



PREPARATORY EXAMINATION

2025

MARKING GUIDELINES

MATHEMATICS PAPER 1

26 pages

Approved:

6 September 2025



GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

**AMENDMENT TO MARKING GUIDELINES
PREPARATORY EXAMINATIONS – 2025**

ATTENTION

THE CHIEF INVIGILATOR

SUBJECT / VAK	MATHEMATICS/WISKUNDE
PAPER / VRAESTEL	1
DATE OF EXAMINATION	5 SEPTEMBER 2025

The errata for the Marking Guidelines of MATHEMATICS P1 has reference.

There is a contention that **Question 11.3** (3 marks) was not answerable by most candidates in the province. This matter was addressed at the Marking Standardisation Meeting. To ensure that candidates are not disadvantaged and prejudiced in way, you are advised to ask your Mathematics Educator(s) to **ignore Question 11.3** when marking.

In other words, the paper must be marked out of a total of 147 instead of 150, and then the learners' marks must be converted to a mark out of 150. E.g., Should a learner attain 85/147 then that mark is recalculated as 87/150.

Use the formula: $\frac{a}{147} \times 100 = b$. Then, $\frac{b}{100} \times 150 = c$

C is the mark that is entered into SASAMS out of 150.

Mr. Jonathan Williams

DIRECTOR: EXAMINATIONS MANAGEMENT

5 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	$f(x) = (x^2 - 3)(3x - 1)(x + 2)$ $0 = (x^2 - 3)(3x - 1)(x + 2)$ $\therefore x^2 = 3 \text{ or } x = \frac{1}{3} \text{ or } x = -2$ $\therefore x = \pm\sqrt{3} \text{ or } x = \frac{1}{3} \text{ or } x = -2$ $x = -2$ NOTE: Answer only, full marks.	✓ all 3 x -values ✓ answer	(2)
1.1.2	$x = \frac{1}{3} \text{ or } x = -2$	✓ both x -answers	(1)
1.1.3	$x = -2 \text{ or } x = \frac{1}{3} \text{ or } x = \pm\sqrt{3}$	✓ all 4 x -answers	(1)
1.2.1	$-15x^2 - 9x + 4 = 0$ $x = \frac{-(-9) \pm \sqrt{(-9)^2 - 4(-15)(4)}}{2(-15)}$ $\therefore x = -0,90 \text{ or } x = 0,30$ 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	$(3x - 2)^2 \geq 3x$ $9x^2 - 12x + 4 \geq 3x$ $9x^2 - 15x + 4 \geq 0$ $(3x - 4)(3x - 1) \geq 0$ $x \leq \frac{1}{3} \text{ or } x \geq \frac{4}{3}$ NOTE: Any other valid method.	✓ standard form ✓ factors ✓ ✓ answer	(4)

1.2.3	$5^x = 5(4 + 5^{2-x})$ $5^x = 20 + 5 \cdot 5^{2-x}$ $5^x = 20 + \frac{5 \cdot 5^2}{5^x}$ $\therefore 5^{2x} = 20 \cdot 5^x + 125 \dots (\times 5^x)$ $\therefore 5^{2x} - 20 \cdot 5^x - 125 = 0$ $(5^x - 25)(5^x + 5) = 0$ $\therefore 5^x = 25 \quad \text{or} \quad 5^x = -5$ $5^x = 5^2 \quad \text{or} \quad NA$ $\therefore x = 2 \quad \text{or} \quad 5^x > 0$ NOTE: Does not have to indicate that $5^x > 0$ if rejection is indicated. OR $5^x = 5(4 + 5^{2-x})$ $5^x = 20 + 5 \cdot 5^{2-x}$ $5^x = 20 + \frac{5 \cdot 5^2}{5^x}$ let $5^x = k$ $\therefore k = 20 + \frac{125}{k}$ $k^2 = 20k + 125$ $k^2 - 20k - 125 = 0$ $(k + 5)(k - 25) = 0$ $\therefore 5^x \neq -5 \quad \text{or} \quad 5^x = 25$ $5^x = 5^2$ $x = 2$	✓ simplification ✓ standard form ✓ factors ✓ answers with rejection OR ✓ simplification ✓ standard form ✓ factors ✓ answers with rejection	(4)
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$ \begin{aligned} &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 \quad \text{or} \quad p = -1 \end{aligned} $ NOTE: Only CA if the square was completed.	✓ complete the square ✓ $-p^2 + 7p + 8 = 0$ ✓ factors ✓ answers	(4)
[25]		

