KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GRADE 12

MATHEMATICS
PAPER 1

PRE-TRIAL EXAMINATION

AUGUST 2024

MARKS: 150
TIME: 3 hours

This question paper consists of 9 pages including cover page and information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 13 questions.
2. Answer ALL the questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. Write neatly and legibly.

QUESTION 1

1.1 Solve for x if:

1.1.1 $(3-4x)(x+2)=0$ (2)

1.1.2 $x(3x+2)=9$ (Round off your answer correct to 2 decimal places) (4)

1.1.3 $\sqrt{x+5}.\sqrt{x-2}=3\sqrt{2}$ (5)

1.1.4 $(x-5)(1-2x)\geq 0$ (3)

1.2 Solve for x and y simultaneously if:

$3x=y+4$ and $y^2-xy=9x+7$ (6)

1.3 If m and n are rational numbers such that $\sqrt{m}+\sqrt{n}=\sqrt{5+\sqrt{24}}$, calculate a possible value for m^2+n^2. (4)

[24]

QUESTION 2

2.1 The sequence: 2 ; 8 ; 16 ; 26 ; … is a quadratic sequence.

2.1.1 Write down the next term. (1)

2.1.2 Determine the expression for the n^{th} term of the sequence (4)

2.1.3 What is the value of the first term of the sequence that is greater than 268? (3)

2.2 Calculate: $\sum_{k=-2}^{67}(-3k+8)$ (4)

[12]

QUESTION 3

3.1 The first two terms of a geometric series are 8 and $\frac{8}{\sqrt{2}}$.

3.1.1 Why the series is convergent? (1)

3.1.2 Determine the sum to infinity of the series without using a calculator. Leave your answer in simplified surd form. (2)

3.2 The sum of n terms of a sequence is given by $S_n=n(n-2)$.

3.2.1 Determine the sum of the first 20 terms. (1)

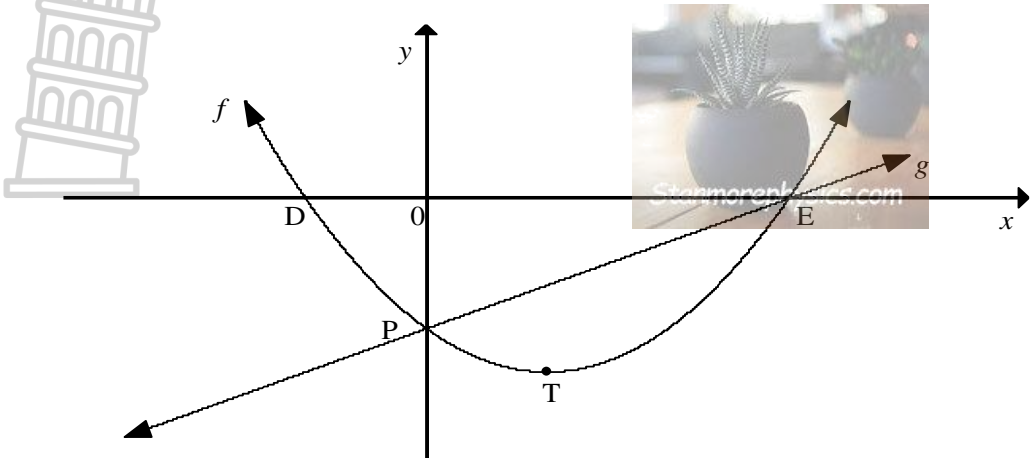
3.2.2 Hence calculate the 21st term of the sequence. (3)

3.3 The first term of an arithmetic sequence is 3. The 3rd, 6th, and 10th terms of the arithmetic sequence form the geometric sequence. Determine the common difference of the arithmetic sequence. (5)

[13]

QUESTION 4

The graph of $f(x) = x^2 - 2x - 3$ and $g(x) = mx + c$ are drawn below. D and E are the x-intercepts and P is the y-intercept of f. The turning point of f is T(1;–4). The graph of f and g intersect at P and E.



