Province of the EASTERN CAPE EDUCATION

Iphondo leMpuma Kapa: Isebe leMfundo
Provinsie van die Oos Kaap: Department van Onderwys
Porafensie Ya Kapa Botjahabela: Lefapha la Thuto

NATIONAL SENIOR CERTIFICATE

BUFFALO CITY METRO DISTRICT

GRADE 12

MATHEMATICS P1

PRE-TRIAL EXAMINATION

MARKING GUIDELINES

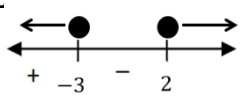
MARKS : 150
Time : 3 Hours

This marking guidelines consists of 10 pages.

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent Accuracy (CA) applies in all aspects of the marking memorandum.
- Only penalise ONCE for rounding in Question 1.1.2
- B/D = Break down. Do not mark any futher.

QUESTION 1 / VRAAG 1

1.1	1.1.1	$x^2 - 6x - 27 = 0$ $(x - 9)(x + 3) = 0$ $x = 9 \;;\; x = -3$	✓ factors/ *faktore* ✓ $x = 9$ ✓ $x = -3$ CA	(3)
	1.1.2	$2 - 4x^2 + x = 0$ $-4x^2 + x + 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(1) \pm \sqrt{(1)^2 - 4(-4)(2)}}{2(-4)}$ $x = \frac{-1 \pm \sqrt{33}}{-8}$ $x = -0{,}59 \quad ; \quad x = 0{,}84$	✓ standard form/ *standaard vorm* ✓ substitution into the correct formula /*vervang korrekte formule* wrong formula or subst B/D ✓ $x = -0{,}59$ ✓ $x = 0{,}84$ −1 Rounding/*ronding*	(4)
	1.1.3	$(\sqrt{x} - 2)^2 = 1$ $x - 4\sqrt{x} + 4 = 1$ $-4\sqrt{x} = -x - 3$ $4\sqrt{x} = x + 3$ $16x = x^2 + 6x + 9$ $x^2 - 10x + 9 = 0$ $(x - 9)(x - 1) = 0$ $x = 9 \;;\; x = 1$ OR $\sqrt{x} - 2 = \pm 1$ $\sqrt{x} - 2 = 1 \quad or \quad \sqrt{x} - 2 = -1$ $\sqrt{x} = 3 \qquad \sqrt{x} = 1$ $x = 9 \qquad x = 1$	✓ simplify/*vereenvoudig* ✓ squaring both sides correctly/*kwadreer beide kante* CA ✓ standard form/*standaard vorm* ✓factors /*faktore* CA ✓ both answers/ *beide antwoorde* CA ✓ $\sqrt{x} - 2 = +1$ ✓$\sqrt{x} - 2 = -1$ ✓✓ simplify/vereenvoudig ✓ both answers /*beide antwoorde* CA	(5)
	1.1.4	$x^2 + x - 6 \geq 0$ $(x + 3)(x - 2) \geq 0$ $CV: x = -3 \;; x = 2$ $x \leq -3 \quad ; \quad x \geq 2$ 	✓factors /*fakore* ✓ critical values ✓ notation **CA if factors were wrong /*CA as faktore verkeerd is***	(3)