QUESTION 2

2.1	$-3; -2; -3; -6; -11; \dots$ first difference: $+1; -1; -3; -5; \dots$ $\therefore a = 1$ 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	$-3; -2; -3; -6; -11;$ $\quad \backslash \quad / \quad \backslash \quad / \quad \backslash \quad /$ $\quad +1; -1; -3; -5;$ 1 st differences $\quad \backslash \quad / \quad \backslash \quad / \quad \backslash \quad /$ $\quad -2 \quad -2 \quad -2$ 2 nd differences $T_n = an^2 + bn + c$ but $\dots 2a = -2$ $\therefore a = -1$ $\therefore T_n = -n^2 + bn + c$ $\therefore T_1 = -(1)^2 + b(1) + c$ $\therefore -3 = -1 + b + c$ $\therefore -2 = b + c \dots \dots (1)$ $\therefore T_2 = -(2)^2 + b(2) + c$ $\therefore -2 = -4 + 2b + c$ $\therefore 2 = 2b + c \dots \dots (2)$ $(2) - (1) \therefore b = 4$ in $\dots (1) \therefore -2 = 4 + c$ $\therefore c = -6$ $\therefore T_n = -n^2 + 4n - 6$	✓ 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 $\frac{108\pi}{324\pi} = \frac{1}{3} \quad ; \quad \frac{36\pi}{108\pi} = \frac{1}{3}$ $\therefore \text{Consant ratio} = \frac{1}{3}$ $-1 < r < 1 \quad \therefore$ ratio is converging $\therefore$ sequence converges NOTE: If the candidate uses the radii to establish the pattern, $r = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}; \text{award 1 mark.}$	✓ 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	$(1 \times 2) + (5 \times 6) + (9 \times 10) + (13 \times 14) + \dots + (81 \times 82)$ 1 ; 5 ; 9 ; 13 ; 81 (1st 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 ; ... 82 (2nd factor in the bracket is 1 more than 1st factor) $\therefore T_n = 4n - 3 + 1$ $\therefore T_n = 4n - 2$ $\therefore (1 \times 2) + (5 \times 6) + (9 \times 10) + (13 \times 14) + \dots + (81 \times 82)$ $= \sum_{n=1}^{21} (4n-3)(4n-2)$ $= \sum_{n=1}^{21} (16n^2 - 20n + 6)$ 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	$a + ar + ar^2 + \dots = 1 \dots\dots (1)$ $a^2 + a^2r^2 + a^2r^4 + \dots = \frac{5}{6} \dots\dots (2)$ $S_{\infty} = \frac{a}{1-r} = 1$ $\therefore a = 1 - r \dots\dots (3)$ $S_{\infty} = \frac{a^2}{1-r^2} = \frac{5}{6}$ $\therefore 6a^2 = 5 - 5r^2 \dots\dots (4)$ (3) in (4) $\therefore 6(1-r)^2 = 5 - 5r^2$ $6(1 - 2r + r^2) = 5 - 5r^2$ $6 - 12r + 6r^2 = 5 - 5r^2$ $\therefore 11r^2 - 12r + 1 = 0$ $(11r - 1)(r - 1) = 0$ $\therefore r = \frac{1}{11} \quad \text{or} \quad r = 1 (NA); \quad (-1 < r < 1)$ $\therefore r = \frac{1}{11}$	✓ a as subject ✓ $6a^2 = 5 - 5r^2$ ✓ substitution ✓ standard form ✓ answers with rejection	(5)
[16]			

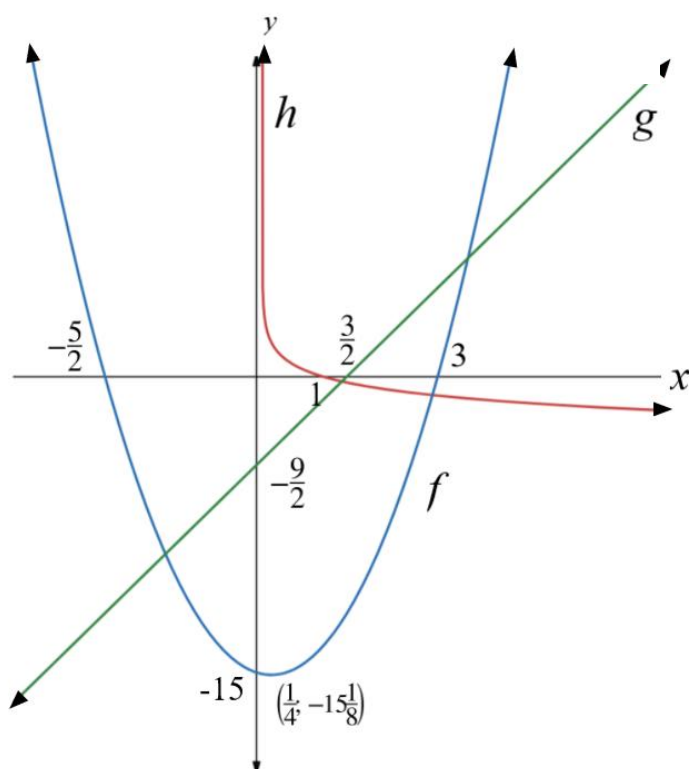
QUESTION 4

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

5.3

✓ f : x and y intercepts✓ f : shape✓ g : y -intercept and positive gradient✓ h : shape✓ h : asymptote

