KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

MATHEMATICS P1

SEPTEMBER 2021

PREPARATORY EXAMINATION

MARKING GUIDELINE

NATIONAL SENIOR CERTIFICATE

GRADE 12

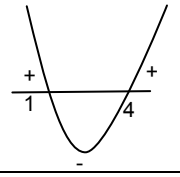
MARKS: 150

TIME: 3 hours

This marking guideline consists of 10 pages.

QUESTION 1

1.1.1	$x = 0 \quad or \quad x = 3$	A✓ $x = 0$ A✓ $x = 3$	(2)
1.1.2	$5x^2 - 4x - 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(5)(-2)}}{2(5)}$ $x = -0{,}35 \quad or \quad 1{,}15$	A✓standard form CA✓substitution in correct formula CACA✓✓answers (penalize 1 mark if rounding off is incorrect-once here for entire paper)	(4)
1.1.3	$\sqrt{7 + 3x} + 2x = 0$ $\sqrt{7 + 3x} = -2x$ $\left(\sqrt{7 + 3x}\right)^2 = (-2x)^2$ $7 + 3x = 4x^2$ $4x^2 - 3x - 7 = 0$ $(x + 1)(4x - 7) = 0$ $x = -1 \text{ or } x = \frac{7}{4}$ *n/a*	A✓Isolating surd A✓ squaring both sides CA✓standard form CA✓factors CA✓answers and rejecting	(5)
1.1.4	$3^{x+2} + 3^{2-x} = 82$ $9.3^x + \frac{9}{3^x} = 82$ $9.3^{2x} - 82.3^x + 9 = 0$ $(9.3^x - 1)(3^x - 9) = 0$ $3^x = \frac{1}{9} \; or \; 3^x = 9$ $3^x = 3^{-2} \; or \; 3^x = 3^2$ $x = -2 \quad or \quad x = 2$	A✓Writing as a positive index CA✓Standard form of equation CA✓factors CA✓exponential forms CA✓answers	(5)

1.2	$x^2 - 5x + 4 \geq 0$ $(x-1)(x-4) \geq 0$ $x \leq 1 \ \ or \ \ x \geq 4$ OR  	A✓$x^2 - 5x + 4 \geq 0$ A✓ factors CA✓ end points A✓ interval **OR** If graphical solution is used: AA 2 marks for graph A /CA 2 marks for answer	(4) (4)
1.3	$xy = 12 \quad \rightarrow (1)$ $x - 4 = y \quad \rightarrow (2)$ Substituting (2) into (1): $x(x-4) = 12$ $x^2 - 4x - 12 = 0$ $(x+2)(x-6) = 0$ $x = -2 \ \ or \ \ x = 6$ $y = -6 \ \ or \ \ y = 2$	A✓correct substitution CA✓standard form CA✓factors CA✓*x/y* – values CA✓ *y/x* values	(5)
			[25]

QUESTION 2

2.1	$T_p = 3p - 2 = 1450$ $p = 484$ Between the 484th and 485th terms	A✓ equating p^{th} term to 1450 CA✓p value CA✓answer	(3)
2.2	**1D** **1** **4** **7** **2D** **3** **3** $2a = 3 \quad \therefore a = \frac{3}{2}$ $3a + b = 1 \quad \therefore b = -\frac{7}{2}$ $T_n = an^2 + bn + c$ $T_{40} = \frac{3}{2}(40)^2 - \frac{7}{2}(40) + c = 2290$ $2400 - 140 + c = 2290$ $c = 30$	A✓ a – value CA✓ b – value CA✓Substitution CA✓answer	(4)
			[7]

