basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 11

MATHEMATICS P1/*WISKUNDE V1*

NOVEMBER 2019

MARKING GUIDELINES/*NASIENRIGLYNE*

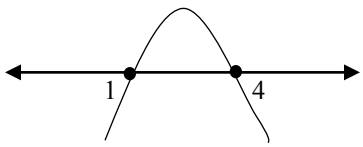
MARKS/*PUNTE*: 150

These marking guidelines consist of 17 pages./
Hierdie nasienriglyne bestaan uit 17 bladsye.

NOTE:
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answer in order to solve a problem is unacceptable.

LET WEL:
- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyne van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

QUESTION/*VRAAG* 1

1.1.1	$2x(x-3)=0$ $2x=0$ or/of $x=3$ $x=0$	✓ $x = 0$ ✓ $x=3$ (2)
1.1.2	$3x^2-2x=4$ $3x^2-2x-4=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(-2)\pm\sqrt{(-2)^2-4(3)(-4)}}{2(3)}$ $x=1{,}54 \quad or \quad x=-0{,}87$	✓standard form/*standaardvorm* ✓substitution into correct formula/ *vervanging in korrekte formule* ✓answer/*antw.* ✓answer/*antw.* (4)
1.1.3	$(x-1)(4-x)\geq 0$  $1\leq x\leq 4$	✓critical values/*kritieke waardes* ✓✓$1\leq x\leq 4$ (3)
1.1.4	$\sqrt{5-x}=x+1$ $5-x=(x+1)^2$ $5-x=x^2+2x+1$ $x^2+3x-4=0$ $(x+4)(x-1)=0$ $x\neq -4$ or $x=1$	✓squaring both sides/ *kwadreer beide kante* ✓standard form/*standaardvorm* ✓factors or using formula/ *faktore of gebruik formule* ✓both solutions to/ *beide oplossings x* ✓ rejecting/*verwerp* $x=-4$ (5)

1.2	$x+4=2y$ and $y^2-xy+21=0$ $\therefore\ x=2y-4$ $y^2-(2y-4)y+21=0$ $y^2-2y^2+4y+21=0$ $-y^2+4y+21=0$ $y^2-4y-21=0$ $(y-7)(y+3)=0$ $y=7$ or $y=-3$ $x=2(7)-4$ or $x=2(-3)-4$ $x=10$ or $x=-10$	✓ $x=2y-4$ ✓substitution /*verv.* ✓std form/*stand. vorm* ✓factors or using formula/ *faktore of gebruik formule* ✓*y*-values/*wrdes* ✓*x*-values/*wrdes* (6)
1.3	$2(x-3)^2+2=0$ $(x-3)^2=-1$ ∴ roots are non - real/wortels is niereël	✓ $(x-3)^2=-1$ ✓conclusion/*gevolgtrekking* (2)
1.4	$g(x)=-2x^2-px+3$ $x=\frac{-b}{2a}=\frac{-(-p)}{2(-2)}=-\frac{p}{4}$ $y=-2\left(-\frac{p}{4}\right)^2-p\left(-\frac{p}{4}\right)+3$ $-2\left(-\frac{p}{4}\right)^2-p\left(-\frac{p}{4}\right)+3=3\frac{1}{8}$ $-\frac{p^2}{8}+\frac{2p^2}{8}=\frac{1}{8}$ $p^2=1$ $p=\pm1$ **OR/*OF*** max value/maks waarde $=\frac{4ac-b^2}{4a}$ $\frac{4(-2)(3)-p^2}{4(-2)}=\frac{25}{8}$ $\frac{-24-p^2}{-8}=\frac{25}{8}$ $-192-8p^2=-200$ $8p^2=8$ $p=\pm1$	✓ $x=-\frac{p}{4}$ ✓ $-2\left(-\frac{p}{4}\right)^2-p\left(-\frac{p}{4}\right)+3=3\frac{1}{8}$ ✓simplification/*vereenvoudiging* ✓ $p=\pm1$ ✓ max value $=\frac{4ac-b^2}{4a}$ ✓ $\frac{4(-2)(3)-p^2}{4(-2)}=\frac{25}{8}$ ✓simplification ✓ $p=\pm1$ (4) **[26]**

