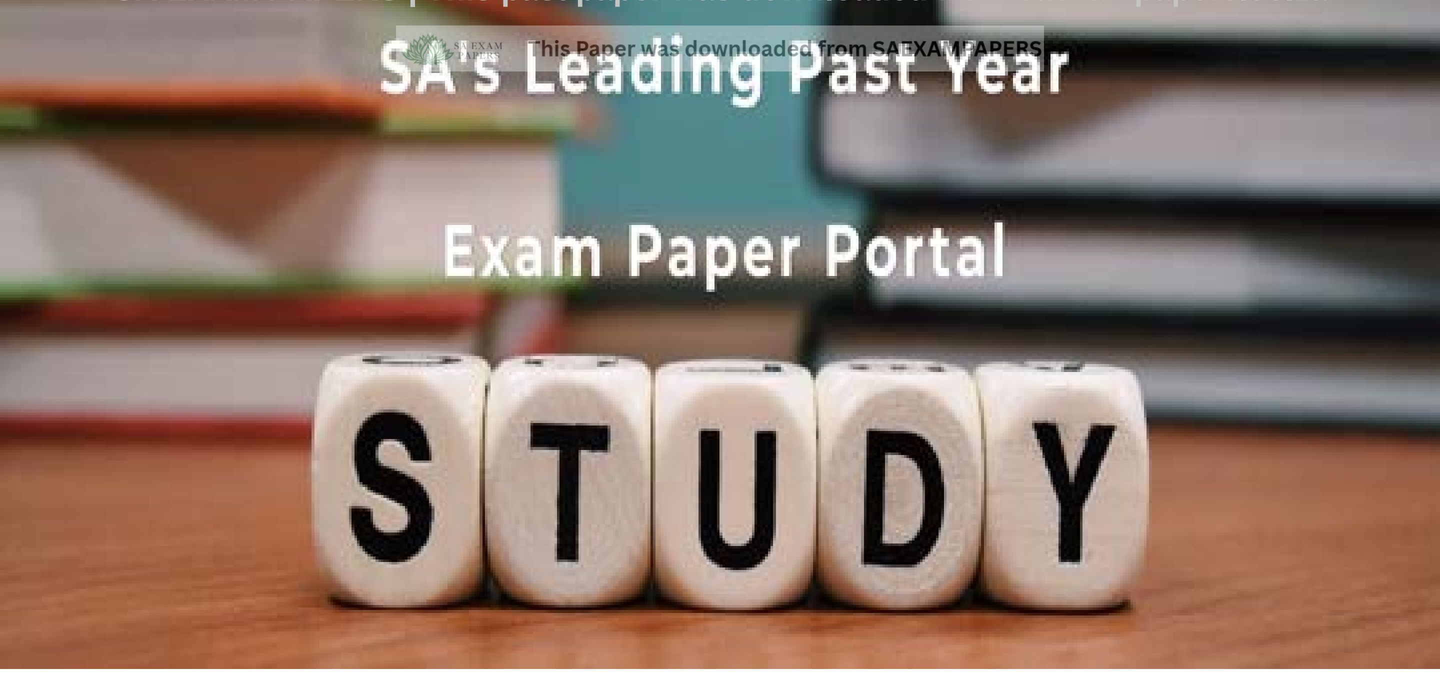
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GAUTENG PROVINCE
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PREPARATORY EXAMINATION

2025

MARKING GUIDELINES

MATHEMATICS PAPER 1

26 pages

Approved: 6 September 2025

INSTRUCTIONS AND INFORMATION

NOTES:

- If a candidate answered a question *TWICE*, mark only the *FIRST* attempt.
- If a candidate crossed *OUT* an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy *(CA)* applies to ALL aspects of the marking guidelines.
- It is UNACCEPTABLE for candidates to assume values/ answers in order to solve a question.
- (A) - denotes an accuracy mark.