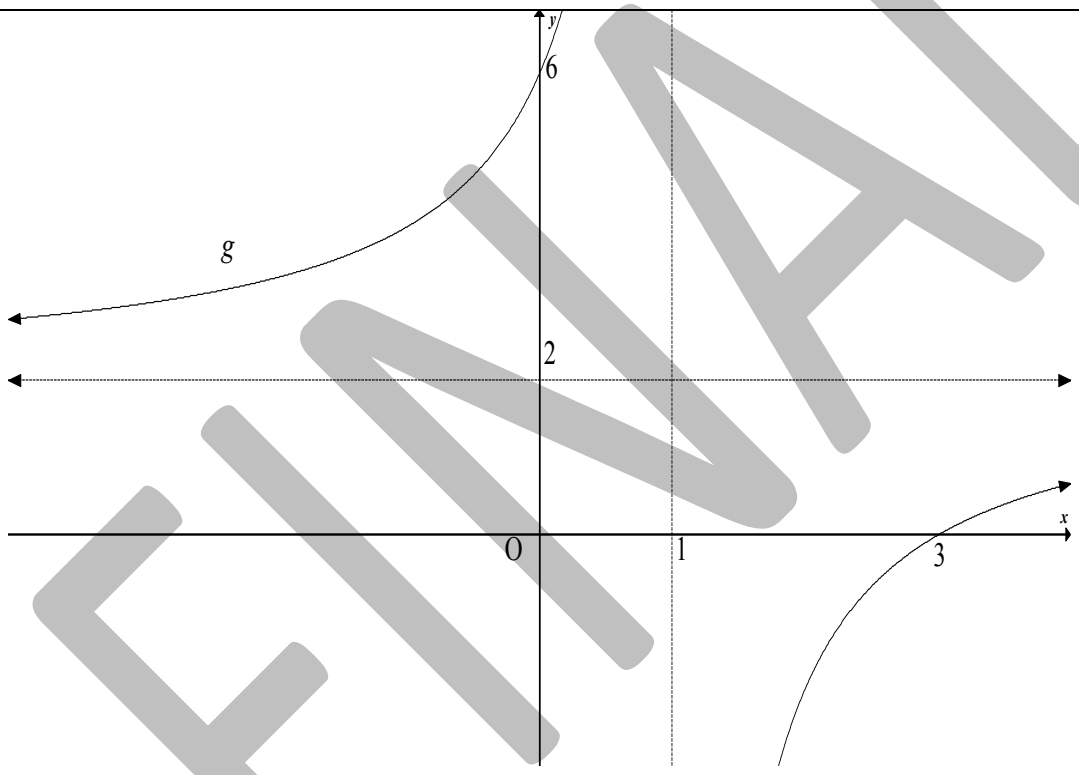
QUESTION 3

3.1.1	$T_n = 8n + 57$	A✓ common difference CA✓answer	(2)
3.1.2	$T_n = 8n + 57$ $T_{1000} = 8(1000) + 57$ $T_{1000} = 8057$	CA✓substitution into formula CA✓answer	(2)
3.1.3	$S_n = \frac{n}{2}[a + T_n]$ $S_{1000} = \frac{1000}{2}[65 + 8057]$ $S_{1000} = 4061000$	CA ✓correct substitution into sum formula CA ✓answer	(2)
3.2	Arithmetic: $5\ ;5 + x\ ;5 + 2x\ ;$ .... Geometric: $5\ ;5x;5x^2;5x^3\ ;$ .... Now: $5x^4 = 80$ $x^4 = 16$ $x = -2 \ \ or \ \ 2$ Sequences are: $5\ ;7\ ;9$ or $5\ ;3\ ;1$	A ✓Setting up equation A ✓dividing by 5 CA ✓x – values CA ✓sequence CA ✓sequence	(5)
			[11]

QUESTION 4

4	$\sum_{p=1}^{5}(4y + 3p) + \sum_{k=4}^{7} 3.(2)^{k-1} = \sum_{j=1}^{\infty}\left(\frac{1}{3}\right)^{j-1}$ $4y + 3 + 4y + 6 + 4y + 9 + 4y + 12 + 4y + 15$ $= 20y + 45$ $3.2^3 + 3.2^4 + 3.2^5 + 3.2^6 = 360$ $S_\infty = \frac{a}{1-r}$ $= \frac{1}{1-\frac{1}{3}}$ $= \frac{3}{2}$ $20y + 45 + 360 = \frac{3}{2}$ $20y = -403{,}5$ $y = -20{,}175$	A✓$20y$ + 45 A✓360 A✓correct substitution into sum to infinity formula CA✓$\frac{3}{2}$ CA✓equation CA✓simplifying CA✓answer	
			[7]

QUESTION 5

5.1	$x = 1 \text{ and } y = 2$	A✓$x = 1$ A✓$y = 2$	(2)
5.2	$y-$ intercept $:(0\,;6)$ $x-$ intercept: $\frac{4}{x-1} = 2$ $x - 1 = 2$ $x = 3$ $(3;\ 0)$	A✓$y-$ intercept A✓$x - 1 = 2$ CA✓$x-$ intercept (co-ordinate form not needed)	(3)
5.3		CA✓x,y - intercepts CA✓both asymptotes A✓shape	(3)
			[8]