QUESTION/*VRAAG* 2

2.1	$\frac{3^{2x+1}.15^{2x-3}}{27^{x-1}.3^{x}.5^{2x-4}}$ $=\frac{3^{2x+1}.3^{2x-3}.5^{2x-3}}{3^{3x-3}.3^{x}.5^{2x-4}}$ $=3^{2x+1+2x-3-3x+3-x}.5^{2x-3-2x+4}$ $=3.5$ $=15$	✓ prime bases/*priembasis* ✓ base/*basis* 3 ✓adding and subtracting exponents/*optel en aftrek van eksponente* ✓answer/*antw.* (4)
2.2.1	$\left(\frac{1}{2}\right)^{x}=32$ $\left(\frac{1}{2}\right)^{x}=2^{5}$ $2^{-x}=2^{5}$ $-x=5$ $x=-5$ **OR/*OF*** $\left(\frac{1}{2}\right)^{x}=32$ $\left(\frac{1}{2}\right)^{x}=2^{5}$ $\left(\frac{1}{2}\right)^{x}=\left(\frac{1}{2}\right)^{-5}$ $x=-5$	✓same base/*dieselfde basis* ✓equating indices/ *gelykstelling van eksponente* ✓answer/*antw.* **OR/*OF*** ✓ same base/*dieselfde basis* ✓simplification/*vereenv* ✓answer/a*ntw.* (3)
2.2.2	$\sqrt[3]{\frac{1}{x^{2}}}=4$ $x^{\frac{-2}{3}}=2^{2}$ $x=\left(2^{2}\right)^{\frac{3}{-2}}$ $x=2^{-3}$ $x=\frac{1}{8}$	✓exp form/*eksp. vorm* ✓ $x=\left(2^{2}\right)^{\frac{3}{-2}}$ ✓answer/*antw.* (3)

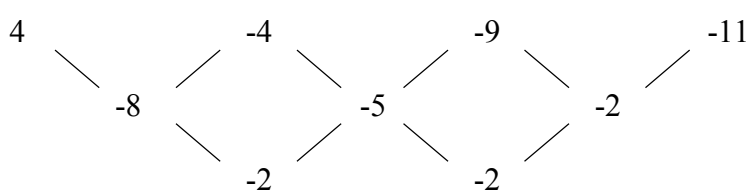
2.2.3	$2^x - \frac{12}{2^x} = -4$ $\left(2^x\right)^2 - 12 = -4.2^x$ $\left(2^x\right)^2 + 4.2^x - 12 = 0$ $\left(2^x + 6\right)\left(2^x - 2\right) = 0$ $2^x \neq -6$ or $2^x = 2$ no solution/*geen oplossing* or/*of* $x = 1$ **OR/*OF*** Let $2^x = k$ $k - \frac{12}{k} = -4$ $k^2 - 12 = -4k$ $k^2 + 4k - 12 = 0$ $(k-2)(k+6) = 0$ $k = 2$ or $k = -6$ $2^x = 2$ or $2^x \neq -6$ $x = 1$ or no solution	✓mult by LCD/*KGN* ✓$\left(2^x\right)^2 + 4.2^x - 12 = 0$ ✓factors/*faktore* ✓$2^x \neq -6$ ✓$x = 1$ (5) **OR/*OF*** ✓ mult by LCD/*KGN* ✓$k^2 + 4k - 12 = 0$ ✓factors/*faktore* ✓$2^x \neq -6$ ✓ $x = 1$ (5)
2.3	$\frac{\sqrt{2}}{\sqrt{2}+1} + \frac{4}{\sqrt{2}}$ $= \frac{\sqrt{2}.\sqrt{2}}{\sqrt{2}\left(\sqrt{2}+1\right)} + \frac{4\left(\sqrt{2}+1\right)}{\sqrt{2}\left(\sqrt{2}+1\right)}$ $= \frac{\left(\sqrt{2}\right)^2 + 4\sqrt{2} + 2^2}{2+\sqrt{2}}$ $= \frac{\left(\sqrt{2}+2\right)^2}{2+\sqrt{2}}$ $= 2 + \sqrt{2}$	✓LCD/*KGN* ✓perfect square trinomial *volkome vierkant drieterm* ✓simplification denominator/ *vereenvoudigingsnoemer* ✓factors/*faktore* ✓answer/*antwoord* (5) **[22]**

