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NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P1

SEPTEMBER 2019

MARKING GUIDELINES

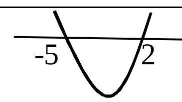
MARKS: 150

This marking guidelines consists of 16 pages.

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent Accuracy applies in ALL aspects of the marking memorandum.

QUESTION 1

1.1.1	$3x^2 - 18x = 0$ $3x(x-6) = 0$ $3x = 0$ or $x - 6 = 0$ $x = 0$ $x = 6$	✓ factors ✓ $x = 0$ ✓ $x = 6$ (3)
1.1.2	$7x^2 - 4x - 5 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{4 \pm \sqrt{(-4)^2 - 4(7)(-5)}}{2(7)}$ $= \frac{4 \pm \sqrt{156}}{14}$ $x = 1{,}18$ of $x = -0{,}61$	✓ standard form ✓ substitution into the correct formula ✓ $x = 1{,}18$ ✓ $x = -0{,}61$ (4)
1.1.3	$(x+5)(x-2) > 0$ $\therefore$ $x < -5$ or $x > 2$  	✓✓ $x < -5$ or $x > 2$ (2)
1.1.4	$26 - 5^{2x} = (5^x - 6)^2$ $26 - 5^{2x} = 5^{2x} - 12.5^x + 36$ $0 = 2.5^{2x} - 12.5^x + 10$ $0 = 5^{2x} - 6.5^x + 5$ $0 = (5^x - 5)(5^x - 1)$ $5^x = 5$ or $5^x = 1$ $x = 1$ $5^x = 5^0$ n.a. $x = 0$ n.a. $\therefore$ No real solution	✓ simplification ✓ standard form ✓ factors/formula ✓ $5^x = 5$ or $5^x = 1$ ✓ $x = 1$ n.a. or $x = 0$ n.a. ✓ No real solution (6)

1.2	$x - 4y = 5$ $x = 4y + 5$ $3x^2 - 5xy + 2y^2 = 25$ $3(4y+5)^2 - 5(4y+5)y + 2y^2 = 25$ $3(16y^2 + 40y + 25) - 20y^2 - 25y + 2y^2 = 25$ $48y^2 + 120y + 75 - 20y^2 - 25y + 2y^2 - 25 = 0$ $30y^2 + 95y + 50 = 0$ $6y^2 + 19y + 10 = 0$ $(3y+2)(2y+5) = 0$ OR $y = \frac{-19 \pm \sqrt{(19)^2 - 4(6)(10)}}{2(6)}$ $3y = -2$ or $2y = -5$ $y = -\frac{2}{3}$ $y = -\frac{5}{2}$ $x = \frac{7}{3}$ $x = -5$	✓ $x = 4y + 5$ ✓substitution ✓ standard form ✓ factors/formula ✓ both y-values ✓ both x-values (6)
	OR	
	$x - 4y = 5$ $4y = x - 5$ $y = \frac{x-5}{4}$ $3x^2 - 5xy + 2y^2 = 25$ $3x^2 - 5x\left(\frac{x-5}{4}\right) + 2\left(\frac{x-5}{4}\right)^2 = 25$ $3x^2 - \left(\frac{5x^2 - 25x}{4}\right) + 2\left(\frac{x^2 - 10x + 25}{16}\right) - 25 = 0$ $3x^2 - \left(\frac{5x^2 - 25x}{4}\right) + \left(\frac{x^2 - 10x + 25}{8}\right) - 25 = 0$ $24x^2 - 10x^2 + 50x + x^2 - 10x + 25 - 200 = 0$ $15x^2 + 40x - 175 = 0$ $3x^2 + 8x - 35 = 0$ $(3x-7)(x+5) = 0$ OR $x = \frac{-8 \pm \sqrt{8^2 - 4(3)(-35)}}{2(3)}$ $x = \frac{7}{3}$ or $x = -5$ $y = -\frac{2}{3}$ $y = -\frac{5}{2}$	✓ $y = \frac{x-5}{4}$ ✓ substitution ✓ standard form ✓ factors/formula ✓ both x-values ✓ both y-values (6)