QUESTION 6

6.1	$f'(x) = -2x + 4 = 0$ or $x = -\frac{4}{2(-1)}$ $x = 2$ $y = f(2) = -4 + 8 + 5 = 9$ $C(2\,;9)$	A✓derivative and equal to 0/ Substitution into formula CA✓Axis of symmetry value CA✓Maximum value	(3)
6.2	$y \leq 9$	CA✓answer	(1)
6.3	$-x^2 + 4x + 5 = 0$ $x^2 - 4x - 5 = 0$ $(x + 1)(x - 5) = 0$ $x = -1 \ or \ \ x = 5$ AB = 6 units	A✓standard form CA✓factors CA✓x - values CA✓answer	(4)
6.4	$m = -1 \ and \ \ c = 5$ $y = -x + 5$	CACA✓✓answer	(2)
6.5	$T(4\,;5)$	CACA✓✓answer	(2)
6.6.1	$m = 0$	A✓ answer	(1)
6.6.2	$9 = -x + 5$ $x = -4$ $E(-4\,;9)$	CA✓Equating equation to 9 CA✓x – value	(2)
6.7	$f'(x) = -2x + 4 = -1$ $x = \frac{5}{2}$ $y = -\left(\frac{5}{2}\right)^2 + 4\left(\frac{5}{2}\right) + 5 = \frac{35}{4}$ $\frac{35}{4} = -\frac{5}{2} + k$ $k = \frac{45}{4}$	A✓Derivative equal to – 1 CA✓ x – value CA✓ y – value CA✓ substitution into equation of line CA✓ answer	(5)
			[20]

QUESTION 7

7.1	$y = log_a x$ $-1 = log_a 0{,}5$ $a^{-1} = 0{,}5 = 2^{-1}$ $a = 2$	A✓ substitution of point P CA✓Writing in exponential form CA✓answer	(3)
7.2	$y = 2^x$	CACA✓✓	(2)
7.3	$x \in R$ or $x \in (-\infty\,;\,\infty)$	A✓answer	(1)
7.4	$log_2 x = -1$ $x = 2^{-1} = \frac{1}{2}$ $0 < x \leq \frac{1}{2}$	CA✓end points A✓ interval **Can be solved by log inequalities**. **Answer Only – Full marks**	(2)
			[8]

QUESTION 8

8.1	$A = P(1-i)^n$ $= 500\,000(1-8{,}5\%)^{12}$ $= R172\,196$	A✓value of *n* A✓value of *i* CA✓ answer	(3)
8.2.1	$P = \frac{x[1-(1+i)^{-n}]}{i}$ $= \frac{3300\left[1-\left(1+\frac{16\,\%}{12}\right)^{-60}\right]}{\frac{16\,\%}{12}}$ $= R135\,701{,}63$	A✓value of *n* A✓value of *i* CA✓Substitution into formula CA✓ answer	(4)
8.2.2	$P = \frac{x[1-(1+i)^{-n}]}{i}$ $125\,701{,}6304 = \frac{x\left[1-\left(1+\frac{16\,\%}{12}\right)^{-60}\right]}{\frac{16\,\%}{12}}$ $x = R3056{,}82$	A✓ P value CA✓substitution into formula CA✓answer	(3)
8.2.3	No. Deposit: 60 x R3300 = R198 000,00 With Deposit: R10 000 + 60 x R3056,82 = R 193 409,20 Savings: R4590,80	A✓R198 000 A✓✓193 409,20 CA✓answer	(4)
			[14]

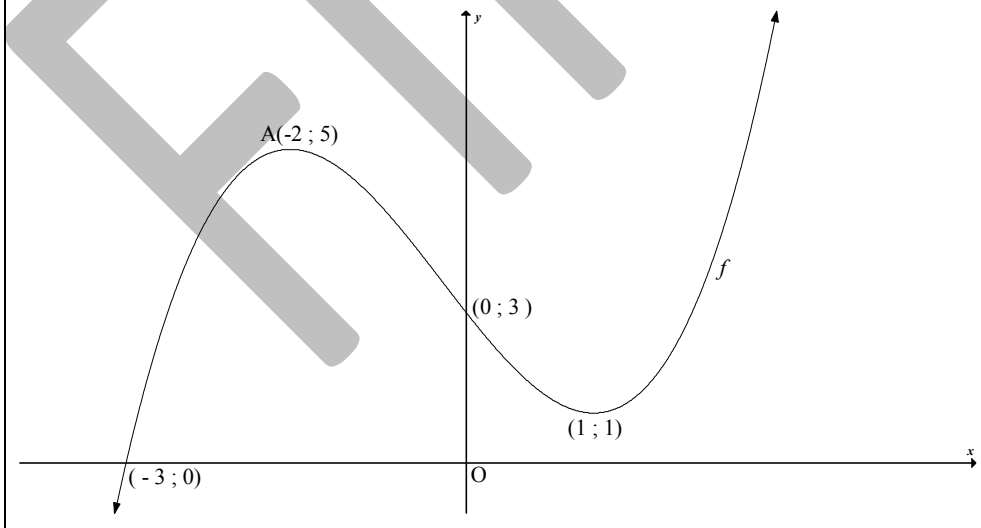
QUESTION 9(penalize 1 mark once for incorrect notation in this question)