QUESTION/*VRAAG* 3

3.1	-5 0 5 5 5 $T_n = an + b$ $= 5n - 10$	✓ $5n$ ✓ -10 (2)
3.2	$T_{12} = 5(12) - 10$ $= 50$	✓substitution/*verv.* ✓answer/*antw.* (2)
3.3	$5n - 10 = 130$ $5n = 140$ $n = 28$ 28^{th} term(T_{28})	✓substitution/*verv.* ✓answer/*antw.* (2)
		[6]

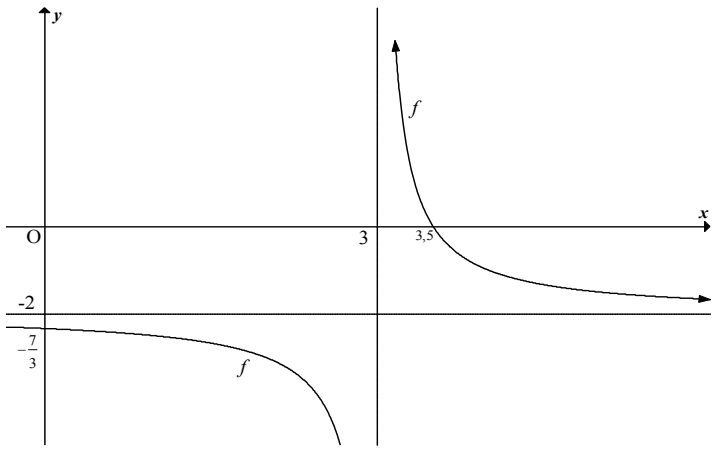
QUESTION/*VRAAG* 4

4.1.1	13 27 45 67 14 18 22 4 4 It is a quadratic number pattern/ *Dit is 'n kwadratiese getalpatrron* Second difference is constant./*Tweede verskil is konstant.*	✓quadratic/ *kwadratiese* ✓justification/ *regverdiging* (2)
4.1.2	$2a = 4$ $a = 2$ $3(2) + b = 14$ $b = 8$ $2 + 8 + c = 13$ $c = 3$ $T_n = 2n^2 + 8n + 3$	✓ $a = 2$ ✓ $b = 8$ ✓ $c = 3$ ✓ $T_n = 2n^2 + 8n + 3$ (4)
4.1.3	$T_n = 2n^2 + 8n + 3$ $T_{100} = 2(100)^2 + 8(100) + 3$ $= 20803$	✓ substitution/*vervanging* ✓answer/*antwoord* (2)
4.1.4	$4n + 10 = 110$ $4n = 100$ $n = 25$ $T_{25} = 2(25)^2 + 8(25) + 3$ $= 1453$ $T_{26} = 2(26)^2 + 8(26) + 3$ $= 1563$	✓✓ $4n + 10 = 110$ ✓ $n = 25$ ✓ $T_{25} = 1453$ ✓ $T_{26} = 1563$ (5)