1.3	$x = \sqrt{12 + \sqrt{12 + \sqrt{12 + \sqrt{12 + \ldots}}}}$ $(x)^2 = \left(\sqrt{12 + \sqrt{12 + \sqrt{12 + \sqrt{12 + \ldots}}}}\right)^2$ $x^2 = 12 + \sqrt{12 + \sqrt{12 + \sqrt{12 + \ldots}}}$ $x^2 = 12 + x$ $x^2 - x - 12 = 0$ $(x - 4)(x + 3) = 0$ $x = 4$ or $x = -3$ n.a.	✓ substitution ✓ standard form ✓ $x = 4$ ✓ $x = -3$ n.a. (4) **[25]**

QUESTION 2

2.1.1	$T_n = a + (n-1)d$ $= -11 + (n-1)(7)$ $= -11 + 7n - 7$ $= 7n - 18$	✓ substituting a and d in T_n: $-11 + (n-1)(7)$ ✓ answer answer only, full marks (2)
2.1.2	$T_n = 7n - 18$ $T_{60} = 7(60) - 18$ $= 402$	✓ substitute n=60 into T_n ✓ answer (2)
2.1.3	$S_n = \frac{n}{2}\left[2a + (n-1)d\right]$ $S_{60} = \frac{60}{2}\left[2(-11) + (60-1)(7)\right]$ $= 11\ 730$	✓ substitution ✓ answer (2)
2.2	$-4 + 3 + 10 + \ldots + 486$ $T_n = 7n - 18$ $486 = 7n - 18$ $504 = 7n$ $72 = n$ $\therefore \sum_{n=2}^{72}(7n - 18)$ **OR**	✓ $486 = 7n - 18$ ✓ $n = 72$ ✓✓ $\sum_{n=2}^{72}(7n - 18)$ (4)

	$-4+3+10+...+486$ $T_n=a+(n-1)d$ $=-4+(n-1)(7)$ $=-4+7n-7$ $=7n-11$ $486=7n-11$ $497=7n$ $71=n$ $\therefore \sum_{n=1}^{71}(7n-11)$	✓ $T_n=7n-11$ ✓ $486=7n-11$ ✓ $n=71$ ✓ $\sum_{n=1}^{71}(7n-11)$ (4)
2.3	$2a=7$ $a=\frac{7}{2}=3,5$ $T_2-T_1=3a+b$ $-11=3(3,5)+b$ $-\frac{43}{2}=b$ $-21,5=b$ $n=-\frac{b}{2a}=-\frac{(-21,5)}{2(3,5)}=\frac{43}{14}=3,07$ The 3rd term is the smallest **OR** T_1 T_2 T_3 T_4 T_5 \ / \ / \ / \ / -11 -4 3 10 $T_1-11=T_2$ $T_1>T_2$ $T_2-4=T_3$ $T_2>T_3$ $T_3+3=T_4$ $T_4>T_3$ $T_4+10=T_5$ $T_5>T_4$ $T_1>T_2>T_3$ & $T_5>T_4>T_3$ $\therefore T_3$ is the smallest term.	✓ $a=\frac{7}{2}=3,5$ ✓ $b=-21,5$ ✓ $n=3,07$ ✓ $T_3<T_4$ ✓ answer (5) ✓ proving $T_1>T_2$ ✓ proving $T_2>T_3$ ✓ proving $T_4>T_3$ ✓ proving $T_5>T_4$ ✓ answer (5) **[15]**

QUESTION 3

3.1	$r=\frac{T_2}{T_1}=\frac{5(3x+1)^2}{5(3x+1)}=3x+1$ $-1<r<1$ $-1<3x+1<1$ $-2<3x<0$ $-\frac{2}{3}<x<0$	✓ $r=3x+1$ ✓ $-1<3x+1<1$ ✓ answer (3)
3.2	$x=-\frac{1}{6}$ $r=3\left(-\frac{1}{6}\right)+1$ $a=5\left(3\left(-\frac{1}{6}\right)+1\right)$ $=\frac{1}{2}$ $=\frac{5}{2}$ $S_\infty=\frac{a}{1-r}$ $=\frac{\frac{5}{2}}{1-\frac{1}{2}}$ $=5$	✓ $r=\frac{1}{2}$ ✓ $a=\frac{5}{2}$ ✓ substitution ✓ answer (4) **[7]**