4.1 Calculate the length of DE. (3)

4.2 Determine the equation of g. (2)

4.3 Write down the values of x for which $f(x).g'(x) > 0$. (2)

4.4 Determine the value of x for which vertical distance between h and g is maximum, if $h(x) = -f(x)$ for $x \in [-2;3]$ (4)

4.5 Given: $k(x) = g(x) - n$. Determine n if k is a tangent to f. (5)

[16]

QUESTION 5

Given : $g(x) = \frac{2}{3-x} + 1$

5.1 Write down the equation of the asymptote of g. (2)

5.2 Draw a graph of g, indicating any intercepts with the axes and asymptotes. (4)

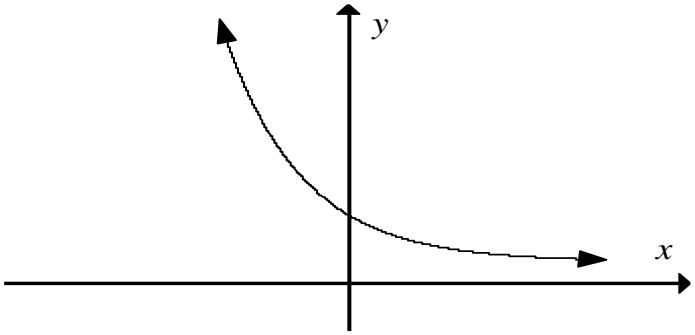
5.3 Determine the equation of the axis of symmetry of g which has a negative gradient. (2)

5.4 The x-intercept of g is reflected about the line in 5.3. Write down the coordinates of A, the image of the x-intercept, after reflection. (2)

[10]

QUESTION 6

Sketched below is the graph of $f(x) = k^x, k > 0$. The point $\left(2; \frac{1}{9}\right)$ lies on f.



6.1 Determine the value of k (2)

6.2 Write down the range of f (1)

6.3 Explain the transformation of f to f^{-1}. (1)

6.4 Determine the equation of f^{-1} in the form $y = ...$ (2)

6.5 Prove that $[f(x)]^2 - [f(-x)]^2 = f(2x) - f(-2x)$. (2)

[08]

QUESTION 7

Kelvin wants to purchase a house that costs R1,2 million. He is required to pay a 30 % deposit and he will borrow the balance from a bank. Kelvin agrees to pay back the money he will borrow over a period of 20 years.

7.1 Calculate the money that Kelvin must borrow from the bank. (2)

7.2 Calculate the monthly instalment Kelvin will pay if interest is charged at 15% per annum, compounded monthly. His repayments start 1 month after his loan is granted. (4)

7.3 Kelvin can afford to repay R12 000 per month. How long will it take to repay the loan amount if he chooses to pay R12 000 as a repayment every month? (4)

7.4 Calculate Kelvin's final payment, if he chooses to pay R12 000 as a repayment every month. (5)

[15]

QUESTION 8

8.1 From first principles, determine the derivative of $f(x) = -3x^2 + 1$ (5)

8.2 Determine $\frac{dy}{dx}$ if :

8.2.1 $y = \frac{4}{x} - 5\sqrt{x}$ (3)

8.2.2 $y + x = 2x^2 + 1$ (2)