QUESTION 1

1.1.1	$f(x)=(x^2-3)(3x-1)(x+2)$ $0=(x^2-3)(3x-1)(x+2)$ $\therefore x^2=3$ or $x=\frac{1}{3}$ or $x=-2$ $\therefore x=\pm\sqrt{3}$ or $x=\frac{1}{3}$ or $x=-2$ $x=-2$ **NOTE:** Answer only, full marks.	✓ all 3 x-values ✓ answer	(2)
1.1.2	$x=\frac{1}{3}$ or $x=-2$	✓ both x-answers	(1)
1.1.3	$x=-2$ or $x=\frac{1}{3}$ or $x=\pm\sqrt{3}$	✓ all 4 x-answers	(1)
1.2.1	$-15x^2-9x+4=0$ $x=\frac{-(-9)\pm\sqrt{(-9)^2-4(-15)(4)}}{2(-15)}$ $\therefore x=-0{,}90$ or $x=0{,}30$ **NOTE:** Accept -0,89 or 0,29. Must show substitution into the formula to obtain full marks Any other valid method.	✓ substitution into correct formula ✓✓ answers	(3)
1.2.2	$(3x-2)^2\geq 3x$ $9x^2-12x+4\geq 3x$ $9x^2-15x+4\geq 0$ $(3x-4)(3x-1)\geq 0$ $x\leq\frac{1}{3}$ *or* $x\geq\frac{4}{3}$ **NOTE:** Any other valid method.	✓ standard form ✓ factors ✓✓ answer	(4)

1.2.3	$5^x = 5(4+5^{2-x})$ $5^x = 20+5.5^{2-x}$ $5^x = 20+\frac{5.5^2}{5^x}$ $\therefore 5^{2x} = 20.5^x+125\cdots\cdots(\times 5^x)$ $\therefore 5^{2x}-20.5^x-125=0$ $(5^x-25)(5^x+5)=0$ $\therefore 5^x=25$ or $5^x=-5$ $5^x=5^2$ or NA $\therefore x=2$ or $5^x>0$ **NOTE:** Does not have to indicate that $5^x>0$ if rejection is indicated.	✓ simplificaction ✓ standard form ✓ factors ✓ answers with rejection	
	OR	**OR**	
	$5^x = 5(4+5^{2-x})$ $5^x = 20+5.5^{2-x}$ $5^x = 20+\frac{5.5^2}{5^x}$ let $5^x = k$ $\therefore k = 20+\frac{125}{k}$ $k^2 = 20k+125$ $k^2-20k-125=0$ $(k+5)(k-25)=0$ $\therefore 5^x \neq -5$ or $5^x=25$ $5^x=5^2$ $x=2$	✓ simplificaction ✓ standard form ✓ factors ✓ answers with rejection	(4)

1.3	$\log_x 16 = 4$ ...(1) and $y + \sqrt{x+7} = x+1$...(2) $x^4 = 16$ $x^4 = 2^4$ $x = 2$...sub into (2) $y + \sqrt{2+7} = 2+1$ $y + \sqrt{9} = 3$ $\sqrt{9} = 3 - y$ $9 = 9 - 6y + y^2$ $0 = y^2 - 6y$ $0 = y(y-6)$ $y = 0$ or $y \neq 6$	✓ exponential form ✓ x-value ✓ substitution into (2) ✓ square both sides ✓ standard form ✓ y-values and rejection	
	OR	**OR**	
	$\log_x 16 = 4$ ...(1) and $y + \sqrt{x+7} = x+1$...(2) $x^4 = 16$ $x^4 = 2^4$ $x = 2$...sub into (2) $y + \sqrt{2+7} = 2+1$ $y + \sqrt{9} = 3$ $3 = 3 - y$ $0 = y$ **NOTE:** Full CA for this question. Do NOT stop marking after two errors.	✓ exponential form ✓ x-value ✓ substitution into (2) ✓ using +3 ✓ simplification ✓ y- value	(6)
1.4	$x^2 + p(2x+7) + 8$ $= x^2 + 2px + 7p + 8$ $\Delta = (2p)^2 - 4(1)(7p+8)$ $0 = 4p^2 - 28p - 32$ $0 = (p-8)(p+1)$ $p = 8$ or $p = -1$	✓ simplification ✓ condition for = roots; $\Delta = 0$ ✓ factors ✓ both answers	
	OR	**OR**	

	$x^2+p(2x+7)+8$ $=x^2+2px+7p+8$ $=x^2+2px+p^2-p^2+7p+8$ $=(x+p)^2-p^2+7p+8$ $\therefore -p^2+7p+8=0$ $p^2-7p-8=0$ $(p-8)(p+1)=0$ $\therefore p=8$ or $p=-1$ **NOTE:** Only CA if the square was completed.	✓ complete the square ✓ $-p^2+7p+8=0$ ✓ factors ✓ answers	(4)
			[25]