QUESTION 4

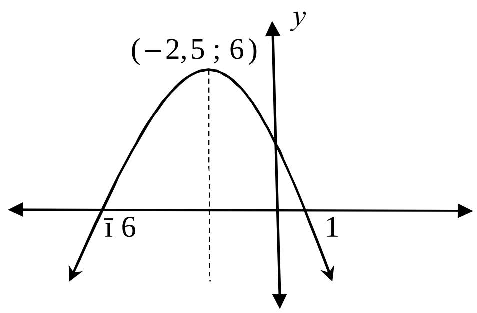
4.1	$C(2;-9)$	✓✓ $C(2;-9)$ (2)
4.2	$y=\frac{1}{2}(x-2)^2-9$ $=\frac{1}{2}(0-2)^2-9$ $=-7$ $\therefore B(0;-7)$	✓ $x=0$ ✓ $y=-7$ (2)
4.3	$f(x)=x-7$	✓✓ $x-7$ (2)

4.4	At the intersection of the asymptotes, $x = 2$ $\therefore y = 2 - 7 = -5$ $\therefore (2; -5)$ $h(x) = \dfrac{a}{x-2} - 5$ $-7 = \dfrac{a}{0-2} - 5$ $-2 = \dfrac{a}{-2}$ $4 = a$ $\therefore h(x) = \dfrac{4}{x-2} - 5$	✓ $y = -5$ ✓ $p = -2$ ✓ $q = -5$ ✓ substitution of B$(0; -7)$ ✓ $a = 4$ (5)
4.5	$3h(x) - 2 = 3\left(\dfrac{4}{x-2} - 5\right) - 2$ $= \dfrac{12}{x-2} - 15 - 2$ $x = 2$ $y = -17$	✓ $x = 2$ ✓ $y = -17$ (2)
4.6	$h(x) = \dfrac{4}{x-2} - 5$ $0 = \dfrac{4}{x-2} - 5$ $5 = \dfrac{4}{x-2}$ $5(x-2) = 4$ $5x - 10 = 4$ $5x = 14$ $x = \dfrac{14}{5} = 2{,}8$	✓ $y = 0$ ✓ simplification ✓ answer (3)
4.7.1	$x \in (-\infty; 2)$ or $(2; 2{,}8)$ **OR** $x \in (-\infty; 2{,}8)$; $x \neq 2$ **OR** $x < 2{,}8$; $x \neq 2$	✓ $(-\infty; 2)$ ✓✓ $(2; 2{,}8)$ ✓✓ $(-\infty; 2{,}8)$ ✓ $x \neq 2$ ✓✓ $x < 2{,}8$ ✓ $x \neq 2$ (3)

4.7.2	$f^{-1}(x-1): x-1 = y-7$ $\therefore y = x+6$ $f^{-1}(x-1) < 2:\ x+6<2$ $\therefore x < -4$ **OR** (2, ï 5) lies on f (ï 5 ; 2) lies on f^{-1} (ï 4 ; 2) lies on $f^{-1}(x-1)$ Since $m_f = 1$, $m_{f^{-1}} = 1$ $\therefore f^{-1}$ is an increasing function $\therefore x < -4$	✓ $f^{-1}(x-1)$ ✓ $y = x+6$ ✓ $x+6<2$ ✓ answer ✓ (ï 5 ; 2) lies on f^{-1} ✓ (ï 4 ; 2) lies on $f^{-1}(x-1)$ ✓ increasing function ✓ answer (4)
4.8	$\frac{1}{2}(x-2)^2 - 9 = x-7+k$ $\frac{1}{2}x^2 - 2x - 7 = x - 7 + k$ $\frac{1}{2}x^2 - 3x - k = 0$ For equal roots : $b^2 - 4ac = 0$ $(-3)^2 - 4\left(\frac{1}{2}\right)(-k) = 0$ $2k = -9$ $k = -\frac{9}{2}$ $\therefore$ For two unequal positive roots : $-4,5 < k < 0$ **OR**	✓ substitution of $g(x)$ and $f(x)$ ✓ standard form ✓ substitution into $b^2 - 4ac = 0$ ✓ value of k for equal roots ✓✓ answer