4.1.5	The first and second differences are all even but the first term is odd./ *Die eerste en tweede verskille is gelyk maar die eerste term is onewe.* Thus when adding an even to an odd number the answer will always be odd./*Wanneer 'n ewe by 'n onewe getal gevoeg word, sal die antwoord altyd onewe wees.* **OR/*OF*** $T_n = 2n^2 + 8n + 3$ $2n^2$ has an even coeficient thus it even $8n$ has an even coeficient thus it even 3 is an odd number $\therefore$ the values will always be odd **OR/*OF*** $T_n = 2n^2 + 8n + 3$ $= 2\left(n^2 + 4n\right) + 3$ For all $n \in$ N, $2\left(n^2 + 4n\right)$ is even/*ewe* $\therefore 2\left(n^2 + 4n\right) + 3$ is odd/*onewe* because an even + odd will always be odd/*want 'n ewe en 'n onewe sal altyd 'n onewe maak*	✓argument ✓conclusion/*gevolgtr* **OR/*OF*** ✓argument ✓conclusion/*gevolgtr* **OR/*OF*** ✓ $2\left(n^2 + 4n\right) + 3$ ✓conclusion/*gevolgtr* (2)
4.2	1st difference/*1ste verskil*: $2p - 4;\ p - 3;\ \frac{p}{2} - 1$ 2nd difference/*2de verskil*: $p - 3 - (2p - 4) = \frac{p}{2} - 1 - (p - 3)$ $-p + 1 = -\frac{p}{2} + 2$ $-\frac{p}{2} = 1$ $p = -2$  $2(-2) - 4;\ -2 - 3;\ \frac{-2}{2} - 1$ $-8; -5; -2$ $x = -4$ and $y = -9$	✓ $p - 3 - (2p - 4) = \frac{p}{2} - 1 - (p - 3)$ ✓ $p = -2$ ✓ $2(-2) - 4 = -8$ ✓ $y = -9$ ✓ $x = -4$ (5) **[20]**

QUESTION/*VRAAG* 5

5.1	$f(x)=\frac{1}{x-3}-\frac{2x+6}{x+3}$ $=\frac{1}{x-3}-\frac{2(x+3)}{x+3}$ $=\frac{1}{x-3}-2$	✓common factor *gemene faktor* ✓simplification/*vereenv.* (2)
5.2	$x=3$ $y=-2$	✓$x=3$ ✓$y=-2$ (2)
5.3	$0=\frac{1}{x-3}-2$ $2=\frac{1}{x-3}$ $2(x-3)=1$ $2x-6=1$ $x=\frac{7}{2}$	✓subst./*verv.* $y=0$ ✓simplification/*vereenv.* ✓answer/*antw.* (3)
5.4	$y=\frac{1}{0-3}-2$ $=\frac{-7}{3}$ **OR/*OF*** $\left(0;\frac{-7}{3}\right)$	✓subst/*verv.* $x=0$ ✓answer/*antw.* ✓✓answer/*antw* (2)

5.5		✓asymptotes/*asimptote* ✓shape/*vorm* ✓*x*- and *y*- int. (3)
5.6	$y=x+c$ $-2=3+c$ $c=-5$ $y=x-5$	✓ m = 1 ✓substitution of/*vervanging van* $(3;-2)$ ✓ $c=-5$ (3)
5.7	Translate f 3 units to the left and 2 units up. *Transleer f 3 eenhede na links en 2 eenhede op.*	✓3 units to the left *eenhede na links* 2 units up/*eenhede op* (2)
5.8	$x\in(-\infty;+\infty)$; $x\neq 0$ **OR/*OF*** $x\in R; x\neq 0$	✓ $x\in(-\infty;+\infty)$ ✓ $x\neq 0$ (2) **[19]**

QUESTION/*VRAAG* 6

6.1	$y=-3x+k$ $0=-3(5)+k$ $k=15$	✓ substitute/*verv.* $(5;0)$ (1)
6.2	$x=\frac{-b}{2a}$ $x=\frac{-2}{2(-1)}$ $x=1$ *or* $x=\frac{-3+5}{2}$ $=1$ $y=-(1)^2+2(1)+15$ $y=16$ $D(1;16)$	✓ $x=1$ ✓substitution/*vervanging* ✓ $y=16$ (3)
6.3	$x<1$ **OR/*OF*** $x\in(-\infty;1)$	✓ answer/*antwoord* (1)
6.4	A$(-3;0)$ D$(1;16)$ Ave grad / *Gemidgrad* $=\frac{y_2-y_1}{x_2-x_1}$ $=\frac{0-16}{-3-1}$ $=4$	✓formula/*formule* ✓subst. into correct formula /*verv. in formule* ✓answer/*antwoord* (3)