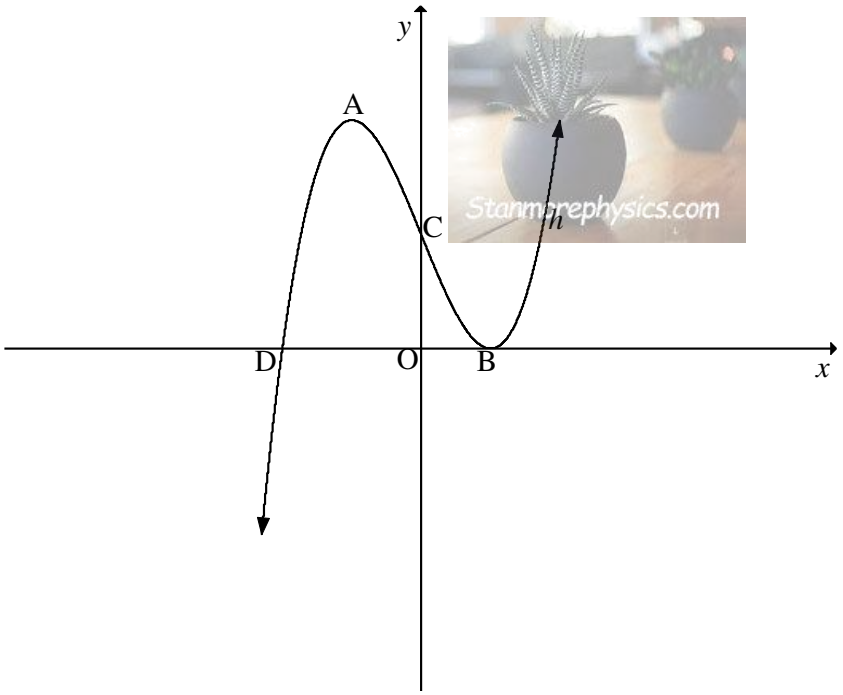
8.3 Given: $f(x) = x^2 - 4x - 6$, determine the equation of the tangent to f which is perpendicular to the line $g(x) = \frac{1}{2}x + 5$ (5)

[15]

QUESTION 9

The graph of $h(x) = x^3 - 3x + 2$ is drawn below.

- A and B are the turning points of *h*.
- C and D are the intercepts of *h* with the axes.



9.1 Determine the coordinates of A and B. (5)

9.2 Determine the coordinates of D (3)

9.3 Calculate the average gradient of h between A and B. (2)

9.4 Determine the value(s) of *x* for which

9.4.1 *h* changes its concavity? (3)

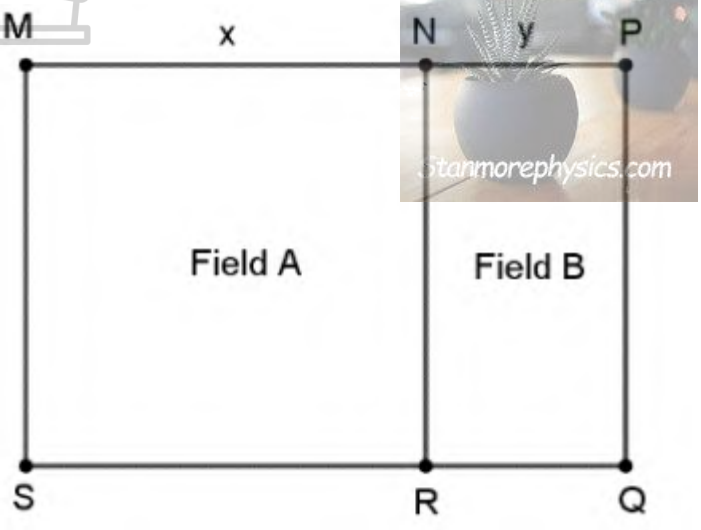
9.4.2 $h'(x) > 0$? (2)

[15]

QUESTION 10

The diagram below, shows a drawing of two adjacent fields that need to be fenced by a certain farmer.

- Field A is a square of width x.
- Field B is rectangular in shape of width y.
- Area of Field A + Area of Field B = 1000 units^2.
- NR is the only fence that is shared by both Field A and Field B.



10.1 Express y in terms of x. (2)

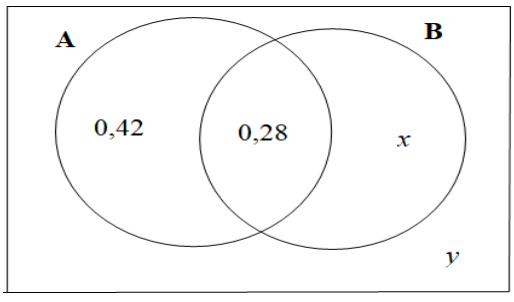
10.2 Show that that the length of the fence needed is given by $P = 3x + \frac{2000}{x}$. (2)

10.3 Calculate the value of x such that the length of the fence required is a minimum. (3)

[7]

QUESTION 11

The probabilities of two events, A and B, are shown in the diagram. A and B are independent events.