QUESTION 2

2.1	$-3;\ -2;\ -3;\ -6;\ -11;\ldots$ first difference: $+1;\ -1;\ -3;\ -5;\ldots$ $\therefore a=1$ and $d=-2$ $\therefore T_n=a+(n-1)d$ $T_n=1+(n-1)(-2)$ $T_n=1-2n+2$ $\therefore T_n=-2n+3$	✓ 1^{st} difference ✓ substitute into correct formula ✓ answer	(3)
2.2	$T_n=-2n+3$ $\therefore T_{35}=-2(35)+3$ $\therefore T_{35}=-67$ **NOTE**: Substitution must be $n=35$. Answer only, full marks.	✓ answer	(1)
2.3	$-3;\ -2;\ -3;\ -6;\ -11;$ $+1;\ -1;\ -3;\ -5;$ 1^{st} differences $-2\ \ -2\ \ -2$ 2^{nd} differences $T_n=an^2+bn+c$ $but\cdots 2a=-2$ $\therefore a=-1$ $\therefore T_n=-n^2+bn+c$ $\therefore T_1=-(1)^2+b(1)+c$ $\therefore -3=-1+b+c$ $\therefore -2=b+c\cdots\cdots(1)$ $\therefore T_2=-(2)^2+b(2)+c$ $\therefore -2=-4+2b+c$ $\therefore 2=2b+c\cdots\cdots(2)$ $(2)-(1)\ \therefore b=4$ $in\cdots(1)\ \therefore -2=4+c$ $\therefore c=-6$ $\therefore T_n=-n^2+4n-6$	✓ 2^{nd} difference ✓ value of a ✓ value of b ✓ value of c	(4)

2.4	$T_n = -n^2 + 4n - 6$ $T_n = -[n^2 - 4n + 4 - 4 + 6]$ $T_n = -[(n-2)^2 + 2]$ $\therefore T_n = -(n-2)^2 - 2$ $\therefore T_n(\text{max}) = -2$ $\therefore$ NO positive terms. **OR** The turning point of a maximum quadratic function is $(2\ ;\ -2)$. $\therefore$ no values ABOVE the x-axis, hence no positive values. **NOTE**: Accept a sketch indicating the correct turning point and shape (ie. $a < 0$). Award full marks.	✓ complete the square ✓ $T_n(\text{max}) = -2$ **OR** ✓ turning point ✓ explanation concluding no positive terms	(2)
			[10]

QUESTION 3

3.1.1	$18cm$; $6\sqrt{3}$cm ; $6cm$.. Area of circle 1: 324π Area of circle 2: 108π Area of circle 3: 36π $\frac{108\pi}{324\pi}=\frac{1}{3}$; $\frac{36\pi}{108\pi}=\frac{1}{3}$ $\therefore Consant\ ratio=\frac{1}{3}$ $-1<r<1$ $\therefore$ ratio is converging $\therefore$ sequence converges **NOTE:** If the candidate uses the radii to establish the pattern, $r=\frac{1}{\sqrt{3}}=\frac{\sqrt{3}}{3}$; award 1 mark.	✓ areas of 3 outermost circles ✓ value of r ✓ $-1<r<1$	(3)
3.1.2	18; $6\sqrt{3}$; 6 $r=\frac{1}{\sqrt{3}}$ $T_n=ar^{n-1}$ $\frac{2}{3}=18\left(\frac{1}{\sqrt{3}}\right)^{n-1}$ $\frac{1}{27}=\left(\frac{1}{\sqrt{3}}\right)^{n-1}$ $3^{-3}=\left(3^{-\frac{1}{2}}\right)^{n-1}$ $3^{-3}=3^{-\frac{1}{2}n+\frac{1}{2}}$ $\therefore -3=-\frac{1}{2}n+\frac{1}{2}$ $\therefore n=7$ **OR**	✓ ratio of radii ✓ substitution into correct formula ✓ $3^{-3}=3^{-\frac{1}{2}n+\frac{1}{2}}$ ✓ answer **OR**	(4)

	$r = \frac{1}{\sqrt{3}}$ $T_n = ar^{n-1}$ $\frac{2}{3} = 18\left(\frac{1}{\sqrt{3}}\right)^{n-1}$ $\frac{1}{27} = \left(\frac{1}{\sqrt{3}}\right)^{n-1}$ $n-1 = \log_{\frac{1}{\sqrt{3}}} \frac{1}{27}$ $\therefore n-1 = 6$ $\therefore n = 7$ **NOTE:** Candidates may use the areas of the circles to do this question. Answer only – award ZERO marks	✓ ratio of radii ✓ substitution in correct formula ✓ correct use of logs ✓ answer	
3.2	$(1\times2) + (5\times6) + (9\times10) + (13\times14) + \ldots + (81\times82)$ $1 ; 5 ; 9 ; 13 ; \ldots. 81$ (1^{st} terms in the bracket) $a = 1$ and $d = 4$ $T_n = a + (n-1)d$ $T_n = 1 + (n-1)4$ $T_n = 1 + 4n - 4$ $\therefore T_n = 4n - 3$ Number of terms: $4n - 3 = 81$ $4n = 84$ $\therefore n = 21$ $2 ; 6 ; 10 ; 14 ; \ldots 82$ (2^{nd} factor in the bracket is 1 more than 1^{st} factor) $\therefore T_n = 4n - 3 + 1$ $\therefore T_n = 4n - 2$ $\therefore (1\times2) + (5\times6) + (9\times10) + (13\times14) + \ldots + (81\times82)$ $= \sum_{n=1}^{21}(4n-3)(4n-2)$ $= \sum_{n=1}^{21}(16n^2 - 20n + 6)$ **NOTE**: Accept answer mark either as a quadratic equation or in factors form.	✓ $T_n = 4n - 3$ ✓ $n = 21$ ✓ $T_n = 4n - 2$ ✓ answer	(4)

