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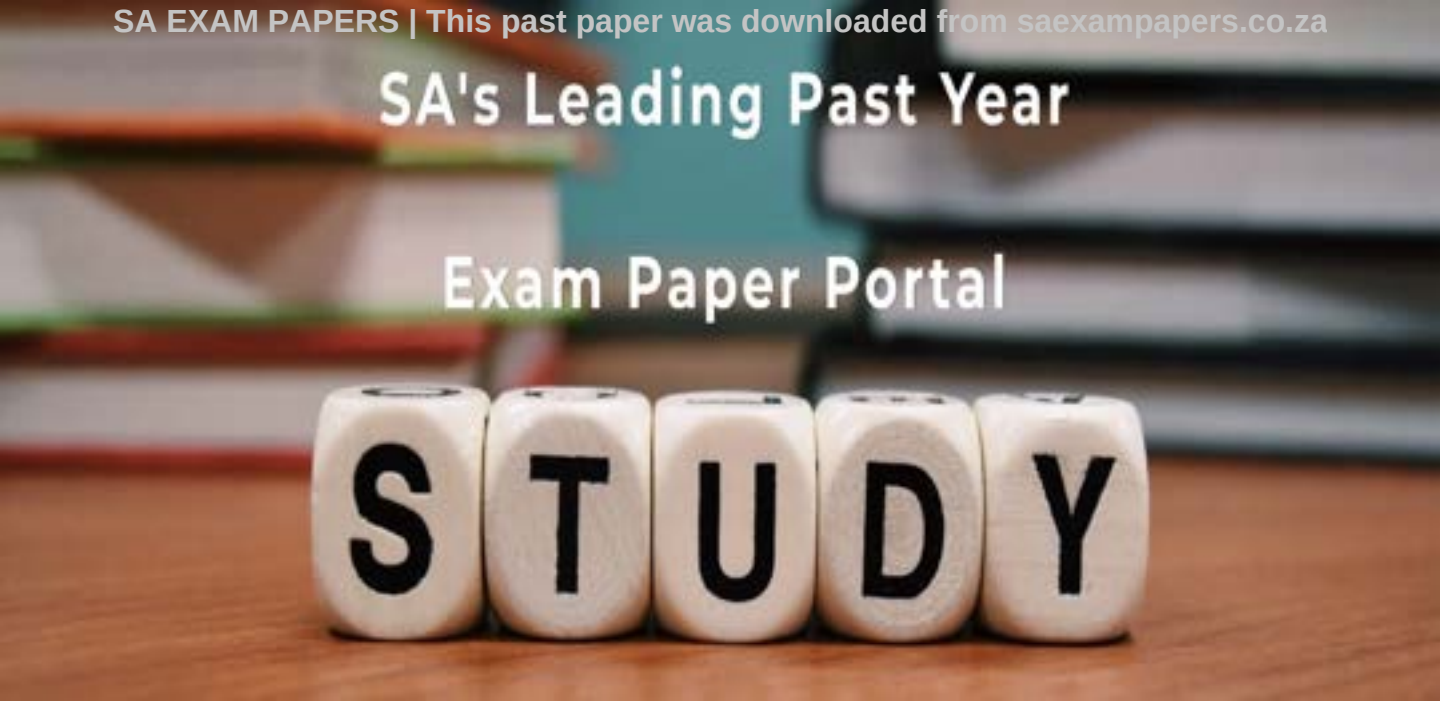

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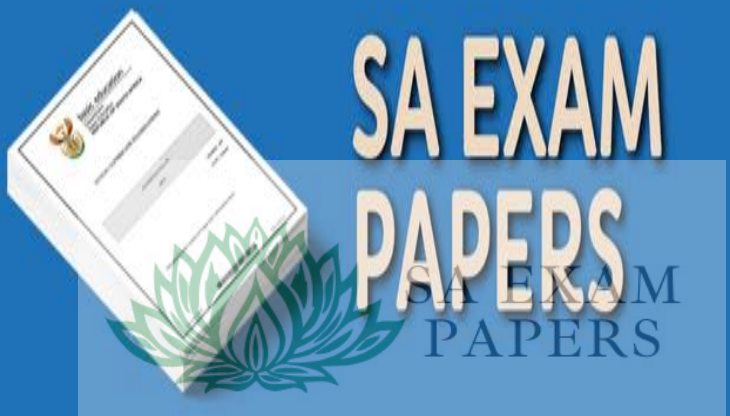