11.1 Show that the value of x is 0,12. (3)

11.2 Determine the value of y. (2)

[5]

QUESTION 12

Mphaso and Akshti are given one attempt at shooting a target in a game of archery.

If the probability that Mphaso will hit the target is $\frac{4}{5}$, and the probability that Akshti will hit the target is $\frac{3}{4}$, calculate the probability that the target will be missed by only one of them.

[5]

QUESTION 13

Consider the word **WINTER**

13.1 How many 6 letter words can be made by using by using the letters of this word if the letters may not be repeated? (1)

13.2 How many 6 letter words can be made if the word must start with a T and ends with a vowel, if the letters may not be repeated? (2)

13.3 Calculate the probability that the word does not start with a T and ending with a vowel. (2)

[5]

MARKS: 150

THE END

INFORMATION SHEET

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1+ni) \qquad A = P(1-ni) \qquad A = P(1-i)^n \qquad A = P(1+i)^n$$

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}\left[2a + (n-1)d\right]$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a\left(r^n - 1\right)}{r-1};\ r \neq 1 \qquad S_\infty = \frac{a}{1-r};\ -1 < r < 1$$

$$F = \frac{x\left[(1+i)^n - 1\right]}{i} \qquad P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad \mathrm{M}\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

$$a^2 = b^2 + c^2 - 2bc.\cos A$$

$$\text{area } \Delta\text{ABC} = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha\cos\alpha$$

$$\bar{x} = \frac{\sum x}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$$

$$\mathrm{P(A)} = \frac{n(\mathrm{A})}{n(\mathrm{S})} \qquad \mathrm{P(A\ or\ B)} = \mathrm{P(A)} + \mathrm{P(B)} - \mathrm{P(A\ and\ B)}$$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

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MARKING GUIDELINES

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QUESTION 1

1.1		
1.1.1	$x=\frac{3}{4}$ or $x=-2$	✓A answer ✓A answer (2)
1.1.2	$3x^2+2x-9=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-2\pm\sqrt{2^2-4(3)(-9)}}{2(3)}$ $\therefore x=-2{,}10$ or $x=1{,}43$	✓A standard form ✓A substitution ✓ A ✓A answers Penalise 1 mark for incorrect rounding off (4)
1.1.3	$\left(\sqrt{x+5}.\sqrt{x-2}\right)^2=\left(3\sqrt{2}\right)^2$ $x^2+3x-10=18$ $x^2+3x-28=0$ $(x+7)(x-4)=0$ $\therefore x\neq -7\,/\,x=4$	✓A squaring both sides ✓CA standard form ✓CA factors ✓CA values of x ✓CA rejecting $x=-7$ (5)
1.1.4	$CVs: x=\frac{1}{2}\,/\,x=5$ $\therefore \frac{1}{2}\le x\le 5 \quad OR \quad x\in\left[\frac{1}{2};5\right]$	✓A Critical values ✓A✓A answers (3)
1.2	$y=3x-4$ $(3x-4)^2-x(3x-4)=9x+7$ $9x^2-24x+16-3x^2+4x-9x-7=0$ $6x^2-29x+9=0$ $(3x-1)(2x-9)=0$ $x=\frac{1}{3}\,/\,x=\frac{9}{2}$ $\therefore y=-3\,/\,y=\frac{19}{2}$	✓A third equation ✓CA substitution ✓CA standard form ✓CA factors ✓CA both values of x ✓CA both values of y (6)
1.3	$\left(\sqrt{m}+\sqrt{n}\right)^2=\left(\sqrt{5+\sqrt{24}}\right)^2$ $m+2\sqrt{m}.\sqrt{n}+n=5+\sqrt{24}$ $m+2\sqrt{m}.\sqrt{n}+n=2+2\sqrt{2}.\sqrt{3}+3$ $\therefore m=2$ and $n=3$ $m^2+n^2=2^2+3^2$ $=4+9$ $=13$	✓A squaring both sides ✓A $2+2\sqrt{2}.\sqrt{3}+3$ ✓A values of m and n ✓CA answer (4)
		[24]