	$\frac{1}{2}(x-2)^2 - 9 = x - 7 + k$	✓ substitution of $g(x)$ and $f(x)$
	$\frac{1}{2}x^2 - 2x - 7 = x - 7 + k$	
	$\frac{1}{2}x^2 - 3x - k = 0$	✓ standard form
	For equal roots: $b^2 - 4ac = 0$	
	$(-3)^2 - 4\left(\frac{1}{2}\right)(-k) = 0$	✓ substitution into $b^2 - 4ac = 0$
	$2k = -9$	
	$k = -\frac{9}{2}$	✓ value of k for equal roots
	$y-$intercept of $y = x - 7 + k$:	
	$y = 0 - 7 - \frac{9}{2}$	
	$y = -11,5$	
	$\therefore$ For two unequal positive roots:	
	$-11,5 < -7 + k < -7$	✓ $-11,5 < -7 + k < -7$
	$-4,5 < k < 0$	✓ answer
	OR	
	$g(x) = \frac{1}{2}(x-2)^2 - 9$	
	$= \frac{1}{2}(x^2 - 4x + 4) - 9$	
	$= \frac{1}{2}x^2 - 2x - 7$	✓ $\frac{1}{2}x^2 - 2x - 7$
	$g'(x) = x - 2$	
	$1 = x - 2$	✓ $g'(x) =$ gradient of $f(x) = 1$
	$3 = x$	
	$g(3) = \frac{1}{2}(3-2)^2 - 9$ or $g(3) = \frac{1}{2}(3)^2 - 2(3) - 7$	
	$g(3) = -8\frac{1}{2}$	✓ $g(3) = -8\frac{1}{2}$
	$y = x + c$	
	$-8\frac{1}{2} = 3 + c$	
	$c = -11,5$	✓ $c = -11,5$
	For two positive roots:	
	$-11,5 < c < -7$	✓ $-11,5 < c < -7$
	$-11,5 < k - 7 < -7$	
	$-4,5 < k < 0$	✓ answer (6) **[29]**

QUESTION 5

5.1.1	$h(x)=\left(\frac{5}{6}\right)^{-x}$ $=\left(\frac{6}{5}\right)^{x}$	✓ any answer (1)
5.1.2	$f(x)=\left(\frac{5}{6}\right)^{x}$ $f^{-1}:\ x=\left(\frac{5}{6}\right)^{y}$ $y=\log_{\frac{5}{6}} x \quad x>0$	✓ $x=\left(\frac{5}{6}\right)^{y}$ ✓ $y=\log_{\frac{5}{6}} x$ (2)
5.1.3	$x\in(0;1]$ **OR** $0<x\leq 1$	✓ critical values ✓ notation (only if values are correct) ✓ critical values ✓ notation (only if values are correct) (2)
5.2	 	✓ turning point ✓ ✓ each x-intercept ✓ shape (4) **[9]**

QUESTION 6

6.1	$\text{Loan}=\frac{75}{100}\times 2\ 000\ 000$ $=R\ 1\ 500\ 000$ **OR** $\frac{25}{100}\times 2\ 000\ 000$ $=R500\ 000$ $\text{Loan}=R\ 2\ 000\ 000-500\ 000$ $=R1\ 500\ 000$	✓ $\frac{75}{100}\times 2\ 000\ 000$ ✓ answer ✓ R 500 000 ✓ answer (2)

6.2	$A = P(1+i)^n$ $= 1\,500\,000\left(1+\frac{0,095}{4}\right)^1$ $= R1\,535\,625$ $P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $1\,500\,000\left(1+\frac{0,095}{4}\right)^1 = \frac{58\,000\left[1-\left(1+\frac{0,095}{4}\right)^{-n}\right]}{\frac{0,095}{4}}$ $0,6288119612 = 1-\left(1+\frac{0,095}{4}\right)^{-n}$ $\left(1+\frac{0,095}{4}\right)^{-n} = 0,3711880386$ $\log_{\left(1+\frac{0,095}{4}\right)}(0,3711880386) = -n$ OR $\frac{\log(0,3711880386)}{\log\left(1+\frac{0,095}{4}\right)} = -n$ $n = 42,22185853$ $\therefore$ 43 quarterly payments	✓ $1\,500\,000\left(1+\frac{0,095}{4}\right)^1$ ✓ $i = \frac{0,095}{4}$ ✓ substitution into the correct formula ✓ correct use of logs ✓ $n = 42,22$ ✓ answer (6)
6.3	Outstanding balance $= P(1+i)^n - \frac{x\left[(1+i)^n - 1\right]}{i}$ $= 1\,535\,625\left(1+\frac{0,095}{4}\right)^{23} - \frac{58\,000\left[\left(1+\frac{0,095}{4}\right)^{23}-1\right]}{\frac{0,095}{4}}$ $= R\,886\,790{,}15$ **OR**	✓ $n = 23$ ✓ $1\,535\,625\left(1+\frac{0,095}{4}\right)^{23}$ OR $1\,500\,000\left(1+\frac{0,095}{4}\right)^{24}$ ✓ $\frac{58\,000\left[\left(1+\frac{0,095}{4}\right)^{23}-1\right]}{\frac{0,095}{4}}$ ✓ answer (4)