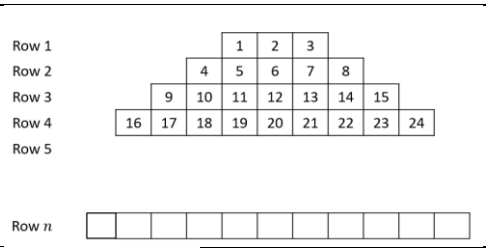
1.2	$y = 4x + 2$ ... ... (1) $(2 + x)(x + 1) = y + 12$ ... ... (2) $subst: (1) into\ (2)$: $(2 + x)(x + 1) = 4x + 2 + 12$ $(2 + x)(x + 1) = 4x + 14$ $x^2 + 3x + 2 = 4x + 14$ $x^2 - x - 12 = 0$ $(x - 4)(x + 3) = 0$ $x = 4 \quad ; \quad x = -3$ $y = 18 \quad ; \quad y = -10$	✓ substitution/*vervanging* ✓ standard form/*standaard vorm* ✓ both values of/*beide waardes van* x CA ✓ both values of/*beide waardes van* y CA (3)	(4)
1.3	$10! = \mathbf{10} \times \mathbf{9} \times \mathbf{8} \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ $= 5 \times 2 \times 3 \times 3 \times 4 \times 2 \times 7!$ $= 5 \times 4 \times 3 \times 2 \times 3 \times 2 \times 7!$ $= 5! \times 3! \times 7!$ OR $10! = \mathbf{10} \times \mathbf{9} \times \mathbf{8} \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$ $= 5 \times 2 \times 3 \times 3 \times 4 \times 2 \times 7!$ $= 6 \times 5 \times 4 \times 3 \times 2 \times 7!$ $= 6! \times 1! \times 7!$	✓ method/*metode* ✓✓✓Values of/*waardes van* a, b, c	(4) **[23]**

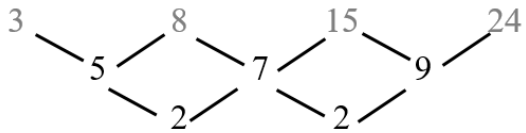
QUESTION 2 / VRAAG 2

2.1	Sequence: 243;81;27;9……			
	2.1.1	3	✓ answer /*antwoord*	(1)
	2.1.2	Yes / Ja , $r = \frac{1}{3} \quad \therefore -1 < r < 1$	✓ yes / *ja* ✓ $-1 < r < 1$	(2)
	2.1.3	$T_n = ar^{n-1}$ $T_n = 243\left(\frac{1}{3}\right)^{n-1}$ $T_n = 3^5\,(3^{-1})^{n-1}$ $T_n = 3^5\,3^{-n+1}$ $\therefore T_n = 3^{6-n}$	✓ r ✓substitution into the correct formula /*vervang in korrekte formule* ✓ $3^5\,3^{-n+1}$ ***Answer given***	(3)
	2.1.4	$S_\infty = \frac{a}{1-r}$ $S_\infty = \frac{243}{1-\frac{1}{3}}$ $S_\infty = \frac{729}{2} = 364{,}5$	✓substitution into the correct formula / *vervang in korrekte formule* **A** ✓ answer/*antwoord* **A**	(2)
2.2	2.2.1	$d = 4$	✓ answer/*antwoord*	(1)
	2.2.2	$T_n = a + (n-1)d$ $124 = -4 + (n-1)(4)$ $124 = -4 + 4n - 4$ $132 = 4n$ $33 = n$ $T_{33} = 124$	✓ $a = -4$ ✓$T_n = 124$ ✓ substitution into the correct formula / *vervang in korrekte formule* ***CA d −value from/waarde van 2.2.1*** ✓ answer /*antwoord*	(4)

2.3	2.3.1	$S_4 = \frac{5(1-3^4)}{-2}$ $= 200$	✓ subst/*vervang* ✓ answer/*antwoord*	(2)
	2.3.2	$T_5 = S_5 - S_4$ $T_5 = \frac{5(1-3^5)}{-2} - 200$ $T_5 = 605 - 200$ $T_5 = 405$	✓ $T_5 = S_5 - S_4$ ✓ answer/*antwoord*	(2) **[17]**