QUESTION 2

2.1		
2.1.1	38	✓A answer (1)
2.1.2	$2a = 2$ $a = 1$ $3(1) + b = 6$ $b = 3$ $1 + 3 + c = 2$ $c = -2$ $\therefore T_n = n^2 + 3n - 2$	✓A value of a ✓CA value of b ✓CA value of c ✓CA formula (4)
2.1.3	$n^2 + 3n - 2 > 268$ $n^2 + 3n - 270 > 0$ $(n + 18)(n - 15) > 0$ $CVs: n = -18 / n = 15$ $\therefore n > 15$ $\therefore n = 16$ $T_{16} > 268$	✓A $n^2 + 3n - 2 > 268$ ✓A factors ✓A 16 (3)
2.2	$14;11;18;...$ $n = 67 - (-2) + 1 = 70$ $S_n = \frac{n}{2}[2a + (n-1)d]$ $S_{70} = \frac{70}{2}[2(14) + (70-1)(-3)]$ $= -6265$	✓A first 3 terms ✓A value of n ✓CA substitution ✓CA answer (4)
		[12]

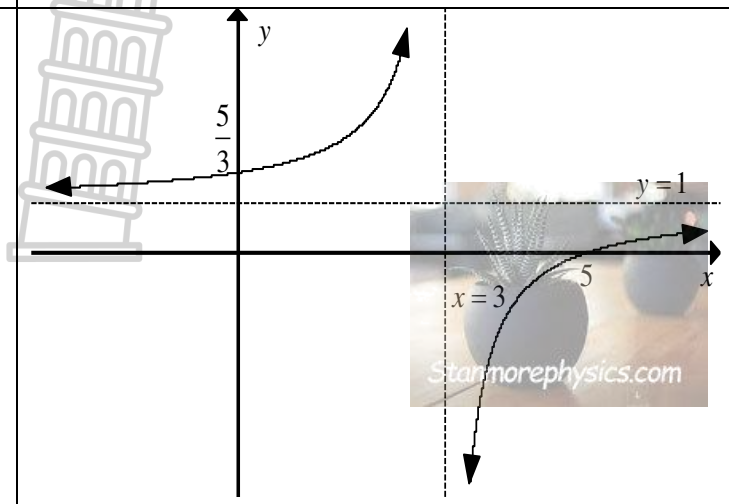
QUESTION 3

3.1		
3.1.1	$r = \frac{1}{\sqrt{2}}$ $\because -1 < r < 1$	✓A $-1 < r < 1$ (1)
3.1.2	$S_\infty = \frac{a}{1-r}$ $= \frac{8}{1-\frac{1}{\sqrt{2}}}$ $= \frac{8}{\frac{\sqrt{2}-1}{\sqrt{2}}}$ $= \frac{8\sqrt{2}}{\sqrt{2}-1} \times \frac{\sqrt{2}+1}{\sqrt{2}+1}$ $= 16+8\sqrt{2}$	✓A substitution ✓ CA answer (2)
3.2		
3.2.1	$S_{20} = 20(20-2)$ $= 360$	✓A answer (1)
3.2.2	$S_{21} = 21(21-2)$ $= 399$ $T_{21} = 399 - 360$ $= 39$	✓A 399 ✓CA subtraction ✓CA answer (3)
3.3	$a = 3$ $T_3 = 3+2d;\ T_6 = 3+5d;\ T_{10} = 3+9d$ $\frac{T_2}{T_1} = \frac{T_3}{T_2}$ $\frac{3+5d}{3+2d} = \frac{3+9d}{3+5d}$ $9+30d+25d^2 = 9+33d+18d^2$ $7d^2 - 3d = 0$ $d(7d-3) = 0$ $d = 0 / d = \frac{3}{7}$ $\therefore d = \frac{3}{7}$	✓A writing given terms in terms of d. ✓CA ratios ✓CA simplifying ✓CA factors ✓CA answer (5)
		[12]