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KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GRADE 12

MATHEMATICS
PAPER 1

PRE-TRIAL EXAMINATTION
AUGUST 2024

MARKING GUIDELINES

MARKS: 150
TIME: 3 hours

This MEMO consists of 9 pages.

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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	$CVs: x=\frac{1}{2} / x=5$ $\therefore \frac{1}{2}\leq x\leq 5 \quad OR \quad x\in\left[\frac{1}{2};5\right]$	✓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]

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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]

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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]

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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]**

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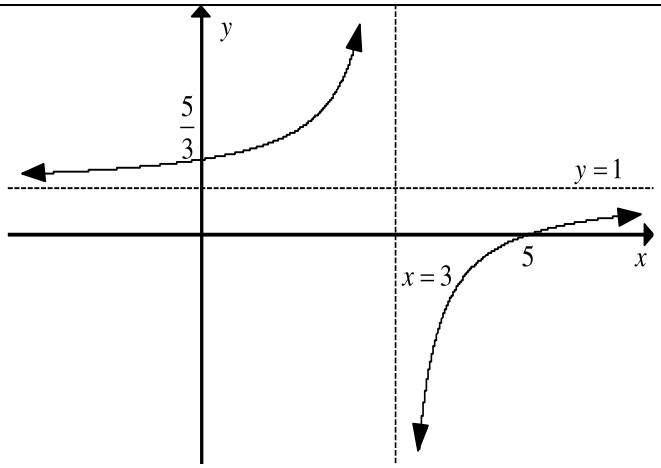
QUESTION 5

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

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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)

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

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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]

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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	$m = \frac{4-1}{-1-0}$ $m = -3$	✓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	$x(x+y) = 1000$ $x + y = \frac{1000}{x}$ $y = \frac{1000}{x} - x$	✓A subst into formula ✓CA answer (2)
10.2	Perimeter $= 5x + 2y$ $= 5x + 2\left(\frac{1000}{x} - x\right)$ $= 5x + \frac{2000}{x} - 2x$ $= 3x + \frac{2000}{x}$	✓A Expression for perimeter ✓A subst into formula (2)
10.3	$P = 3x + 2000x^{-1}$ $\frac{dP}{dx} = 3 - 2000x^{-2}$ $0 = 3 - \frac{2000}{x^2}$ $3x^2 = 2000$ $x = \sqrt{\frac{2000}{3}} = 25,82$	✓A derivative ✓A equating to zero ✓CA answer (3) **[07]**

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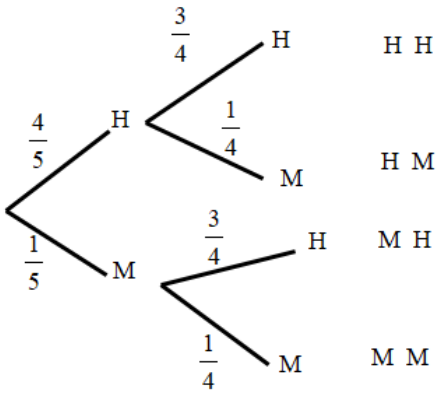
QUESTION 11		
11.1	$P(A)\times P(B) = P(A \text{ and } B)$ $(0,42+0,28)(x+0,28)=0,28$ $0,7(x+0,28)=0,28$ $x+0,28=0,4$ $x=0,12$	✓A formula ✓A subst into formula ✓A simplifying (3)
11.2	$y=1-(0,42+0,28+0,12)$ $y=0,18$	✓A 1 – P(A or B) ✓CA answer (2)
		[05]

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

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