	Outstanding time $= 42{,}22185853 - 23$ $= 19{,}22185853$ Outstanding balance: $P = \dfrac{x\left[1-(1+i)^{-n}\right]}{i}$ $= \dfrac{58\ 000\left[1-\left(1+\dfrac{0{,}095}{4}\right)^{-19{,}22185853}\right]}{\dfrac{0{,}095}{4}}$ $= R\ 886\ 790{,}15$	✓ 23 ✓ $n = 19{,}22185853$ ✓ substitution ✓ answer (4)
6.4	Interest charged $= (58\ 000 \times 23) - (1\ 500\ 000 - 886\ 790{,}1491)$ $= R\,720\ 790{,}15$	✓ $58\ 000 \times 23$ ✓ ✓ $1\ 500\ 000 - 886\ 790{,}1491$ ✓ answer (4) **[16]**

QUESTION 7

7.1	$f(x) = -x^2 + 3x - 7$ $f(x+h) = -(x+h)^2 + 3(x+h) - 7$ $= -(x^2 + 2xh + h^2) + 3x + 3h - 7$ $= -x^2 - 2xh - h^2 + 3x + 3h - 7$ $f(x+h) - f(x) = (-x^2 - 2xh - h^2 + 3x + 3h - 7)$ $- (-x^2 + 3x - 7)$ $= -2xh - h^2 + 3h$ $f'(x) = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$ $= \lim_{h \to 0} \dfrac{-2xh - h^2 + 3h}{h}$ $= \lim_{h \to 0} \dfrac{h(-2x - h + 3)}{h}$ $= \lim_{h \to 0} (-2x - h + 3)$ $= -2x + 3$ **OR**	✓ $-(x+h)^2 + 3(x+h) - 7$ ✓ $-x^2 - 2xh - h^2 + 3x + 3h - 7$ ✓ simplification ✓ substitution into formula ✓ factors ✓ answer (6)

	$f(x) = -x^2 + 3x - 7$ $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \to 0} \frac{-(x+h)^2 + 3(x+h) - 7 - (-x^2 + 3x - 7)}{h}$ $= \lim_{h \to 0} \frac{-(x^2 + 2xh + h^2) + 3x + 3h - 7 + x^2 - 3x + 7}{h}$ $= \lim_{h \to 0} \frac{-x^2 - 2xh - h^2 + 3x + 3h - 7 + x^2 - 3x + 7}{h}$ $= \lim_{h \to 0} \frac{-2xh - h^2 + 3h}{h}$ $= \lim_{h \to 0} \frac{h(-2x - h + 3)}{h}$ $= \lim_{h \to 0} (-2x - h + 3)$ $= -2x + 3$	✓ $-(x+h)^2 + 3(x+h) - 7$ ✓ substitution into formula ✓ $-x^2 - 2xh - h^2 + 3x + 3h - 7$ ✓ simplification ✓ factors ✓ answer (6)
7.2	$D_x\left[15\sqrt[5]{x^4} - \frac{3x^7 + x}{4x^3}\right]$ $= D_x\left[15x^{\frac{4}{5}} - \frac{3x^4}{4} - \frac{x^{-2}}{4}\right]$ $= 12x^{-\frac{1}{5}} - 3x^3 + \frac{1}{2}x^{-3}$	✓ $15x^{\frac{4}{5}}$ ✓ $-\frac{3x^4}{4}$ ✓ $-\frac{x^{-2}}{4}$ ✓ $12x^{-\frac{1}{5}}$ ✓ $-3x^3$ ✓ $+\frac{1}{2}x^{-3}$ (6) **[12]**

QUESTION 8

8.1	$x \leq -3$ or $x \geq 2$ Note: Accept $x < -3$ or $x > 2$. At the stationary points, the graph is both increasing and decreasing.	✓ $x \leq -3$ ✓ $x \geq 2$ (2)
8.2	$x = -3$	✓ $x = -3$ (1)
8.3	$f'(x) = 1(x+3)(x-2)$ $= x^2 + x - 6$	✓ $(x+3)(x-2)$ ✓ answer (2)