QUESTION 4

4.1	$x^2-2x-3=0$ $(x-3)(x+1)=0$ $x=3/x=-1$ $\therefore DE=3-(-1)=4\,units$	✓A equating to 0 ✓A x-values ✓CA length of DE (3)
4.2	$y=mx+c$ $0=m(3)-3$ $3=3m$ $\therefore m=1$ $\therefore y=x-3$ **OR** $m=\frac{y_2-y_1}{x_2-x_1}$ $=\frac{0-(-3)}{3-0}$ $=\frac{3}{3}$ $=1$ $\therefore y=x-3$	✓CA value of m ✓CA equation (2) ✓CA value of m ✓CA equation (2)
4.3	$x<-1 or x>3$ *OR* $x\in(-\infty;-1) or (3;\infty)$	✓CA $x<-1$ ✓CA $x>3$ (2)
4.4	$h(x)=-x^2+2x+3$ $d=-x^2+2x+3-(x-3)$ $=-x^2+x+6$ $d'=-2x+1=0$ $\therefore x=\frac{1}{2}$	✓A equation of h ✓CA distance in terms of x ✓CA equating derivative to 0 ✓CA value of x (4)
4.5	$k(x)=x-3-n$ $2x-2=1$ $\therefore x=\frac{3}{2}$ $f\left(\frac{3}{2}\right)=-\frac{15}{4}$ $\therefore -\frac{15}{4}=\frac{3}{2}-3-n$ $n=\frac{9}{4}$	✓A derivative of f equal to 1 ✓CA value of x ✓CA value of y ✓CA substitution of x and y ✓ CA value of n (5) **[16]**

QUESTION 5

5.1	$x = 3$ $y = 1$	✓A vertical asymptote ✓A horizontal asymptote (2)
5.2		✓A x-intercept ✓A y-intercept ✓CA asymptotes ✓A shape (4)
5.3	$y = -x + 3 + 1$ $y = -x + 4$ OR $y = -x + c$ $1 = -(3) + c$ $4 = c$ $\therefore y = -x + 4$	✓A✓A equation (2) ✓A value of c ✓A equation (2)
5.4	A(4;−1)	✓CA value of x ✓ CA value of y (2) **[10]**

QUESTION 6

6.1	$\frac{1}{9} = k^2$ $\therefore k = \frac{1}{3}$	✓A substitution of a point ✓A value of k (2)
6.2	$y > 0$ OR $y \in (0;\infty)$	✓A answer (1)
6.3	Reflect f about the line $y = x$	✓A answer (1)
6.4	$x = \left(\frac{1}{3}\right)^y$ $\therefore y = \log_{\frac{1}{3}} x$	✓CA interchanging x and y ✓CA answer (2) Answer only: full marks

6.5	$[f(x)]^2-[f(-x)]^2=\left[\left(\frac{1}{3}\right)^x\right]^2-\left[\left(\frac{1}{3}\right)^{-x}\right]^2$ $=\left(\frac{1}{3}\right)^{2x}-\left(\frac{1}{3}\right)^{-2x}$ $=f(2x)-f(-2x)$	✓A substitution ✓A simplification (2)
		[08]

QUESTION 7

7.1	Loan $=70\%\times R1\,200\,000$ $=R840\,000$ *OR* Deposit $=30\%\times R1\,200\,000=R360\,000$ Loan $=R1\,200\,000-R360\,000=R840\,000$	✓A 70% of R1 200 000 ✓A answer (2) ✓A deposit ✓A answer (2)
7.2	$P=\frac{x\left[1-(1+i)^{-n}\right]}{i}$ $840\,000=\frac{x\left[1-\left(1+\frac{0,15}{12}\right)^{-240}\right]}{\frac{0,15}{12}}$ $x=\frac{840\,000\left(\frac{0,15}{12}\right)}{\left[1-\left(1+\frac{0,15}{12}\right)^{-240}\right]}$ $x=R11\,061,03$	✓CA R840 000 ✓CA substitution ✓CA making x the subject of the formula ✓CA answer (4)