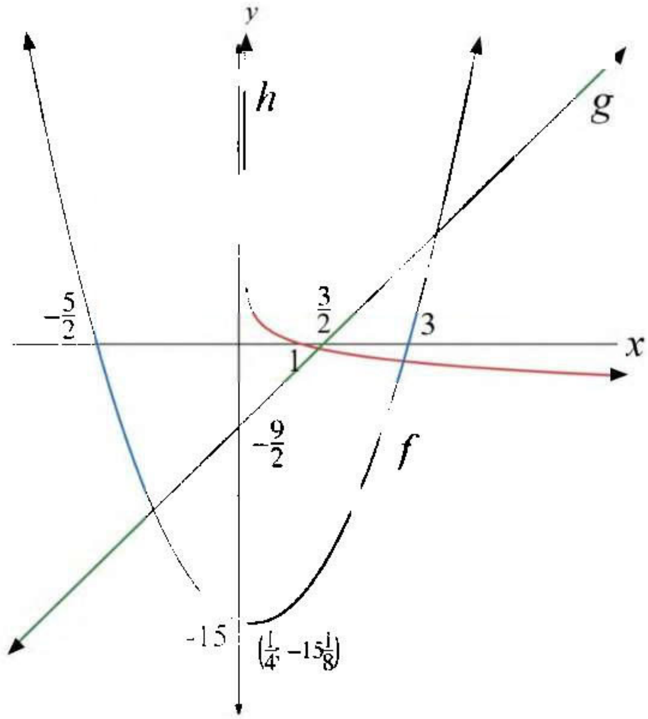
3.3	$a+ar+ar^2+...=1\cdots\cdots(1)$ $a^2+a^2r^2+a^2r^4+...=\frac{5}{6}\cdots\cdots(2)$ $S_\infty=\frac{a}{1-r}=1$ $\therefore a=1-r\cdots\cdots(3)$ $S_\infty=\frac{a^2}{1-r^2}=\frac{5}{6}$ $\therefore 6a^2=5-5r^2\cdots\cdots(4)$ (3) in (4) $\therefore 6(1-r)^2=5-5r^2$ $6(1-2r+r^2)=5-5r^2$ $6-12r+6r^2=5-5r^2$ $\therefore 11r^2-12r+1=0$ $(11r-1)(r-1)=0$ $\therefore r=\frac{1}{11}$ or $r=1(NA);\ (-1<r<1)$ $\therefore r=\frac{1}{11}$	✓ a as subject ✓ $6a^2=5-5r^2$ ✓ substitution ✓ standard form ✓ answers with rejection	(5)
			[16]

QUESTION 4

4.1	$p=2$ $q=-1$ **NOTE:** Do NOT accept answers in terms of x and y.	✓ answer ✓ answer	(2)
4.2	$f(x)=\frac{a}{x+p}+q$ $-\frac{5}{2}=\frac{a}{-4+2}-1$ $a=3$ **NOTE:** Answer only, full marks.	✓ answer	(1)
4.3	$y\in\Re$; $y\neq-1$ **NOTE:** Both conditions must be stated.	✓ answer	(1)
4.4	$m=-1$ $y-(-1)=-1(x-(-2))$ $y+1=-x-2$ $y=-x-3$	✓ $m=-1$ ✓ substitution ✓ answer	(3)
4.5	$f\left(x+4\frac{1}{2}\right)$ moves $4\frac{1}{2}$ units to the left. $x=-6\frac{1}{2}$ $y=-1$ **NOTE**: Answers only, full marks.	✓ x-asymptote ✓ y- asymptote	(2)
			[9]