8.4	$f(x) = px^3 + qx^2 + rx + 10$ $f^{/}(x) = 3px^2 + 2qx + r$ $f^{/}(x) = x^2 + x - 6$ $\therefore 3p = 1 \quad 2q = 1 \quad r = -6$ $p = \frac{1}{3} \quad q = \frac{1}{2}$	✓ $f^{/}(x) = 3px^2 + 2qx + r$ ✓ $3p = 1$ ✓ $2q = 1$ ✓ $r = -6$ (4)

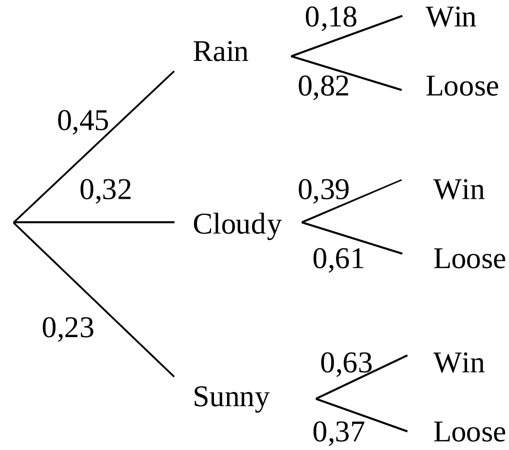
8.5	$f(x) = \frac{1}{3}x^3 + \frac{1}{2}x^2 - 6x + 10$
	$f^{/}(x) = x^2 + x - 6$
	$f^{//}(x) = 2x + 1$
	Concave down when $f^{//}(x) < 0$
	$2x + 1 < 0$
	$x < -\frac{1}{2}$
	
	OR
	
	$f(x) = \frac{1}{3}x^3 + \frac{1}{2}x^2 - 6x + 10$
	$f^{/}(x) = x^2 + x - 6$
	$x = \frac{-3+2}{2}$
	$x = -\frac{1}{2}$
	$f^{/}(x)$ is decreasing for $x < -\frac{1}{2}$
	$\therefore f^{//}(x) < 0$ when $x < -\frac{1}{2}$
	$\therefore$ Concave down: $x < -\frac{1}{2}$
		✓ $f^{//}(x) = 2x + 1$
		✓ $f^{//}(x) < 0$
		✓ $x < -\frac{1}{2}$
		(3)
		
		✓ $x = \frac{-3+2}{2}$
		✓ $f^{//}(x) < 0$
		✓ answer
		(3)
		[12]

QUESTION 9

9.1	$\text{AH} = 4t$ $\text{HB} = 1\,200 - 4t$ $\text{BD} = 5t$ $\text{HD}^2 = (1\,200 - 4t)^2 + (5t)^2$ Pyth $= 1\,440\,000 - 9\,600t + 16t^2 + 25t^2$ $= 41t^2 - 9\,600t + 1\,440\,000$ $\text{HD} = \sqrt{41t^2 - 9\,600t + 1\,440\,000}$	✓ $\text{HB} = 1\,200 - 4t$ ✓ $\text{BD} = 5t$ ✓ $\text{HD}^2 = (1\,200 - 4t)^2 + (5t)^2$ ✓ $1\,440\,000 - 9\,600t + 16t^2 + 25t^2$ (4)

9.2	$\left(\text{HD}^2\right)'(t) = 82t - 9600$ $0 = 82t - 9600$ $82t = 9\ 600$ $t = 117,07$ seconds $\therefore$ after 117,07 seconds **OR** The minimum of HD occurs when HD^2 is a minimum. $\text{min } t = \dfrac{-(-9\ 600)}{2(41)}$ $= 117,07$ seconds	✓ $\left(\text{HD}^2\right)'(t) = 82t - 9600$ ✓ $\left(\text{HD}^2\right)'(t) = 0$ ✓ answer ✓ min of HD = min HD^2 ✓ substitute into equation of axis of symmetry ✓ answer (3)
9.3	$\text{HD} = \sqrt{41(117,07)^2 - 9\ 600(117,07) + 1\ 440\ 000}$ $= \sqrt{878\ 048,7805}$ $= 937,04$ m No, the hunter is outside the shooting range.	✓ substitution ✓ answer ✓ No (3) **[10]**

