Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 12

JUNE/*JUNIE* 2019

MATHEMATICS P1/*WISKUNDE V1* MARKING GUIDELINE/*NASIENRIGLYN*

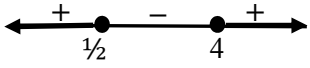
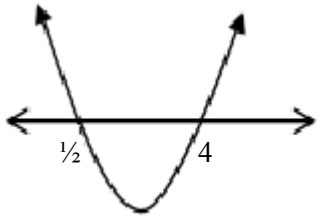
MARKS/*PUNTE*: 150

This marking guideline consists of 14 pages./
Hierdie nasienriglyn bestaan uit 14 bladsye.

NOTE/*LET WEL*:

- If a candidate answered a question TWICE, mark the FIRST attempt ONLY.
  Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, merk SLEGS die EERSTE poging.
- Consistent accuracy(CA) applies in ALL aspects of the marking guideline.
  Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyn van toepassing.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
  Indien 'n kandidaat 'n poging vir 'n vraag deurgetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deurgetrek is.
- The mark for substitution is awarded for substitution into the correct formula.
  Die punt vir substitusie word toegeken vir substitusie in die korrekte formule.

QUESTION 1/*VRAAG 1*

1.1.1	$x^2 + 7x = 0$ $x(x+7) = 0$ $x = 0 \ \ or \ \ x + 7 = 0$ $x = -7$	✓ both factors / *beide faktore* ✓ both x-values / *beide x-waardes* (2)
1.1.2	$5 - 10x - 3x^2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(-3)(5)}}{2(-3)}$ $x = \frac{10 \pm \sqrt{160}}{-6}$ $\therefore x = 0,44 \quad or / of \quad x = -3,77$ Penalise 1 mark for incorrect rounding off./ *Penaliseer 1 punt vir verkeerde afronding.*	✓ substitution / *vervanging* ✓✓ x-values / *waardes* (3)
1.1.3	$(2x-1)(4-x) \geq 0$ $(2x-1)(x-4) \leq 0$   $\frac{1}{2} \leq x \leq 4$	✓ critical values / *kritieke waardes* ✓✓ answer (accuracy) / *antwoord (akkuraatheid)* (3)

1.1.4	$2\sqrt{x-3}=x-3$ $\left(2\sqrt{x-3}\right)^2=(x-3)^2$ $4(x-3)=x^2-6x+9$ $0=x^2-6x-4x+9+12$ $0=x^2-10x+21$ $0=(x-3)(x-7)$ $\therefore x=3 \text{ or } x=7$	✓ squaring both sides / *kwadreer beide kante* ✓ multiplication / *vermenigvuldiging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ answers / *antwoorde* (5)
1.2	$y=-3x+2$.....(1) $x^2+y=xy+x$.....(2) (1) *in* (2): $x^2+(-3x+2)=x(-3x+2)+x$ $x^2-3x+2=-3x^2+2x+x$ $4x^2-6x+2=0$ $2x^2-3x+1=0$ $(2x-1)(x-1)=0$ $x=½ \text{ or / of } x=1$ $y=½ \text{ or / of } y=-1$	✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ x-values / *waardes* ✓ y-values / *waardes* (5)
1.3.1	$x=\frac{3\sqrt{45}-2\sqrt{80}}{\sqrt{125}}$ $x=\frac{3\sqrt{9\times5}-2\sqrt{16\times5}}{\sqrt{25\times5}}$ $x=\frac{9\sqrt{5}-8\sqrt{5}}{5\sqrt{5}}$ $x=\frac{1}{5}$	✓ factors under root / *faktore onder wortel* ✓ simplification (this step must be seen) / *vereenvoudiging (hierdie stap moet gesien word)* ✓ answer / *antwoord* (3)

1.3.2	$a^2 = \frac{5}{b^3} \quad .....(1)$ $\frac{a^5}{b^2} = 7 \quad ....(2)$ $From(2): b^2 = \frac{a^5}{7}$ $b = \left(\frac{a^5}{7}\right)^{\frac{1}{2}} \quad .....(3)$ $(3)\text{into}(1): \quad a^2\left[\left(\frac{a^5}{7}\right)^{\frac{1}{2}}\right]^3 = 5$ $a^2 \times \frac{a^{\frac{15}{2}}}{7^{\frac{3}{2}}} = 5$ $a^2 \times a^{\frac{15}{2}} = 5 \times 7^{\frac{3}{2}}$ $a^{\frac{19}{2}} = 5 \times 7^{\frac{3}{2}}$ $a = \left(5 \times 7^{\frac{3}{2}}\right)^{\frac{2}{19}}$ $a = \sqrt[19]{25 \times 343}$	✓ equation (3) / *vergelyking (3)* ✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ simplification / *vereenvoudiging* ✓ isolating a / *isolering van a* (5)
		[26]