QUESTION 5

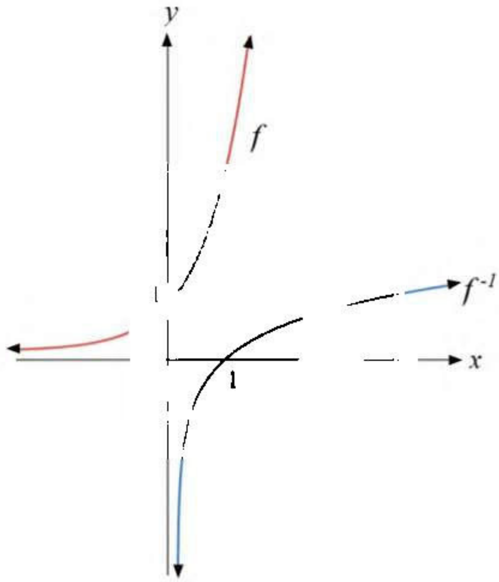
5.1	$0 = 2x^2 - x - 15$ $\therefore 0 = 4x - 1$ $\therefore x = \frac{1}{4}$ $\therefore f\left(\frac{1}{4}\right) = -\frac{121}{8}$ $\left(\frac{1}{4}\ ;\ -\frac{121}{8}\right)$	✓ x-value ✓ y-value	
	OR	**OR**	
	$0 = 2x^2 - x - 15$ $\therefore x = -\frac{(-1)}{2(2)}$ $\therefore x = \frac{1}{4}$ $\therefore f\left(\frac{1}{4}\right) = -\frac{121}{8}$	✓ x-value ✓ y-value	(2)
5.2	$f(x) = 2x^2 - x - 15$ $\therefore 0 = 2x^2 - x - 15$ $\therefore 0 = (2x+5)(x-3)$ $\therefore x = -\frac{5}{2}$ or $x - 3$	✓ factors = 0	
	OR	**OR**	
	$\therefore 0 = 2x^2 - x - 15$ $\therefore x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-15)}}{2(2)}$ $\therefore x = -\frac{5}{2}$ or $x = 3$	✓ substitution into quadratic formula	(1)

5.3	 **NOTE:** Candidates must not be penalised if the functions are sketched on 3 different axes.	✓ f : x and y intercepts ✓ f : shape ✓ g: y-intercept and positive gradient ✓ h : shape ✓ h : asymptote	(5)

5.4	$HR = f(x) - g(x)$ $HR = 2x^2 - x - 15 - 3x + 4\frac{1}{2}$ $HR = 2x^2 - 4x - 10\frac{1}{2}$ *but* $(x = 4)$ $\therefore HR = 2(4)^2 - 4(4) - 10\frac{1}{2}$ $HR = 5\frac{1}{2} units$ $f(4) = 2(4)^2 - 4 - 1$: $\therefore f(4) = 13$ $g(4) = 3(4) - 4\frac{1}{2}$ $\therefore g(4) = 7\frac{1}{2}$ $g(4) = 13 - 7\frac{1}{2}$ $HR = 5\frac{1}{2} units$ **NOTE:** Accept $g(x) - f(x)$ however candidate must present answer as a POSTIVE value for HR.	✓ method ✓ substitution ✓ answer **OR** ✓ calculate $f(4)$ and $g(4)$ ✓ $f(4) - g(4)$ ✓ answer	(3)
5.5.1	$x \in \Re$	✓ answer	(1)
5.5.2	$y \in \Re; \quad y > 0$ **NOTE**: No penalty for not stating $y \in \Re$.	✓ answer	(1)
5.6	$k = \frac{1}{8}$ For equal roots the graph shifts $15\frac{1}{8}$ units upwards and the y-intercept will be $15\frac{1}{8}$ units above where it is now. **OR**	✓✓ value of k **OR**	

	$2x^2 - x + k = 0$ For equal roots, $\Delta = 0$ $b^2 - 4ac = 0$ $\therefore (-1)^2 - 4(2)(k) = 0$ $\therefore 1 = 8k$ $\therefore k = \frac{1}{8}$	✓ condition for equal roots ✓ value of k	(2)
5.7	$g(x) - f(x)$ $= 3x - 4\frac{1}{2} - 2x^2 + x + 15$ $= -2x^2 + 4x + 10\frac{1}{2}$ $\therefore \frac{-\Delta}{4a}$ $= \frac{-\left[4^2 + 8\left(10\frac{1}{2}\right)\right]}{-8}$ $\therefore Max = 12\frac{1}{2} units$ **OR** $g(x) - f(x)$ $= 3x - 4\frac{1}{2} - 2x^2 + x + 15$ $= -2x^2 + 4x + 10\frac{1}{2}$ $\therefore -4x + 4 = 0$ $\therefore x = 1$ max value = $12\frac{1}{2} units$ **NOTE**: Any valid method.	✓ method ✓ substitution ✓ answer **OR** ✓ method ✓ derivative ✓ answer	(3)
			[18]