QUESTION 10

10.1		✓ first outcomes ✓ second outcomes (2)
10.2	P(Win) = P(RW) + P(CW) + P(SW) = (0,45)(0,18) + (0,32)(0,39) + (0,23)(0,63) = 0,3507 = 35,07%	✓ P(RW) = (0,45)(0,18) ✓ P(CW) = (0,32)(0,39) ✓ P(SW) = (0,23)(0,63) ✓ answer (4) **[6]**

QUESTION 11

11.1	$9! = 362\ 880$	✓ $9!$ **OR** $362\ 880$ (1)
11.2	$8! \times 2! = 80\ 640$	✓✓ $8! \times 2!$ **OR** $80\ 640$ (2)
11.3	$\frac{5 \times 7! \times 4}{9!}$ $= \frac{5}{18}$ or $0{,}28$	✓ $5 \times 7! \times 4$ ✓ $9!$ in denominator ✓ answer (3)
11.4	Total number of ways that 9 horses can be arranged in 4 stables $= 9 \times 8 \times 7 \times 6 = 3024$ Total number of ways without a mare in the arrangement $= 4! = 24$ Total number of ways in which at least 1 mare in the arrangement $= 3\ 024 - 24$ $= 3\ 000$ ways **OR** The total number of ways in which there is at least 1 mare in the arrangement: $= [(5 \times 4 \times 3 \times 2) \times 4] + \left[(5 \times 4 \times 4 \times 3) \times \frac{12}{2}\right] +$ $[(5 \times 4 \times 3 \times 4) \times 4] + [5 \times 4 \times 3 \times 2]$ $= 3\ 000$ ways	✓ 3 024 ✓ 24 ✓ 3 000 ✓ $[(5 \times 4 \times 3 \times 2) \times 4] + \left[(5 \times 4 \times 4 \times 3) \times \frac{12}{2}\right]$ ✓ $[(5 \times 4 \times 3 \times 4) \times 4] + [5 \times 4 \times 3 \times 2]$ ✓ answer (3) **[9]**
		TOTAL: 150

	COGNITIVE LEVELS				TOPICS						
	LEVEL 1 (20%)	LEVEL 2 (35%)	LEVEL 3 (30%)	LEVEL 4 (15%)							
QUESTION	KNOWLEDGE	ROUTINE PROCEDURES	COMPLEX PROCEDURES	PROBLEM SOLVING	ALGEBRA	PATTERNS	FUNCTIONS	FINANCE	DIFFERENTIATION	PROBABILITY	TOTAL MARKS
1.1.1	3				3						
1.1.2	4				4						
1.1.3	2				2						
1.1.4			6		6						
1.2		6			6						
1.3				4	4						**25**
2.1.1	2					2					
2.1.2	2					2					
2.1.3	2					2					
2.2		4				4					
2.3				5		5					**15**
3.1		3				3					
3.2		4				4					**7**
4.1	2						2				
4.2	2						2				
4.3	2						2				
4.4		5					5				
4.5			2				2				
4.6		3					3				
4.7.1			3				3				
4.7.2			4				4				
4.8			6				6				**29**
5.1.1	1						2				
5.1.2		2					1				
5.1.3			2				2				
5.2			4				4				**9**
6.1	2							2			
6.2		6						6			
6.3			4					4			
6.4				4				4			**16**
7.1		6							6		
7.2			6						6		**12**
8.1	2								2		
8.2	1								1		
8.3		2							2		
8.4			4						4		
8.5		3							3		**12**

	COGNITIVE LEVELS				TOPICS						
	LEVEL 1 (25%)	LEVEL 2 (30 %)	LEVEL 3 (30%)	LEVEL 4 (15%)							
QUESTION	KNOWLEDGE	ROUTINE PROCEDURES	COMPLEX PROCEDURES	PROBLEM SOLVING	ALGEBRA	PATTERNS	FUNCTIONS	FINANCE	DIFFERENTIATION	PROBABILITY	TOTAL MARKS
9.1				4					4		
9.2		3							3		
9.3				3					3		**10**
10.1		2								2	
10.2		4								4	**6**
11.1	1									1	
11.2		2								2	
11.3			3							3	
11.4				3						3	**9**
TOT	28	55	44	23	25	22	38	16	34	15	150
%	**19%**	**37%**	**29%**	**15%**							
Pol	**20%**	**35%**	**30%**	**15%**	**25**	**25**	**35**	**15**	**35**	**15**	**150**