QUESTION 3 / VRAAG 3

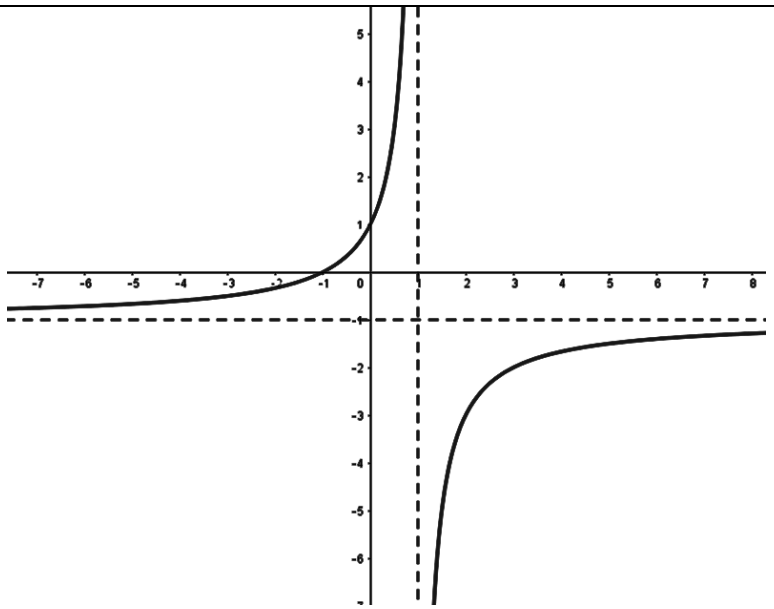


3.1	 $2a = 2$ $a = 1$ $3a + b = 5$ $3 + b = 5$ $b = 2$ $a + b + c = 3$ $1 + 2 + c = 3$ $c = 0$ $T_n = n^2 + 2n$		✓ $a = 1$ ✓ $b = 2$ ✓ $c = 0$ ✓ T_n	(4)
3.2	3; 5; 7; 9 ... $T_n = 2n + 1$ Row/ry 8 = 17 drawers		✓ T_n ✓ answer/*antwoord*	(2)
3.3	$S_n = \frac{n}{2}[2a + (n-1)d]$ $255 = \frac{n}{2}[2(3) + (n-1)(2)]$ $510 = n[6 + 2n - 2]$ $510 = 2n^2 + 4n$ $2n^2 + 4n - 510 = 0$ $n^2 + 2n - 255 = 0$ $(n-15)(n+17) = 0$ $n = 15 \quad ; n \neq -17$ 15 complete rows will have handles./*handvatsels*		✓$a = 3$ *and/en* $d = 2$ ✓ =255 ✓ factors / formula *Faktore/formule* ✓ answer/*antwoord*	(4) **[10]**

QUESTION 4 / VRAAG 4

4.1	B$(6;0)$ AB$= 8\ units$		✓ B ✓ answer/*antwoord*	(2)
4.2	$g(x) = x - 6$ $g(2) = 2 - 6 = -4$ $D(2;-4)$		✓ $x\ value$ of/*waarde van* D ✓ y value of/*waarde van* D	(2)
4.3	$f(x) = a(x+2)(x-6)$ $= a(x^2 - 4x - 12)$ $= ax^2 - 4ax - 12a$ $4a - 8a - 12a = -4$ $-16a = -4$ $a = \frac{4}{16} = \frac{1}{4}$ $\therefore f(x) = \frac{1}{4}x^2 - x - 3$ **OR**		✓ Substitute into correct formula/ *vervang in korrekte formule* ✓ simplify/*vereenvoudig* ✓ Subst/*vervang* (2;-4) ✓ value of /*waarde van a* **OR**	(4)
	Substitute TP and A: $f(x) = a(x-2)^2 - 4$ $0 = a(-2-2)^2 - 4$ $0 = a(-4)^2 - 4$ $0 = 16a - 4$ $16a = 4$ $a = \frac{4}{16} = \frac{1}{4}$ $f(x) = a(x^2 - 4x + 4) - 4$ $= ax^2 - 4ax + 4a - 4$ $= \frac{1}{4}x^2 - x + 1 - 4$ $= \frac{1}{4}x^2 - x - 3$	Substitute TP and B: $f(x) = a(x-2)^2 - 4$ $0 = a(6-2)^2 - 4$ $0 = a(4)^2 - 4$ $0 = 16a - 4$ $16a = 4$ $a = \frac{4}{16} = \frac{1}{4}$ $f(x) = a(x^2 - 4x + 4) - 4$ $= ax^2 - 4ax + 4a - 4$ $= \frac{1}{4}x^2 - x + 1 - 4$ $= \frac{1}{4}x^2 - x - 3$	✓ Substitute into correct formula/ *vervang in korrekte formule* ✓ simplify/*vereenvoudig* ✓ value of /*waarde van a* ✓ Subst/*vervang a* into simplified *f*	
4.4	$C(0;-3)$ $k = -3$		✓ value of/*waarde van* k	(1)
4.5	$m_g = 1$ Tangent: $y = x + c$ $-3 = 4 + c$ $c = -7$ $y = x - 7$		✓ m ✓ c	(2)
4.6	$2 < x < 6 \quad for\ x \in \mathbb{R}$		✓✓ answer/*antwoord*	(2)
4.7	$(0;-3)$		✓✓ answer/*antwoord*	(2) **[15]**