QUESTION 6

6.1	$f(x)=3^x$ $\therefore f^{-1}=\log_3 x$	✓ answer	(1)
6.2		✓ shape of f ✓ y-intercept of f ✓ shape of f^{-1} ✓ x-intercept of f^{-1}	(4)
6.3	$y=x$	✓ answer	(1)
6.4	$0<x\le 1$ **NOTE**: Accept answer as separate inequalities.	✓ answer	(1)
6.5	$y>-4$	✓ answer	(1)
6.6	$g(x)=-f(x-2)$ $\therefore g(x)=-3^{x-2}$ **NOTE:** Answer only, FULL marks	✓ $g(x)=-f(x-2)$ ✓ answer	(2)
			[10]

QUESTION 7

7.1.1	$A = P(1 - i)^n$ $\therefore A = 120\,000(1 - 0{,}09)^5$ $\therefore A = R74883{,}86$ **NOTE**: Answer only with correct formula, full marks.	✓ substitute correctly into correct formula ✓ answer	(2)
7.1.2	$A = P(1 + i)^n$ $\therefore A = 120\,000(1 + 0{,}07)^5$ $\therefore A = R168\,306{,}21$ **NOTE**: Answer only with correct formula, full marks.	✓ substitute correctly into correct formula ✓ answer	(2)
7.1.3	**NOTE**: From Q7.1.1 and Q7.1.2, the (estimated) value of the sinking fund: R168 306,21 − R74 883,86 = R93 422,35 [So R90 000 is close to this value] $F_v = \frac{x[(1+i)^{n+1} - 1]}{i} = 90000$ $\therefore \frac{x[(1+\frac{0{,}085}{12})^{61} - 1]}{\frac{0{,}085}{12}} = 90\,000$ $\therefore x = R1\,184{,}68$	✓ value of i and n ✓ substitute correctly into correct formula ✓ answer	(3)

7.2	$P_v = \frac{x[1-(1+i)^{-n}]}{i} = 900000$ $\therefore \frac{18000\left[1-\left(1+\frac{0,105}{12}\right)^{-n}\right]}{\frac{0,105}{12}} = 900000$ $\therefore \frac{\left[1-\left(1+\frac{0,105}{12}\right)^{-n}\right]}{\frac{0,105}{12}} = 50$ $\therefore 1-\left(1+\frac{0,105}{12}\right)^{-n} = \frac{7}{16}$ $\therefore 1-\frac{7}{16} = \left(1+\frac{0,105}{12}\right)^{-n}$ $\therefore \frac{9}{16} = \left(1+\frac{0,105}{12}\right)^{-n}$ $\therefore \left(1+\frac{0,105}{12}\right)^{n} = \frac{16}{9}$ $\therefore n\log\left(1+\frac{0,105}{12}\right) = \log\frac{16}{9}$ $\therefore n = 66,043$ **NOTE**: Accept 66 or 67 months	✓ substitute correctly into correct formula ✓ value of i and n ✓ simplification ✓ correct use of logs ✓ answer	(5)
			[12]

QUESTION 8

8.1.1	$f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim_{h\to 0}\frac{-2(x+h)^2+1-(-2x^2+1)}{h}$ $=\lim_{h\to 0}\frac{-2(x^2+2xh+h^2)+1+2x^2-1}{h}$ $=\lim_{h\to 0}\frac{-2x^2-4xh-2h^2+1+2x^2-1}{h}$ $=\lim_{h\to 0}\frac{-4xh-2h^2}{h}$ $=\lim_{h\to 0}\frac{h(-4x-2h)}{h}$ $=\lim_{h\to 0}(-4x-2h)$ $=-4x$ **NOTE**: Penalise for notation error in this question only.	✓ substitution ✓ simplification ✓ $=\lim_{h\to 0}\frac{-4xh-2h^2}{h}$ ✓ answer	(4)
8.1.2	$f'\left(\frac{-1}{2}\right)=-4\left(-\frac{1}{2}\right)$ $\therefore f'\left(\frac{-1}{2}\right)=2$ **NOTE**: Answer only, full marks.	✓ answer	(1)
8.2	$f(x)=\sqrt[3]{x^2}+\frac{1}{4x^4}$ $\therefore f(x)=x^{\frac{2}{3}}+\frac{1}{4}x^{-4}$ $f'(x)=\frac{2}{3}x^{-\frac{1}{3}}-1x^{-5}$	✓ write as exponents ✓✓ answers	(3)