9.1	$f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $f'(x) = \lim_{h\to 0}\frac{(x+h)^2+5(x+h)-6-(x^2+5x-6)}{h}$ $f'(x) = \lim_{h\to 0}\frac{x^2+2xh+h^2+5x+5h-x^2-5x+6}{h}$ $f'(x) = \lim_{h\to 0}\frac{2xh+h^2+5h}{h}$ $f'(x) = \lim_{h\to 0}\frac{h(2x+h+5)}{h}$ $f'(x) = 2x+5$ **OR** $f(x+h) = (x+h)^2+5(x+h)-6$ $f(x+h) = x^2+2xh+h^2+5x+5h-6$ $f(x+h)-f(x) = 2xh+h^2+5h$ $\frac{f(x+h)-f(x)}{h} = \frac{2xh+h^2+5h}{h}$ $\frac{f(x+h)-f(x)}{h} = \frac{h(2x+h+5)}{h}$ $f'(x) = \lim_{h\to 0}(2x+h+5)$ $f'(x) = 2x+5$	A✓formula A✓substitution CA✓ simplification of numerator CA✓factorization CA✓answer **OR** A✓value of *f(x+h)* CA✓ simplification CA✓factorization A✓formula CA✓answer	(5) (5)
9.2.1	$f(x) = 3x(\sqrt{x}-4)$ $f(x) = 3x^{\frac{3}{2}}-12x$ $f'(x) = \frac{9}{2}x^{\frac{1}{2}}-12$	A✓rewriting in exponential form CACA✓✓derivatives	(3)
9.2.2	$y = \frac{x^3-4x}{2-x}$ $y = \frac{x(x-2)(x+2)}{-(x-2)} = -x^2-2x$ $\frac{dy}{dx} = -2x-2$	A✓factors A✓simplified expression CACA✓✓ each term	(4)
			[12]

QUESTION 10

10.1	$d = 4$	A✓Answer	(1)
10.2	$0 = -1 + b - c + 4$ $b - c = -3$ $f'(x) = 3x^2 + 2bx + c$ $0 = 3(0)^2 + 2b(0) + c$ $c = 0$ $b = -3$	A✓substitution of point (–1 ;0) A✓ equation A✓derivative A✓ substitution of point (–1 ;0) into derivative	(4)
10.3	$f(x) = x^3 - 3x^2 + 4$ $f'(x) = 3x^2 - 6x$ $f'(5) = 3(5)^2 - 6(5) = 45$ $f(5) = (5)^3 - 3(5)^2 + 4 = 54$ $54 = 45(5) + c$ $c = -171$ $y = 45x - 171$	A✓ gradient value of tangent A✓ y – value of tangent CA✓ c – value CA✓ answer	(4)
10.4	$0 < k < 4$	AA✓answer	(2)
10.5	$f'(x) = 3x^2 - 6x = 0$ $3x(x - 2) = 0$ $x = 0 \ or \ x = 2$ $y = 4 \ or \ y = 0$ B$(2\,;0)$ B$'(-2\,;3)$	CA✓x - values CA✓ y - values CA✓x – value CA✓ y – value	(4)
			[15]

QUESTION 11

11.1		A✓Local Maximum point A✓Local Minimum point A✓x – intercept A✓y – intercept A✓shape	(5)
11.2.1	$-3 < x < 0$	CACA✓✓	(2)
11.2.2	$(-2\,;-5)$	CACA✓✓	(2)
			[9]

QUESTION 12

12.1	8! = 40 320	A✓8! A✓40 320	(2)
12.2	$1 \times 6! \times 1$ = 720	A✓✓$1 \times 6! \times 1$ A✓720	(3)
12.3	Probability of a word starting with P and ending with C $\frac{720}{40\,320} = \frac{1}{56} = 1{,}79\,\% = 0{,}0179$	CA✓Numerator CA✓denominator $\frac{720}{40\,320}$ or $\frac{1}{56}$ or 0,0179 or 1,79%	(2)
			[7]

QUESTION 13

13.1	160	A✓answer	(1)
13.2	$\text{P(Male)} = \frac{60}{160} = \frac{3}{8} = 0{,}375 = 37{,}5\,\%$	AA ✓✓ $\frac{60}{160}$ or $\frac{3}{8}$ or 0,375 or 37,5 %	(2)
13.3	P(Male choosing coffee) = P(Male) × P(coffee) $\frac{b}{160} = \frac{60}{160} \times \frac{80}{160}$ $\frac{b}{160} = \frac{3}{16}$ $b = 30$	A✓Condition for independent events AA✓✓Substitution into equation A✓Answer	(4)
			[7]

Total: 150