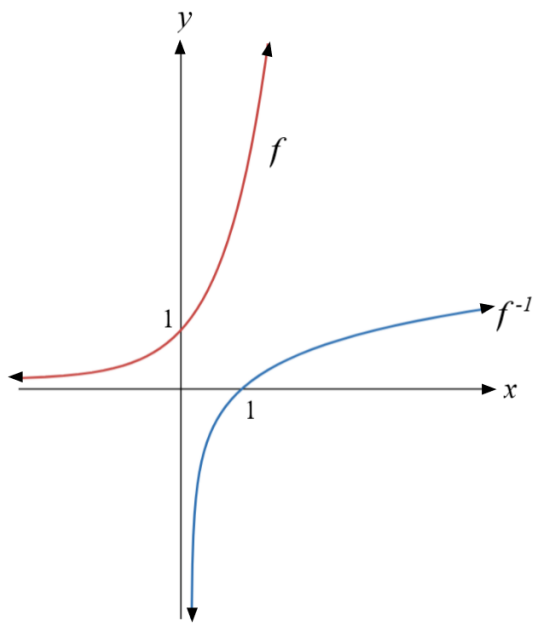
NOTE: Candidates must not be penalised if the functions are sketched on 3 different axes.

(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 ($x=4$) $\therefore HR = 2(4)^2 - 4(4) - 10\frac{1}{2}$ $HR = 5\frac{1}{2} \text{ units}$ OR $f(4) = 2(4)^2 - 4 - 15$ $\therefore f(4) = 13$ $g(4) = 3(4) - 4\frac{1}{2}$ $\therefore g(4) = 7\frac{1}{2}$ $g(4) = 13 - 7\frac{1}{2}$ $HR = 5\frac{1}{2} \text{ units}$ 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	$y \in \Re; y > 0$ 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	$g(x) - f(x)$ $= 3x - 4\frac{1}{2} - 2x^2 + x + 15$ $= -2x^2 + 4x + 10\frac{1}{2}$ $\therefore \frac{-\Delta}{4a}$ $= \frac{-[4^2 + 8(10\frac{1}{2})]}{-8}$ $\therefore \text{Max} = 12\frac{1}{2} \text{ units}$ 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 = $12\frac{1}{2} \text{ units}$ 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	$0 < x \leq 1$ 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	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{-2(x+h)^2 + 1 - (-2x^2 + 1)}{h}$ $= \lim_{h \rightarrow 0} \frac{-2(x^2 + 2xh + h^2) + 1 + 2x^2 - 1}{h}$ $= \lim_{h \rightarrow 0} \frac{-2x^2 - 4xh - 2h^2 + 1 + 2x^2 - 1}{h}$ $= \lim_{h \rightarrow 0} \frac{-4xh - 2h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-4x - 2h)}{h}$ $= \lim_{h \rightarrow 0} (-4x - 2h)$ $= -4x$ NOTE: Penalise for notation error in this question only.	✓ substitution ✓ simplification ✓ $= \lim_{h \rightarrow 0} \frac{-4xh - 2h^2}{h}$ ✓ 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)