QUESTION 2/*VRAAG 2*

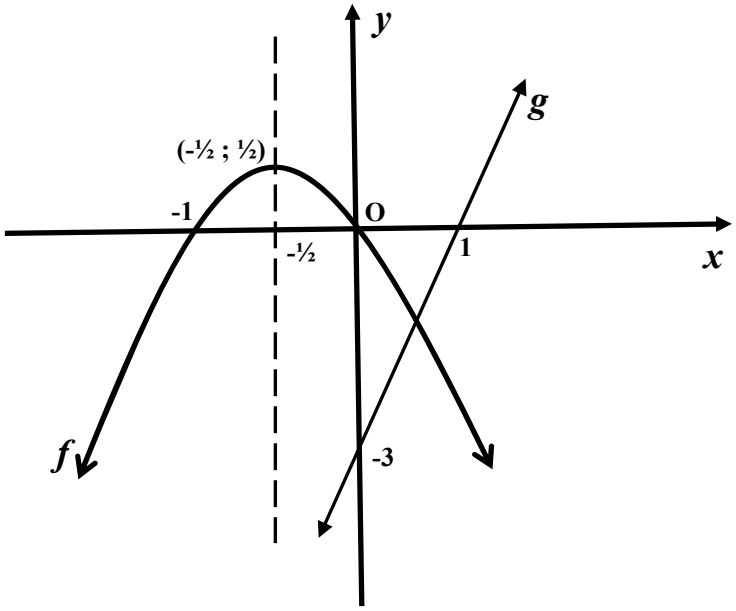
2.1.1	12 ; 9 ; 6 ; . . . . . a = 12 and/*en* d = –3 $T_n = 12 + (n-1)(-3)$ $= -3n + 15$	✓ d = –3 ✓ answer / *antwoord* (2)
2.1.2	$T_n = -3(40) + 15$ $= -105$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
2.1.3	$S_{40} = \frac{40}{2}(12 + (-105))$ $= -1860$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
2.2.1	*Quadratic Pattern / Kwadratiese Patroon* : $T_1 = 10$ 1*st difference pattern / 1ste verskille patroon* : $-7; -5; -3; ...$ $\therefore T_2 = 3$ *and / en* $T_3 = -2$	✓ first differences / *eerste verskille* ✓ ✓ answers / *antwoorde* (T_1 and/*en* T_2) (3)
2.2.2	$2a = 2 \quad 3a + b = -7 \quad a + b + c = 10$ $a = 1 \quad 3(1) + b = -7 \quad (1) + (-10) + c = 10$ $b = -10 \quad c = 19$ $\therefore T_n = n^2 - 10n + 19$	✓ value of *a* / *waarde van a* ✓ value of *b* / *waarde van b* ✓ value of *c* / *waarde van c* **(✓✓✓can be awarded at formula / *kan by formule toegeken word)*** (3)
2.2.3	$n^2 - 10n + 19 = 2019$ $n^2 - 10n - 2000 = 0$ $(n-50)(n+40) = 0$ $n = 50$ *or / of* $n = -40$ $\therefore T_{50} = 2019$	✓ equation / *vergelyking* ✓ factors / *faktore* ✓ answer / *antwoord* (T_{50}) (3)
2.3.1	$S_n = 81 - 81(3)^{-n}$ $T_1 = S_1 = 81 - 81(3)^{-1}$ $= 54$	✓ answer / *antwoord* (1)

2.3.2	$T_2 = S_2 - S_1$ $= 72 - 54$ $= 18$ $r = \frac{T_2}{T_1} = \frac{18}{54} = \frac{1}{3}$ $T_n = a.r^{n-1}$ $= 54\left(\frac{1}{3}\right)^{n-1}$	✓ $T_2 = 18$ ✓ $r = \frac{1}{3}$ ✓ answer / *antwoord* (3)
2.3.3	Yes/*Ja*. $r = -1 < \frac{1}{3} < 1 \quad ; \quad r \neq 0$	✓ YES / *JA* ✓ reason / *rede* (2)
2.3.4	$S_\infty = \frac{a}{1-r}$ *or / of* $S_\infty = 81 - 81(3)^{-\infty}$ $= \frac{54}{1-\frac{1}{3}}$ $= 81 - 81\left(\frac{1}{3}\right)^{\infty}$ $= 81$ $= 81$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
2.4	$\sum_{t=1}^{3}(2x+3t) + \sum_{r=7}^{12}\left(3(2)^{r-1}\right) = 0$ $(2x+3+2x+6+2x+9) + \frac{192\left(2^6-1\right)}{2-1} = 0$ $6x + 18 + 12096 = 0$ $6x = -12114$ $x = -2019$	✓ $(2x + 3 + 2x + 6 + 2x + 9)$ ✓ sum of GS / *som van MR* ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (4)
		[27]

