegewe die kondisies*	✓ $i = \dfrac{0{,}11}{12}$ ✓ $n = 180$ ✓ substitution correct formula ✓ R791 837,43 ✓ R791 000 (5) **[16]**

QUESTION/*VRAAG* 7

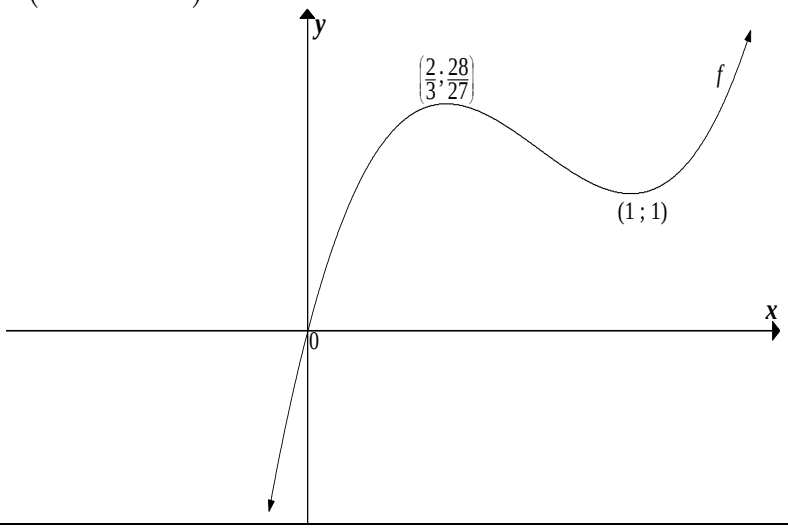
PENALISE ONLY ONCE for incorrect notation in this question.

7.1	$f(x+h)=(x+h)^2-5=(x^2+2xh+h^2)-5$ $=x^2+2xh+h^2-5$ $f(x+h)-f(x)=x^2+2xh+h^2-5-\left(x^2-5\right)$ $=2xh+h^2$ $f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{2xh+h^2}{h}$ $=\lim\limits_{h\to 0}\dfrac{h(2x+h)}{h}$ $=\lim\limits_{h\to 0}\left(2x+h\right)$ $=2x$ **OR/OF** $f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{x^2+2xh+h^2-5-\left(x^2-5\right)}{h}$ $=\lim\limits_{h\to 0}\dfrac{2xh+h^2}{h}$ $=\lim\limits_{h\to 0}\dfrac{h(2x+h)}{h}$ $=\lim\limits_{h\to 0}\left(2x+h\right)$ $=2x$	✓simplifying ✓formula ✓subst. into formula ✓factorisation ✓answer (5) ✓formula ✓subst. into formula ✓simplifying ✓factorisation ✓answer (5)
7.2	$g(x)=5x^2-\dfrac{2x}{x^3}$ $=5x^2-2x^{-2}$ $g'(x)=10x+4x^{-3}$ $=10x+\dfrac{4}{x^3}$	✓ $5x^2-2x^{-2}$ ✓ $10x$ ✓ $4x^{-3}$ or $\dfrac{4}{x^3}$ (3)

7.3	$h(x) = ax^2,\ x > 0$ $h^{-1}:\ x = ay^2 \quad y > 0$ $y = \sqrt{\frac{x}{a}}$ $h^{-1}(8) = \sqrt{\frac{8}{a}}$ $h^{/}(x) = 2ax$ $h^{/}(4) = 2a(4)$ $= 8a$ $\sqrt{\frac{8}{a}} = 8a$ $64a^2 = \frac{8}{a}$ $a^3 = \frac{1}{8}$ $a = \frac{1}{2}$	✓ $y = \sqrt{\frac{x}{a}}$ ✓ $\sqrt{\frac{8}{a}}$ ✓ $h^{/}(4) = 8a$ ✓ $\sqrt{\frac{8}{a}} = 8a$ ✓ $a^3 = \frac{1}{8}$ ✓ $a = \frac{1}{2}$ (6)
		[14]

QUESTION/*VRAAG* 8

8.1	$f^{/}(x) = 0$ $6x^2 - 10x + 4 = 0$ $3x^2 - 5x + 2 = 0$ $(3x-2)(x-1) = 0$ $x = \frac{2}{3}$ or $x = 1$ $y = 2\left(\frac{2}{3}\right)^3 - 5\left(\frac{2}{3}\right)^2 + 4\left(\frac{2}{3}\right)$ $\quad y = 2(1)^3 - 5(1)^2 + 4(1)$ $y = \frac{28}{27}$ or $y = 1$ Turning points are $\left(\frac{2}{3}; \frac{28}{27}\right)$ and $(1;1)$	✓ derivative ✓ derivative $= 0$ ✓ factors ✓ x-values ✓ y-values (5)

8.2	$2x^3 - 5x^2 + 4x = 0$ $x(2x^2 - 5x + 4) = 0$ $x = 0$ or $x = \dfrac{5 \pm \sqrt{25 - 4(2)(4)}}{4}$ $= \dfrac{5 \pm \sqrt{-7}}{4}$ No real roots / *Geen reële wortels* **OR / OF** $2x^3 - 5x^2 + 4x = 0$ $x(2x^2 - 5x + 4) = 0$ $x = 0$ or $b^2 - 4ac = 25 - 4(2)(4)$ $= -7 < 0$ No real roots / *Geen reële wortels*	✓ $x(2x^2 - 5x + 4) = 0$ ✓ $x = 0$ ✓ $\dfrac{5 \pm \sqrt{-7}}{4}$ (3) ✓ $x(2x^2 - 5x + 4) = 0$ ✓ $x = 0$ ✓ $b^2 - 4ac < 0$ (3)
8.3	$f(x) = 2x^3 - 5x^2 + 4x$ $x(2x^2 - 5x + 4) = 0$  	✓(0 ; 0) ✓turning points ✓shape (3)