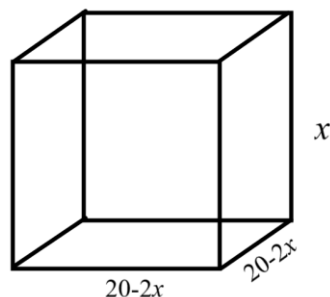
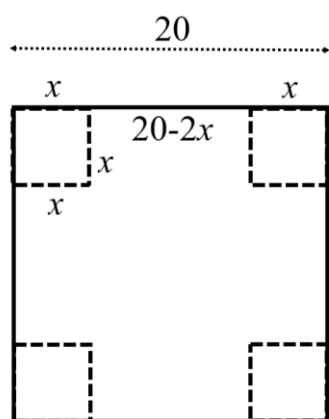
8.3	$h(x) = ax^2 \dots\dots a > 0$ $\therefore h'(x) = 2ax$ $h'(4) = 2a(4)$ $\therefore h'(4) = 8a$ inverse: $x = ay^2 \quad ; \quad y > 0$ $\therefore y^2 = \frac{x}{a} \quad ; \quad y > 0$ $\therefore y = +\sqrt{\frac{x}{a}}$ $\therefore h^{-1}(x) = \sqrt{\frac{x}{a}}$ $\therefore h^{-1}(8) = \sqrt{\frac{8}{a}}$ $\therefore h^{-1}(8) = h'(4)$ $\therefore \sqrt{\frac{8}{a}} = 8a$ $\left(\sqrt{\frac{8}{a}}\right)^2 = (8a)^2$ $\frac{8}{a} = 64a^2$ $\therefore 8 = 64a^3$ $\therefore \frac{8}{64} = a^3$ $\therefore a^3 = \frac{1}{8}$ $\therefore a = \sqrt[3]{\frac{1}{8}}$ $\therefore a = \frac{1}{2}$	$\checkmark \quad h'(x) = 2ax$ $\checkmark \quad h'(4) = 8a$ $\checkmark \quad h^{-1}(8) = \sqrt{\frac{8}{a}}$ $\checkmark \quad \sqrt{\frac{8}{a}} = 8a$ $\checkmark \quad \text{value of } a$	(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	$f(x) = -2x^3 + 12x^2 - 18x + 8$ $\therefore f'(x) = -6x^2 + 24x - 18$ $\therefore f'(x) = x^2 - 4x + 3$ $\therefore 0 = x^2 - 4x + 3$ $0 = (x-3)(x-1)$ $\therefore x = 1 \quad \text{or} \quad x = 3$ 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	$f'(x) = -6x^2 + 24x - 18$ $f''(x) = -12x + 24$ $0 = -12x + 24$ $x = 2$ $f(2) = 4$ $\therefore \perp h = 4$ $Area = \frac{1}{2}(3)(4)$ $Area = 6 \text{ units}^2$	✓ $f''(x) = 0$ ✓ 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



$$V(x) = x(20 - 2x)(20 - 2x)$$

$$\therefore V(x) = 400x - 80x^2 + 4x^3$$

$$V'(x) = 400 - 160x + 12x^2$$

$$\therefore 0 = 400 - 160x + 12x^2$$

$$0 = 4(100 - 40x + 3x^2)$$

$$0 = 4(3x - 10)(x - 10)$$

$$\therefore x = \frac{10}{3} \quad \text{or} \quad x = 10$$

$$V''(x) = -160 + 24x$$

$$\therefore V''\left(\frac{10}{3}\right) = -160 + 80 < 0$$

$$\therefore V''(10) = -160 + 240 > 0$$

By the 2nd derivative test, the dimensions would be:

$$\frac{10}{3} \text{ cm by } \frac{40}{3} \text{ cm by } \frac{40}{3} \text{ cm}$$

NOTE: $V'(x) = 0$ must be stated and not implied. Accept valid methods indicating that $x = \frac{10}{3}$ at the maximum and $x \neq 10$.

$$\checkmark \quad V(x) = x(20 - 2x)(20 - 2x)$$

$$\checkmark \quad V(x) = 400x - 80x^2 + 4x^3$$

$$\checkmark \quad 0 = 400 - 160x + 12x^2$$

$\checkmark$ x -values

$$\checkmark \quad V''(x) = -160 + 24x$$

$$\checkmark \quad V''\left(\frac{10}{3}\right) < 0 \quad \text{and} \quad V''(10) > 0$$

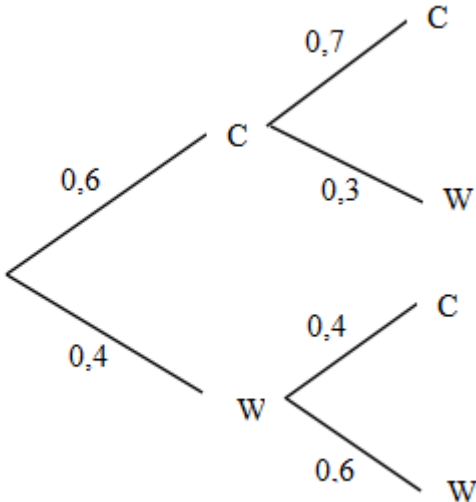
$\checkmark$ dimensions

(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. $P(A, B \text{ and } C) \neq 0$ 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	$P(B) \times P(C)$ $= \frac{1}{2} \times \frac{1}{6}$ $= \frac{1}{12}$ <i>but</i> ... $P(B \cap C) = \frac{1}{6}$ $\therefore P(B \cap C) \neq P(B) \times P(C)$ $\therefore B$ 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  $P(2^{nd} \dots ans \dots corr) = 0,6 \times 0,7 + 0,4 \times 0,4$ $= 0,42 + 0,16$ $= 0,58$	✓ correct 1st and 2nd 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