6.5	$D(1;16)$ $E(1;12)$ $DE = 4\text{units}$	✓ E(1;12) ✓ answer/*antwoord* (2)
6.6	$h(x) = f(x-1)-2$ $= -(x-1)^2 + 2(x-1)+15-2$ $= -x^2 + 2x - 1 + 2x - 2 + 15 - 2$ $= -x^2 + 4x + 10$ $= -(x^2 - 4x - 10)$ $= -(x^2 + -4x + 4 - 4 - 10)$ $= -(x-2)^2 + 14$ **OR/*OF*** $D(1;16)$ and $a = -1$ $f(x) = -(x-1)^2 + 16$ $h(x) = f(x-1)-2$ $= -(x-1-1)^2 + 16 - 2$ $= -(x-2)^2 + 14$	✓ $-(x-1)^2 + 2(x-1)+15-2$ ✓ $-x^2 + 4x + 10$ ✓ $-(x^2 + -4x + 4 - 4 - 10)$ ✓ $h(x) = -(x-2)^2 + 14$ **OR/*OF*** ✓subst./*vervang* $D(1;16)$ and $a = -1$ ✓correct form/*korrekte vorm* ✓ $h(x) = -(x-1-1)^2 + 16 - 2$ ✓ $h(x) = -(x-2)^2 + 14$ (4)
6.7	max value of/*maks wrde van* $f(x)$ is 16 $\therefore$ max value of/*maks wrde van* $f(x) - 12$ is $16 - 12 = 4$ max/*maks* $p(x) = 3^4$ $= 81$	✓ max value of $f(x)$ is 16 ✓ max value of $f(x) - 12$ is $16 - 12 = 4$ ✓answer/*antw.* (3)
6.8	$x \in R; x \neq 1$	✓✓answer/a*ntwoord* (2) **[19]**

QUESTION/*VRAAG* 7

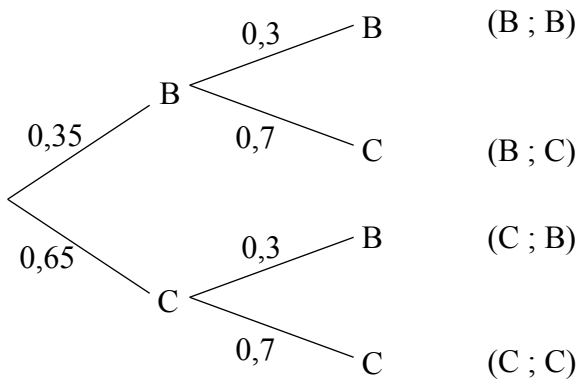
7.1	$y = 3^{x+p} - 27$ $54 = 3^{3+p} - 27$ $81 = 3^{3+p}$ $3^4 = 3^{3+p}$ $3 + p = 4$ $p = 1$	\ ✓subs/*vervanging* (3 ; 54) ✓ equating indices/*gelykst. eksp.* ✓answer/a*ntwoord* (3)
7.2	range / *waardeversameling* $y > -27$ or / *of* $y \in (-27; \infty)$	✓✓ answer/a*ntwoord* (2)
7.3	$-y = 3^{x+1} - 27$ $g(x) = -1.3^{x+1} + 27$ $y = -1.3^{0+1} + 27$ $= 24$ $y -$ intercept/*afsnit* $(0; 24)$	✓new equation/*nuwe verg.* ✓ answer/*antwoord* (2) **[7]**