QUESTION 3/*VRAAG 3*

3.1	$(let / laat \ \ y = 0)$ / $(let / laat \ \ x = 0)$ $\frac{2}{x-1}+1=0$ $y=\frac{2}{0-1}+1$ $\frac{2}{x-1}=-1$ $y=-2+1$ $2=-x+1$ $y=-1$ $x=-1$ $(-1;0)$ $(0;-1)$	✓ substitution / *vervanging* ($y = 0$) ✓ substitution / *vervanging* ($x = 0$) ✓ coordinates of A / *koördinate van A* ✓ coordinates of B / *koördinate van B* (4)
3.2	$x=1$	✓ answer / *antwoord* (1)
3.3	$y \in \mathbb{R}\backslash\{1\}$ OR/*OF* $y \in \mathbb{R}$ but $y \neq 1$	✓ answer / *antwoord* (1)
3.4	$A\left(-\sqrt{2}+1;-\sqrt{2}+1\right)$ *and / en* $B\left(\sqrt{2}+1;\sqrt{2}+1\right)$ $AB^2=\left(\sqrt{2}+1+\sqrt{2}-1\right)^2+\left(\sqrt{2}+1+\sqrt{2}-1\right)^2$ $=\left(2\sqrt{2}\right)^2+\left(2\sqrt{2}\right)^2$ $=16$ $\therefore AB=4 \, units \ / \ eenhede$	✓ coordinates of A and B *koördinate van A en B* ✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (4)
3.5	$h(x)=-\frac{2}{(x-5)}+1$	✓ – ve (reflection / *refleksie*) ✓ $(x – 5)$ (shift / *skuif*) (2)
		[12]

QUESTION 4/*VRAAG 4*

4.1		**Parabola / *Parabool*** ✓ *x*-intercepts / x-afsnitte ✓ Turning point / *Draaipunt* ✓ Axis of symmetry / *Simmetrie-as* ✓ Shape / *Vorm* **Straight line / *Reguitlyn*** ✓ *x*-intercept / x-afsnit ✓ *y*-intercept / y-afsnit (6)
4.2	From sketch / *Vanaf skets* $-1 < x < 0 \quad or / of \quad x \in (-1;0)$ Algebraic solution / *Algebraïese oplossing* $-2x^2 - 2x > 0$ $-2x(x+1) > 0$ $2x(x+1) < 0$  *cv / kw*: $-1 < x < 0$	✓✓ answer / *antwoord* (2)
4.3	$ST = -2x^2 - 2x - (3x - 3)$ $= -2x^2 - 5x + 3$ $ST'(x) = -4x - 5 = 0$ $-4x = 5$ $x = -\frac{5}{4}$ $Max / Maks = -2\left(-\frac{5}{4}\right)^2 - 5\left(-\frac{5}{4}\right) + 3$ $= \frac{49}{8} / \left(6\frac{1}{8}\right)$	✓ ST = $-2x^2 - 2x - (3x - 3)$ ✓ ST′ = 0 ✓ $x = -\frac{5}{4}$ ✓answer / *antwoord* (4)
		[12]

QUESTION 5/*VRAAG 5*

5.1	$f(x)=2^x$ $k=2^{-3}$ $k=\frac{1}{8}$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
5.2	$f^{-1}(x):\ x=2^y$ $y=\log_2 x$ $g^{-1}(x):\ x=2y+1$ $x-1=2y$ $y=\frac{1}{2}x-\frac{1}{2}$	✓ interchanging x and y *omruil van x en y* ✓ answer / *antwoord* ✓ interchanging x and y *omruil van x en y* ✓ answer / *antwoord* (4)
5.3	$f'(x).g(x)\le 0$ $f'(x)\ is\ always + ve$ $g(x)\ is\ -ve\ for\ x<-½$ $+ve\ for\ x>-½$ $\therefore\ x\le -½$	✓ method / *metode* ✓ answer / *antwoord* (2)
		[8]