QUESTION 5 / VRAAG 5

5.1	$x = 1$ $y = -1$	✓✓ Each equation/*elke vergelyking*	(2)
5.2	y-intercept : $y = -1$ $x -$ intercept: $0 = \frac{-2}{x-1} - 1$ $x = -1$	✓y-intercept/*afsnit* ✓ $y = 0$ ✓x-intercept/*afsnit*	(3)
5.3		✓asymptotes/asimptote ✓intercepts/*afsnitte* ✓shape in correct quadrants/ *vorm in korrekte kwadrante*	(3)
5.4	$-1 = (-1)(1) + c$ $c = 0$ $y = -x$	✓gradient ✓c=0	(2) **[10]**

QUESTION 6 / VRAAG 6

6.1	$\log_a 4 = -2$ $a^{-2} = 4$ $\therefore a = (2^2)^{-\frac{1}{2}}$ $a = 2^{-1} = \frac{1}{2}$	✓Subst /*vervang* ✓simplification/*vereenvoudig*	(2)
6.2	$f(x) = log_{\frac{1}{2}} x$ $x = \log_{\frac{1}{2}} y$ $y = \left(\frac{1}{2}\right)^x$	✓swop/ruil x and/*en* y ✓Answer/*antwoord* **AO full marks**	(2)
6.3	$h(x) = -\log_{\frac{1}{2}} x$ OR $h(x) = \log_{\frac{1}{2}} x^{-1}$ OR $h(x) = \log_2 x$	✓✓answer/*antwoord*	(2)
6.4	$-4 < x \leq -3$	✓✓ answer/*antwoord* **AO full marks**	(2) **[8]**

QUESTION 7 / VRAAG 7

7.1		$A = P(1+i)^n$ $66\,611 = 45\,000\left(1+\frac{r}{2}\right)^{10}$ $\left(1+\frac{r}{2}\right)^{10} = \frac{66\,611}{45\,000}$ $1+\frac{r}{2} = 1{,}040$ $\frac{r}{2} = 0.040$ $r = 0{,}080$ $Interest = 8\%$	✓answer/*antwoord* ✓subst into correct formula/*vervang in korekte formule* ✓Simplification/*vereenvoudig* ✓ value of interest/*waarde van rente*	(4)
7.2		$F_v = \frac{x[(1+i)^n - 1]}{i}$ $= \frac{2500\left[\left(1+\frac{0{,}06}{4}\right)^{21} - 1\right]}{\frac{0{,}06}{4}}$ $= R\ 61\,176{,}31$	✓ $n = 21$ ✓ $i = \frac{0{,}06}{4}$ ✓ R2500 substitution into correct formula/*vervang in korrekte formule* ✓answer/*antwoord* **CA**	(4)
7.3	7.3.1	$A = P(1+i)^n$ $= 82\,000\left(1+\frac{0{,}15}{12}\right)^5$ $= R87\,254{,}74$	✓$n = 5$ ✓ substitution into correct formula/ *vervang in korrekte formule* ✓answer/*antwoord*	(3)
	7.3.2	$P_v = \frac{x[1-(1+i)^{-n}]}{i}$ $87\,254{,}74 = \frac{3200\left[1-\left(1+\frac{0{,}15}{12}\right)^{-n}\right]}{\frac{0{,}15}{12}}$ $\frac{87\,254{,}74\left(\frac{0{,}15}{12}\right)}{3\,200} = 1-\left(1+\frac{0{,}15}{12}\right)^{-n}$ $\left(1+\frac{0{,}15}{12}\right)^{-n} = 0{,}6591611719$ $-n = log_{\left(1+\frac{0{,}15}{12}\right)} 0{,}6591611719$ $n = 33{,}55$ $= 33\ installments$/paaiemente	✓substitution into correct formula/ *vervang in korrekte formule* ✓ $P_v = 87254{,}74$ **CA from 7.3.1** **If/As PV = 82000 max 2/4** ✓ correct use of logs/ *korrekte gebruik van logs* ✓answer/*antwoord*	(4) **[15]**

QUESTION 8 / VRAAG 8

Penalise for notation: Only once (-1) in this question.