QUESTION/*VRAAG* 8

8.1	$A = P(1-i)^n$ $85\,000 = 200\,000(1-i)^5$ $i = 1-\sqrt[5]{\frac{85\,000}{200\,000}}$ $i = 15{,}73\%$	✓substitution/*verv.* ✓rewrite in terms of *i*/ *skryf in terme van i* ✓answer/*antw.* (3)
8.2	$1+i_{eff} = \left(1+\frac{i_{nom}}{m}\right)^m$ $1+i_{eff} = \left(1+\frac{0{,}085}{4}\right)^4$ $i_{eff} = \left(1+\frac{0{,}085}{4}\right)^4 - 1$ $i_{eff} = 8{,}77\%$	✓formula/*form.* ✓$i = \frac{0{,}085}{4}$ ✓answer/*antw.* (3)
8.3.1	$A = P(1+i)^n$ $= 28\,000\left(1+\frac{0{,}12}{12}\right)^{2\times 12}$ $= R\,35\,552{,}57$	✓substitution/*verv.* ✓answer/*antw.* (2)
8.3.2	$A = 28\,000\left(1+\frac{0{,}12}{12}\right)^{12\times 4}\left(1+\frac{0{,}129}{2}\right)^{2\times 4} +$ $12\,000\left(1+\frac{0{,}12}{12}\right)^{12}\left(1+\frac{0{,}129}{2}\right)^{2\times 4} - 6500\left(1+\frac{0{,}129}{2}\right)^{2\times 3}$ $= R87\,267{,}25$ **OR/*OF***	✓ $\frac{0{,}12}{12}$ and $n = 48$ ✓ $\frac{0{,}129}{12}$ and $n = 8$ ✓ $12\,000\left(1+\frac{0{,}12}{12}\right)^{12}\left(1+\frac{0{,}129}{2}\right)^{2\times 4}$ ✓ $-6500\left(1+\frac{0{,}129}{2}\right)^{2\times 3}$ ✓ answer/*antw.* (5)

	$A=\left\langle\left\{28\,000\left(1+\frac{0,12}{12}\right)^{12\times 3}+12\,000\right\}\right.$ $\left.\left(1+\frac{0,12}{12}\right)^{12}\left(1+\frac{0,129}{2}\right)^{2}-6500\right\rangle\left(1+\frac{0,129}{2}\right)^{6}$ = R87 267,25	✓✓ $28\,000\left(1+\frac{0,12}{12}\right)^{12\times 3}+12000$ ✓ $\left(1+\frac{0,12}{12}\right)^{12}\left(1+\frac{0,129}{2}\right)^{2}-6500$ ✓$\left(1+\frac{0,129}{2}\right)^{6}$ ✓ answer/*antw.* (5)
		[13]

QUESTION/*VRAAG* 9

9.1.1	$P(\text{A and/en B})$ $= P(\text{A}) \times P(\text{B})$ $= 0,48 \times 0,28$ $= 0,1248$	✓ $0,48 \times 0,28$ ✓answer/*antwoord* (2)
9.1.2	$P(\text{A or B}) = P(\text{A}) + P(\text{B})$ $= 0,48 + 0,26$ $= 0,74$	✓substitution/*verv.* ✓answer/*antwoord* (2)
9.2.1	$10 + 6 + x + 5 = 29$ $x = 8$ $41 + 10 + 30 + 6 + 8 + 5 + 25 + y = 130$ $y = 5$	✓method/*metode* ✓value of/*wrde van x* ✓method/*metode* ✓value of/*wrde van y* (4)
9.2.2	$P(\text{no nut snack or no snack}) = \frac{41 + 10 + 30}{130} + \frac{5}{130}$ $= \frac{43}{65}$	✓41 + 10 + 3 ✓adding/*optel* 5 ✓answer/*antwoord* (3)
9.3.1	 (B ; B) (B ; C) (C ; B) (C ; C)	✓ branch at first level *tak by eerste vlak* ✓ branches at second level/*takke by tweede vlak* ✓outcomes/*uitkomste* ✓ probabilities /*moontlikhede* (4)

9.3.2	$P(BB) + P(CC) = (0,35 \times 0,3) + (0,65 \times 0,7)$ $= 0,56 = 56\%$ $0,56 \times 200 = 112$ clients/*kliënte*	✓ $(0,35 \times 0,3) + (0,65 \times 0,7)$ ✓probability/*moontlikhede* ✓ answer/*antwoord* (3)
9.3.3	Number of clients who chose different meals/*Getal kliënte wat verskillende maaltye gekies het* = 200 – 112 = 88 More clients preferred to make the same choice/*Meer kliënte verkies om dieselfde keuse te maak.*	✓ 88 ✓ conclusion/*gevolgtr.* (2) **[20]**

TOTAL/*TOTAAL*: 150