QUESTION 6/*VRAAG 6*

6.1	$A = P(1+i)^n$ $= 150\,000\left(1+\frac{6,5}{100}\right)^5$ $= R\,205\,513.00$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
6.2	$A = P(1-i)^n$ $134\,000 = 975\,000(1-i)^7$ $(1-i)^7 = \frac{134}{975}$ $1-i = \sqrt[7]{\frac{134}{975}}$ $-i = -0,2468673864$ $\therefore rate / koers = 24,69\%$	✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (3)
6.3.1	$1+i_{eff} = \left(1+\frac{i_{nom}}{n}\right)^n$ $i_{eff} = \left(1+\frac{6,5\%}{12}\right)^{12} - 1$ $i_{eff} = 0,066971852$ $\therefore effective\,rate / effektiewe\,koers = 6,70\%\,p.a.$	✓ formula / *formule* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
6.3.2	$x\left(1+\frac{6,5}{1200}\right)^{60}\left[1+\frac{7,5}{400}\right]^{20} = 2\,000\,000$ $x = \frac{2\,000\,000}{\left(1+\frac{6,5}{1200}\right)^{60}\left[1+\frac{7,5}{400}\right]^{20}}$ $x = R\,997\,500,00$	✓ $\left(1+\frac{6,5}{1200}\right)^{60}$ ✓ $\left[1+\frac{7,5}{400}\right]^{20}$ ✓ equation / *vergelyking* (= 2 000 000) ✓ making *x* subject of the formula / *maak x die onderwerp van die formule* ✓ answer / *antwoord* (5)
		[13]

QUESTION 7/*VRAAG 7*

Penalise 1 mark for incorrect notation in the question
Penaliseer 1 punt vir verkeerde notasie in die vraag

7.1	$f(x) = 5x^2 - 5x$ $f(x+h) = 5(x+h)^2 - 5(x+h)$ $= 5(x^2 + 2xh + h^2) - 5x - 5h$ $= 5x^2 + 10xh + 5h^2 - 5x - 5h$ $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h\to 0} \frac{5x^2 + 10xh + 5h^2 - 5x - 5h - 5x^2 + 5x}{h}$ $= \lim_{h\to 0} \frac{10xh - 5h^2 - 5h}{h}$ $= \lim_{h\to 0} \frac{h(10x + 5h - 5)}{h}$ $= \lim_{h\to 0} (10x + 5h - 5)$ $= 10x - 5$ Answer ONLY: 0 marks *SLEGS antwoord: 0 punte*	✓ $5x^2 + 10xh + 5h^2 - 5x - 5h$ ✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ common factor / *gemene faktor* ✓ answer / *antwoord* (5)
7.2	$y = \frac{\sqrt{x}}{2} - \frac{1}{x^3}$ $y = \frac{1}{2}x^{\frac{1}{2}} - x^{-3}$ $\therefore \frac{dy}{dx} = \frac{1}{4}x^{-\frac{1}{2}} + 3x^{-4}$	✓ $y = \frac{1}{2}x^{\frac{1}{2}} - x^{-3}$ ✓ $\frac{1}{4}x^{-\frac{1}{2}}$ ✓ $3x^{-4}$ (3)
7.3	$f(-1) = (-1)^3 = -1$ $f(1) = (1)^3 = 1$ $\overline{m} = \frac{f(x_2) - f(x_1)}{x_2 - x_1}$ $= \frac{1-(-1)}{1-(-1)}$ $= \frac{2}{2} / 1$	✓ $f(-1)$ *and / en* $f(1)$ ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
		[11]