7.3	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $840\,000 = \frac{12\,000\left[1-\left(1+\frac{0,15}{12}\right)^{-n}\right]}{\frac{0,15}{12}}$ $\frac{840\,000\left(\frac{0,15}{12}\right)}{12\,000} = 1-\left(1+\frac{0,15}{12}\right)^{-n}$ $\frac{7}{8} = 1-\left(1+\frac{0,15}{12}\right)^{-n}$ $\left(1+\frac{0,15}{12}\right)^{-n} = \frac{1}{8}$ $-n = \log_{\left(1+\frac{0,15}{12}\right)}\frac{1}{8}$ $-n = -167,3928915$ $\therefore n = 168$ months	✓CA substitution ✓CA simplification ✓CA introducing log ✓CA value of n (4)
7.4	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $\text{BO} = \frac{12\,000\left[1-\left(1+\frac{0,15}{12}\right)^{-0,3928915}\right]}{\frac{0,15}{12}}$ $= R4\,674,06$ $\textit{Final Payment} = 4\,674,06\left(1+\frac{0,15}{12}\right)$ $= R4\,732,48$ **OR** $\text{BO} = \text{A} - \text{F}$ $\text{BO} = 840\,000\left(1+\frac{0,15}{12}\right)^{167} - \frac{12\,000\left[\left(1+\frac{0,15}{12}\right)^{167}-1\right]}{\frac{0,15}{12}}$ $= R4\,674,06$ $\textit{Final Payment} = 4\,674,06\left(1+\frac{0,15}{12}\right)$ $= R4\,732,48$	✓CA value of n ✓CA substitution ✓CA R4 674,06 ✓CA compounding OB for 1 month ✓CA R4 732,48 (5) ✓CA value of n ✓CA substitution ✓CA R4 674,06 ✓CA compounding OB for 1 month ✓CA R4 732,48 (5) **[15]**

QUESTION 8

8.1	$f(x)=-3x^2+1$ $f(x+h)=-3(x+h)^2+1=-3x^2-6xh-3h^2+1$ $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $f'(x)=\lim_{h\to 0}\frac{-3x^2-6xh-3h^2+1+3x^2-1}{h}$ $f'(x)=\lim_{h\to 0}\frac{-6xh-3h^2}{h}$ $f'(x)=\lim_{h\to 0}\frac{h(-6x-3h)}{h}$ $f'(x)=\lim_{h\to 0}(-6x-3h)$ $f'(x)=-6x$	✓A value of $f(x+h)$ ✓A substitution into formula ✓CA simplifying ✓CA factors ✓CA answer (5)
8.2.1	$y=4x^{-1}-5x^{\frac{1}{2}}$ $\frac{dy}{dx}=-4x^{-2}-\frac{5}{2}x^{-\frac{1}{2}}$	✓A $y=4x^{-1}-5x^{\frac{1}{2}}$ ✓CA✓CA each term (3)
8.2.2	$y=2x^2-x+1$ $\frac{dy}{dx}=4x-1$	✓A transposing x ✓CA answer (2)
8.3	$f'(x)=2x-4$ $g(x)=\frac{1}{2}x+5$, $m=\frac{1}{2}$ $\therefore m\perp \text{line}=-2$ $2x-4=-2$ $2x=2$ $x=1$ $f(1)=(1)^2-4(1)-6=-9$ Tangent is at $(1;-9$ $y=-2x+c$ $-9=-2(1)+c$ $c=-7$ $y=-2x-7$	✓A $\therefore m\perp \text{line}=-2$ ✓CA $2x-4=-2$ ✓CA value of x ✓CA value of y ✓CA answer (5)
		[15]