8.1	$f(x) = 4x^2 - x$ $f(x+h) = 4(x+h)^2 - (x+h)$ $= 4(x^2 + 2xh + h^2) - x - h$ $= 4x^2 + 8xh + 4h^2 - x - h$ $f(x+h) - f(x) = 8xh + 4h^2 - h$ $f'(x) = \lim_{h \to 0} \frac{h(8x + 4h - 1)}{h}$ $= \lim_{h \to 0} (8x + 4h - 1)$ $= 8x - 1$	✓ $4x^2 + 8xh + 4h^2 - x - h$ ✓ $8xh + 4h^2 - h$ ✓ factorising/*faktorisering* ✓simplify/*vereenvoudig* ✓ answer /*antwoord* **CA**	(5)
8.2	8.2.1 $D_x\left[x^2 - \frac{1}{2x^3} + \sqrt{x}\right]$ $= D_x[x^2 - \frac{1}{2}x^{-3} + x^{\frac{1}{2}}]$ $= 2x + \frac{3}{2}x^{-4} + \frac{1}{2}x^{-\frac{1}{2}}$	✓$x^{\frac{1}{2}}$ ✓ $2x$ ✓$\frac{3}{2}x^{-4}$ **only CA if index is negative integer/** ***negatiewe integer*** ✓$\frac{1}{2}x^{-\frac{1}{2}}$ **only CA if index is rational/** ***rasionaal***	(4)
	8.2.2 $y = k^2 - 4kp + 4p^2$ $\frac{dy}{dk} = 2k - 4p$	✓ standard form/*standaard vorm* ✓ $2k$ ✓ $-4p$	(3)
8.3	$f'(x) = -2x$ $f'(2) = -4$ $g(x) = px^{-1} - 3$ $g'(x) = -px^{-2}$ $but\ g'(2) = -4$ $-p(2)^{-2} = -4$ $-\frac{p}{4} = -4$ $\therefore p = 16$	✓ -4 ✓ $-px^{-2}$ ✓ Equation/vergelyking **CA** ✓ answer/antwoord	(4) **[16]**

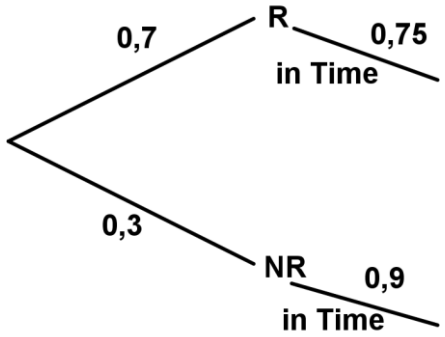
QUESTION 9 / VRAAG 9

9.1	$f(x) = (x+5)(2x^2 - 13x - 7)$ $0 = (x+5)(2x+1)(x-7)$ $x = -5 \; ; x = -\frac{1}{2} \; ; x = 7$ $B = \left(-\frac{1}{2}\,;0\right)$ $C = (7\,;0)$	✓ $(x+5)$ ✓ $(2x+1)(x-7)$ **CA** ✓ ✓correct coordinates/*korrekte koördinate* **CA**	(4)
9.2.	$f'(x) = 6x^2 - 6x - 72$ $x^2 - x - 12 = 0$ $(x+3)(x-4) = 0$ $x = -3$ or $x = 4$ $f(-3) = 2(-3)^3 - 3(-3)^2 - 72(-3) - 35$ $= 100$ or $f(4) = 2(4)^3 - 3(4)^2 - 72(4) - 35$ $= -243$ $D = (-3\,;100)$ $E = (4\,;-243)$	✓ $f'(x)$ ✓ $= 0$ ✓ factors/*faktore* ✓ *both /beide* x −values /*waardes* CA ✓ *both /beide* y −values /*waardes* **CA**	(5)
9.3	$f''(x) = 12x - 6$ $12x - 6 < 0$ $x < \frac{1}{2}$	✓ 2nd derivative/*afgeleide* ✓ $f''(x) < 0$ ✓ answer/*antwoord* **CA**	(3)
9.4	$-5 \le x \le -3$ *or* $-\frac{1}{2} \le x \le 0$	✓ $-5 \le x \le -3$ ✓ $-\frac{1}{2} \le x \le 0$	(2) **[14]**