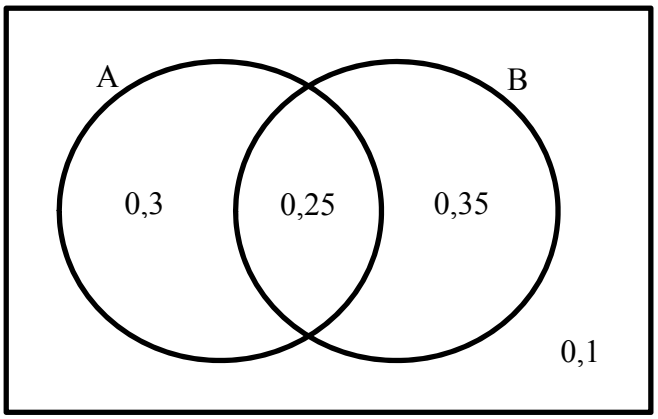
QUESTION 8/*VRAAG 8*

8.1.1	$f(x) = -(2x-5)(x+2)^2 = 0$ $-2x+5=0 \ \ or/of \ \ x+2=0$ $\therefore \ x = \frac{5}{2} \ \ or/of \ \ x=-2$ $AB = 4,5 \, units/eenhede$	✓ *x*-intercepts / *x-afsnitte* ✓ answer / *antwoord* (2)
8.1.2	$f(x) = -2x^3 - 3x^2 + 12x + 20$ $f'(x) = -6x^2 - 6x + 12 = 0$ $x^2 + x - 2 = 0$ $(x+2)(x-1) = 0$ $x+2=0$ or/*of* $x-1=0$ $x=-2$ or /*of* $x=1$ $T(1 \ ; \ y)$	✓ $f'(x)$ ✓ factors / *faktore* ✓ correct *x*-value for T / *korrekte x-waarde vir T* (3)
8.1.3	$m_p = -6(-3)^2 - 6(-3) + 12$ $= -24$ $y - y_1 = m(x - x_1)$ $y - 11 = -24(x+3)$ $y = -24x - 61$	✓ gradient / *gradiënt* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
8.1.4	T(1 ; *y*) $y = -2(1)^3 - 3(1)^2 + 12(1) + 20$ $= 27$ $\therefore \ 0 < k < 27$	✓ max. value / *maks. waarde* ✓✓ answer / *antwoord* (accuracy/*akkuraatheid*) (3)
8.2.1	$c'(x) = -\frac{3}{2}x^2 + 6x = 0$ $x\left(-\frac{3}{2}x + 6\right) = 0$ $x = 0 \ \ or/of \ \ x = 4$ $\therefore \ 0 < x < 4$	✓ equating to 0 / *gelykstel aan 0* ✓ factors / *faktore* ✓ answer / *antwoord* (accuracy/*akkuraatheid*) (3)
8.2.2	$c''(x) = -3x + 6 = 0 \qquad or/of \qquad x = \frac{0+4}{2}$ $x = 2 \qquad\qquad x = 2$ $\therefore \ c(x)$ is concave up for $x < 2$ / $c(x)$ *is konkaaf opwaarts vir* $x < 2$ $c(x)$ is concave down for $x > 2$ / $c(x)$ *is konkaaf afwaarts vir* $x > 2$	✓ method / *metode* ✓ *x*-value / x-waarde ✓✓ conclusion/*gevolgtrekking* (4)
		[18]

QUESTION 9/*VRAAG 9*

9.1	$h = \frac{12-4x}{3}$	✓✓ answer / *antwoord* (2)
9.2	$Area = l \times b$ $= x\left(\frac{12-4x}{3}\right)$ $= 4x - \frac{4x^2}{3}$ $A'(x) = 4 - \frac{8}{3}x = 0$ $-\frac{8}{3}x = -4$ $x = 1,5\,m$ $h = \frac{12-4(1,5)}{3} = 2m$	✓ substitution / *vervanging* ✓ answer / *antwoord* ✓ derivative / *afgeleide* ✓ $f'(x) = 0$ ✓ answer / *antwoord* ✓ answer / *antwoord* (6)
		[8]

QUESTION 10/*VRAAG 10*

10.1.1	P(S) = 1  	✓ 0,3 & 0,25 ✓ 0,35 & 0,25 ✓ 0,1 (3)
10.1.2	$P(A \text{ or/of } B) = P(A) + P(B) - P(A \text{ and/en } B)$ $= 0,55 + 0,6 - 0,25$ $= 0,9$ *or / of* (*from sketch / vanaf skets*) $P(A \text{ or/of } B) = 0,3 + 0,25 + 0,35$ $= 0,9$	✓ method / *metode* ✓ answer / *antwoord* (2)
10.1.3	$P(A \text{ and/en } B') = 0,3$	✓✓ answer / *antwoord* (2)
10.1.4	No/*Nee* : $P(A \cap B) = 0,25 \neq 0$	✓ answer / *antwoord* (1)
10.1.5	$P(A \cup B)' = 0,1 \neq 0$ No/*Nee* : *or / of* $P(A \cup B) = 0,9 \neq 1$	✓ answer / *antwoord* (1)
10.2.1	$a = 20$ $b = (40 - x)$	✓ $a = 20$ ✓ $b = (40 - x)$ (2)
10.2.2	$79 - x + 20 + 19 - x + x + 11 + 16 + 40 - x = 173$ $-2x = 173 - 185$ $-2x = -12$ $x = 6$	✓ equation / *vergelyking* ✓ answer / *antwoord* (2)
10.2.3	$P(\text{at least } 2 / \text{ten minste } 2)$ $= \frac{20 + 11 + 16 + 6}{173}$ $= \frac{53}{173} / 0,31 / 30,6\%$	✓ adding correct values / *tel korrekte waardes op* ✓ answer / *antwoord* (2)
		[15]
		TOTAL/*TOTAAL*: 150