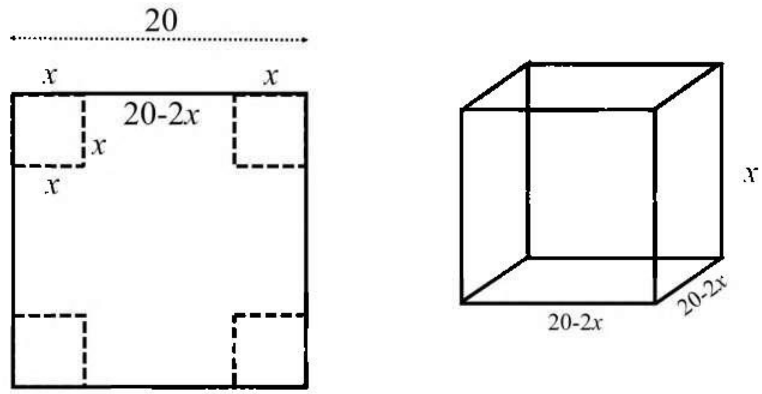
8.3	$h(x) = ax^2 \cdots\cdots a > 0$ $\therefore h'(x) = 2ax$ $h'(4) = 2a(4)$ $\therefore h'(4) = 8a$ inverse: $x = ay^2 \quad ; \quad y > 0$ $\therefore y^2 = \frac{x}{a} \quad ; \quad y > 0$ $\therefore y = +\sqrt{\frac{x}{a}}$ $\therefore h^{-1}(x) = \sqrt{\frac{x}{a}}$ $\therefore h^{-1}(8) = \sqrt{\frac{8}{a}}$ $\therefore h^{-1}(8) = h'(4)$ $\therefore \sqrt{\frac{8}{a}} = 8a$ $\left(\sqrt{\frac{8}{a}}\right)^2 = (8a)^2$ $\frac{8}{a} = 64a^2$ $\therefore 8 = 64a^3$ $\therefore \frac{8}{64} = a^3$ $\therefore a^3 = \frac{1}{8}$ $\therefore a = \sqrt[3]{\frac{1}{8}}$ $\therefore a = \frac{1}{2}$	✓ $h'(x) = 2ax$ ✓ $h'(4) = 8a$ ✓ $h^{-1}(8) = \sqrt{\frac{8}{a}}$ ✓ $\sqrt{\frac{8}{a}} = 8a$ ✓ value of a	(5)
			[13]

QUESTION 9

9.1	$y=-2(x-1)^2(x-4)$ $=-2(x^2-2x+1)(x-4)$ $=-2(x^3-2x^2+x-4x^2+8x-4)$ $=-2(x^3-6x^2+9x-4)$ $\therefore y=-2x^3-12x^2-18x+8$ $\therefore a=12$ $\therefore b=-18$ $\therefore c=8$	✓ method ✓ $-2(x^2-2x+1)(x-4)$ ✓ $-2(x^3-6x^2+9x-4)$	(3)
9.2	$f(x)=-2x^3+12x^2-18x+8$ $\therefore f'(x)=-6x^2+24x-18$ $\therefore f'(x)=x^2-4x+3$ $\therefore 0=x^2-4x+3$ $0=(x-3)(x-1)$ $\therefore x=1$ or $x=3$ but $f(3)=8$ $\therefore$ tangent passes through points C and D. **NOTE:** Does not have to conclude that the tangent passes through points C and D. Can conclude at $f(3)=8$. If a candidate calculates the tangent at point D and proves that the tangent does NOT pass through point C, award full marks.	✓ $f'(x)$ ✓ x-values ✓ $f(3)=8$	(3)
9.3	$f'(x)=-6x^2+24x-18$ $f''(x)=-12x+24$ $0=-12x+24$ $x=2$ $f(2)=4$ $\therefore \perp h=4$ $Area=\frac{1}{2}(3)(4)$ $Area=6\ units^2$	✓ $f''(x)=0$ ✓ value for x ✓ $f(2)=4$ ✓ answer	(4)
9.4	$f''(x)<0$ $\therefore -12x+24<0$ $\therefore x>2$ **NOTE**: Valid from Q9.3. Answer only, full marks.	✓ answer	(1)
9.5	$1<x<3$	✓ answer	(1)

9.6	turning points: $(x\ ;\ y-3)$ $(1\ ;\ -3)$ and $(3\ ;\ 5)$	✓✓ answers	(2)
			[14]