QUESTION 10 /VRAAG 10

10	$TSA\ of\ box = 1350\ cm^2$ $2(x^2) + 4(xh) = 1350$ $2x^2 + 4xh = 1\,350$ $h = \frac{1350}{4x} - \frac{x}{2}\ or\ h = \frac{1350-2x^2}{4x}$ $Volume = x^2\left(\frac{1350}{4x} - \frac{x}{2}\right)$ $V(x) = \frac{675x}{2} - \frac{x^3}{2}$ $\frac{dV}{dx} = \frac{675}{2} - \frac{3}{2}x^2$ $\frac{675}{2} - \frac{3}{2}x^2 = 0$ $-\frac{3}{2}x^2 = -\frac{675}{2}$ $3x^2 = 675$ $x^2 = 225$ $x = 15$	✓ $2(x^2) + 4(xh)$ ✓h ✓ subst h into correct formula/ *Vervang h in korrekte formule* **If formula incorrect BD!** ✓ Derivative/*afgeleide* ✓ $= 0$ ✓ x^2 ✓Value of/*waarde van* x	(7) **[7]**

QUESTION 11 /VRAAG 11

11.1	11.1.1	$P(A \text{ and } B) = P(A) \times P(B)$ $0{,}28 = (0{,}42 + 0{,}28) \times (0{,}28 + x)$ $0{,}28 = 0{,}7(0{,}28 + x)$ $0{,}4 = 0{,}28 + x$ $0{,}4 - 0{,}28 = x$ $x = 0{,}12$	✓ subst. into correct formula/ *vervang in korrekte formule* ✓ Equation simplified /*Vergelyking vereenvoudig* ✓ $0{,}4 - 0{,}28$ **CA** Answer given / *antwoord gegee*	(3)
	11.1.2	$y = 1 - 0{,}82 = 0{,}18$	✓ answer/antwoord	(1)
	11.1.3	From sketch: P(A *or* B)= $0{,}42 + 0{,}28 + 0{,}12$ $= 0{,}82$ OR P(A *or* B)= P(A)+P(B)$-P$(A and B) P(A *or* B)= $0{,}7 + 0{,}4 - 0{,}28$ $= 0{,}82$	✓ add values from diagram/ *tel waardes op vanaf diagram* ✓*answer/antwoord* ✓ subst. into correct formula/ *vervang in korrekte formule* ✓ answer/*antwoord*	(2)
11.2		 $P(in\ time) = (0{,}7 \times 0{,}75) + (0{,}3 \times 0{,}9)$ $= 0{,}795 = 79{,}5\%$	✓✓ method/*metode* ✓ subst. into correct formula/ *vervang in korrekte formule* ✓ answer/*antwoord*	(4) **[10]**

QUESTION 12 /VRAAG 12

12.1	$6! = 720$	✓ $6!$ *or* 720	(1)
12.2	$1 \times 4! \times 2 = 48$	✓ $4! \times 2$ ✓	(2)
12.3	$P(start\ with\ T, end\ with\ vowel) = \frac{48}{720} or \frac{1}{15} or\ 0.07$ $P(NOT) = 1 - \frac{48}{720}\ or\ 1 - \frac{1}{15}\ or\ 1 - 0{,}07$ $= \frac{672}{720}\ or\ \frac{14}{15}\ or\ 0{,}93$	✓$\frac{48}{720}\ or\ \frac{1}{15}\ or\ 0.27$ **CA** ✓Answer/*antwoord* **CA**	(2) **[5]**

TOTAL = 150