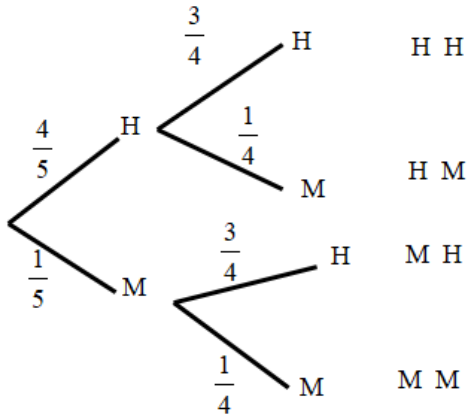
QUESTION 9

9.1	$h'(x) = 3x^2 - 3$ $0 = 3x^2 - 3$ $0 = x^2 - 1$ $0 = (x-1)(x+1)$ $x = \pm 1$ $h(1) = (1)^2 - 3(1) + 2 = 0$ $h(-1) = (-1)^2 - 3(-1) + 2 = 4$ A$(-1;4)$, B$(1;0)$	✓ derivative ✓CA equating to zero ✓CA values of x ✓CA value of y ✓CA answer (5)
9.2	$0 = (x+1)(x^2 + x - 2)$ $0 = (x-1)(x-1)(x+2)$ $x = 1$ or -2 D$(-2;0)$	✓A equating to zero ✓A factors ✓CA answer (3)
9.3	$m = \dfrac{4-1}{-1-0}$ $m = -3$	✓CA subst in formula ✓CA answer (2)
9.4.1	$h'(x) = 3x^2 - 3$ $h''(x) = 6x$ $0 = 6x$ $x = 0$	✓CA second derivative ✓CA equating to zero ✓CA answer (3)
9.4.2	$x > 0$	✓✓CA answer (2)
		[15]

QUESTION 10

10.1	$x(x+y) = 1000$ $x + y = \dfrac{1000}{x}$ $y = \dfrac{1000}{x} - x$	✓A subst into formula ✓CA answer (2)
10.2	Perimeter $= 5x + 2y$ $= 5x + 2\left(\dfrac{1000}{x} - x\right)$ $= 5x + \dfrac{2000}{x} - 2x$ $= 3x + \dfrac{2000}{x}$	✓A Expression for perimeter ✓A subst into formula (2)
10.3	$P = 3x + 2000x^{-1}$ $\dfrac{dP}{dx} = 3 - 2000x^{-2}$ $0 = 3 - \dfrac{2000}{x^2}$ $3x^2 = 2000$ $x = \sqrt{\dfrac{2000}{3}} = 25,82$	✓A derivative ✓A equating to zero ✓CA answer (3) **[07]**

QUESTION 11		
11.1	$P(A)\times P(B) = P(A \text{ and } B)$ $(0,42+0,28)(x+0,28)=0,28$ $0,7(x+0,28)=0,28$ $x+0,28=0,4$ $x=0,12$	✓A formula ✓A subst into formula ✓A simplifying (3)
11.2	$y=1-(0,42+0,28+0,12)$ $y=0,18$	✓A 1 – P(A or B) ✓CA answer (2)
		[05]

QUESTION 12		
	 $P(\text{HM or MH}) = \frac{4}{5}\times\frac{1}{4}+\frac{1}{5}\times\frac{3}{4}$ $=\frac{7}{20}$	✓A tree diagram and probabilities ✓A outcomes ✓A $\frac{4}{5}\times\frac{1}{4}$ ✓A $\frac{1}{5}\times\frac{3}{4}$ ✓CA answer **[05]**

QUESTION 13		
13.1	$6! = 720$	✓A answer (1)
13.2	$1\times 4!\times 2 = 48$	✓✓A answer (2)
13.3	$1-\frac{48}{720}=\frac{14}{15}$	✓CA $1-\frac{48}{720}$ ✓CA answer (2)
		[05]

TOTAL: 150 MARKS