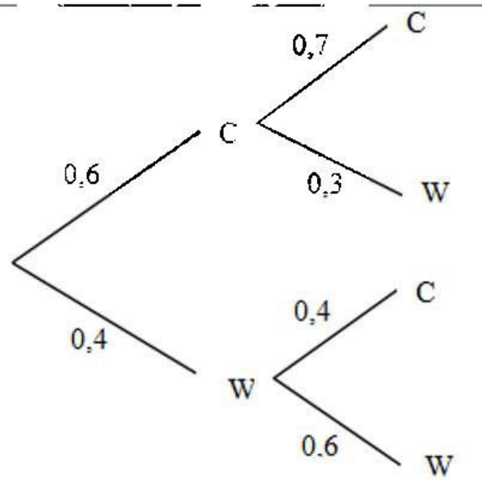
QUESTION 10



$V(x)=x(20-2x)(20-2x)$ $\therefore V(x)=400x-80x^2+4x^3$ $V'(x)=400-160x+12x^2$ $\therefore 0=400-160x+12x^2$ $0=4(100-40x+3x^2)$ $0=4(3x-10)(x-10)$ $\therefore x=\frac{10}{3}$ or $x=10$ $V''(x)=-160+24x$ $\therefore V''\left(\frac{10}{3}\right)=-160+80<0$ $\therefore V''(10)=-160+240>0$ By the 2^{nd} derivative test, the dimensions would be: $\frac{10}{3}cm$ by $\frac{40}{3}cm$ by $\frac{40}{3}cm$ **NOTE:** $V'(x)=0$ must be stated and not implied. Accept valid methods indicating that $x=\frac{10}{3}$ at the maximum and $x\neq 10$.	✓ $V(x)=x(20-2x)(20-2x)$ ✓ $V(x)=400x-80x^2+4x^3$ ✓ $0=400-160x+12x^2$ ✓ x-values ✓ $V''(x)=-160+24x$ ✓ $V''\left(\frac{10}{3}\right)<0$ and $V''(10)>0$ ✓ dimensions	(7)
		[7]

QUESTION 11

11.1.1	$P(A)=\frac{2}{6}=\frac{1}{3}$ $P(B)=\frac{3}{6}=\frac{1}{2}$	✓ answer $P(A)$ ✓ answer $P(B)$	(2)
11.1.2	$P(A')=1-P(A)$ $\therefore P(A')=1-\frac{1}{3}$ $\therefore P(A')=\frac{2}{3}$	✓ answer	(1)
11.1.3	$A=\{1\ ;\ 2\}$ $B=\{2\ ;\ 4\ ;\ 6\}$ $C=\{6\}$ NO. $P(A, \text{B and } C)\neq 0$ **NOTE:** The first mark can only be awarded if a reason is provided. Not awarding marks for yes/ no answers only.	✓ NO. ✓ valid explanation	(2)
11.1.4	$P(A \text{ or } C)=P(A)+P(C)-P(A \text{ and } C)$ $\therefore P(A \text{ or } C)=\frac{1}{3}+\frac{1}{6}-0$ $\therefore P(A \text{ or } C)=\frac{1}{2}$ **OR** $P(A \text{ or } C)=\frac{n(A \text{ or } C)}{n(S)}$ $P(A \text{ or } C)=\frac{3}{6}$ $\therefore P(A \text{ or } C)=\frac{1}{2}$ **NOTE**: Answer only, full marks.	✓ $P(A\cup C)=\frac{1}{3}+\frac{1}{6}-0$ ✓ Answer **OR** ✓ substitution ✓ answer	(2)

11.1.5	$P(B) \times P(C)$ $= \frac{1}{2} \times \frac{1}{6}$ $= \frac{1}{12}$ $but \cdots P(B \cap C) = \frac{1}{6}$ $\therefore P(B \cap C) \neq P(B) \times P(C)$ $\therefore$ B and C are not independent events.	✓ $P(B) \times P(C) = \frac{1}{12}$ ✓ $P(B \cap C) \neq P(B) \times P(C)$ ✓ conclusion	(3)
11.2	C - Correct W - Wrong  $P(2^{nd} \cdots ans \cdots corr) = 0{,}6 \times 0{,}7 + 0{,}4 \times 0{,}4$ $= 0{,}42 + 0{,}16$ $= 0{,}58$	✓ correct 1^{st} and 2^{nd} branches ✓ $= 0{,}6 \times 0{,}7 + 0{,}4 \times 0{,}4$ ✓ answer	(3)
11.3	**NOTE:** This question is removed from the question paper.		
			[13]

TOTAL: 147

END