8.4	$f(x) = 2x^3 - 5x^2 + 4x$ $f'(x) = 6x^2 - 10x + 4$ $f''(x) = 12x - 10$ $f''(x) > 0$ $12x - 10 > 0$ $x > \frac{5}{6}$	✓ $12x - 10$ ✓ $f''(x) > 0$ ✓ answer (3)
	OR Point of inflection: $x = -\frac{b}{3a}$ $x = -\frac{(-5)}{3(2)}$ $x = \frac{5}{6}$ The function is concave up for $x > \frac{5}{6}$ since $a > 0$	✓ $x = -\frac{(-5)}{3(2)}$ ✓ $x = \frac{5}{6}$ ✓ $f''(x) > 0$ (3)
	OR Point of inflection: $x = \frac{\frac{2}{3}+1}{2}$ $x = \frac{5}{6}$ The function is concave up for $x > \frac{5}{6}$ since $a > 0$	✓ $x = \frac{\frac{2}{3}+1}{2}$ ✓ $x = \frac{5}{6}$ ✓ $f''(x) > 0$ (3) **[14]**

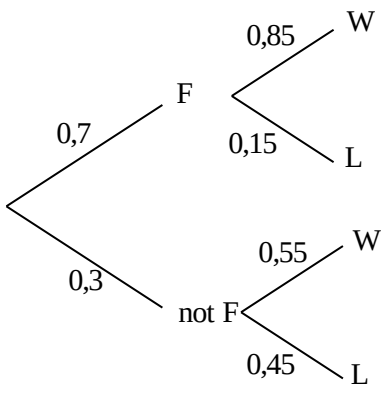
QUESTION/*VRAAG* 9

9.	Length of one side of the square / *lengte van sy van vierkant* $= \frac{x}{4}$ Length of the rectangle / *lengte van die reghoek*: $2l + x + \frac{x}{4} = 6$ $l = \frac{6 - \frac{5x}{4}}{2}$ $= \frac{24 - 5x}{8}$ $A = \left(\frac{x}{4}\right)^2 + \frac{x}{4}\left(\frac{24 - 5x}{8}\right)$ $= \frac{x^2}{16} + \frac{24x - 5x^2}{32}$ $= \frac{24x - 3x^2}{32}$ $A = \frac{24x - 3x^2}{32}$. For minimum area / *Vir* min*imum oppervlaktte* $\frac{dA}{dx} = 0$ $\frac{dA}{dx} = \frac{24 - 6x}{32}$ $6x = 24$ $x = 4$	✓ $\frac{x}{4}$ ✓ $\frac{6 - \frac{5x}{4}}{2}$ or $\frac{24 - 5x}{8}$ ✓ $\left(\frac{x}{4}\right)^2$ ✓ $\frac{x}{4}\left(\frac{24 - 5x}{8}\right)$ ✓ $\frac{dA}{dx} = 0$ ✓ $\frac{24 - 6x}{32}$ ✓ $x = 4$ (7)
		[7]

QUESTION/*VRAAG* 10

10.1.1	$P(S \text{ and } T) = P(S) \times P(T)$ $\frac{1}{6} = \left(\frac{1}{4}\right) \times P(T)$ $P(T) = \frac{2}{3}$	✓ $P(S \text{ and } T) = P(S) \times P(T)$ ✓ $P(T) = \frac{2}{3}$ (2)
10.1.2	$P(S \text{ or } T) = P(S) + P(T) - P(S \text{ and } T)$ $= \left(\frac{1}{4}\right) + \left(\frac{2}{3}\right) - \frac{1}{6}$ $= \frac{3}{4}$	✓ $\left(\frac{1}{4}\right) + \left(\frac{2}{3}\right) - \frac{1}{6}$ ✓ $\frac{3}{4}$ (2)
10.2.1	5! = 120	✓ 5 ✓ 5! or 120 (2)
10.2.2	5^5 $= 3125$	✓ 5^5 or 3 125 (1)
10.3	$n(E) = 5! \times 2! \times 2!$ $n(S) = 7!$ $P(E) = \frac{5! \times 2! \times 2!}{7!}$ $= \frac{2}{21}$	✓ 5! ✓ 2! × 2! ✓ $\frac{5! \times 2! \times 2!}{7!}$ ✓ $\frac{2}{21}$ (4)
		[11]

QUESTION/*VRAAG* 11

11	 P(F and W) = 0,595 P(F and L) = 0,105 P(not F and W) = 0,165 P(not F and L) = 0135 P(Win) = P(F and W) + P(not F and W) $= 0,7 \times 0,85 + 0,3 \times 0,45$ $= 0,595 + 0,165$ $= 0,76$ $= 76\%$ $= \frac{19}{25}$	✓ 0,3 ✓ P(F and W) = $0,7 \times 0,85$ = 0,595 ✓ P(not F and W) = $0,3 \times 0,45$ = 0,165 ✓ 0,595 + 0,165 ✓ 0,76 / 76% / $\frac{19}{25}$ (5)
		[5]

TOTAL/*TOTAAL*: 150