Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ NASIONALE SENIOR SERTIFIKAAT

GRADE/GRAAD 12

JUNE/JUNIE 2017

MATHEMATICS P1/WISKUNDE V1 MEMORANDUM

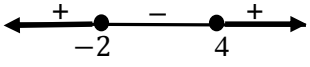
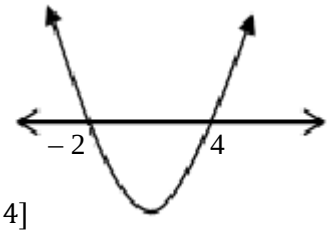
MARKS/PUNTE: 150

This memorandum consists of 14 pages./
Hierdie memorandum bestaan uit 14 bladsye.

NOTE/LET OP:

- 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 memorandum.
  Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die memorandum.
- 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	$x^2 - x - 30 = 0$ $(x + 5)(x - 6) = 0$ $x + 5 = 0$ or/of $x - 6 = 0$ $x = -5$ or/of $x = 6$	✓✓ factors / faktore ✓ x-values / waardes (3)
1.1.2	$3x^2 + x - 1 = 0$ $x = \frac{-(1) \pm \sqrt{(1)^2 - 4(3)(-1)}}{2(3)}$ $x = \frac{-1 \pm \sqrt{13}}{6}$ $\therefore x = 0,43 \quad or / of \quad x = -0,77$ Penalise 1 mark for incorrect rounding off./ Penaliseer 1 punt vir verkeerde afronding.	✓ substitution / vervanging ✓✓ x-values / waardes (3)
1.1.3	$x^2 \leq 2(x+4)$ $x^2 - 2x - 8 \leq 0$ $(x+2)(x-4) \leq 0$ + – +  -2 4  -2 4 $\therefore -2 \leq x \leq 4 \quad / \quad x \in [-2\,;4]$	✓ factors / faktore ✓ critical values with method kritieke waardes met metode ✓✓ answer (accuracy) / antwoord (akkuraatheid) (4)

1.1.4	$3x-5\sqrt{x}=2$ $3x-2=5\sqrt{x}$ $(3x-2)^2=\left(5\sqrt{x}\right)^2$ $9x^2-12x+4=25x$ $9x^2-37x+4=0$ $(9x-1)(x-4)=0$ $\therefore\ x=\frac{1}{9}\quad or/of\quad x=4$ *Check*: $3\left(\frac{1}{9}\right)-5\sqrt{\frac{1}{9}}=2$ $\qquad$ $3(4)-5\sqrt{4}=2$ $\frac{1}{3}-\frac{5}{3}=2$ $\qquad$ $12-10=2$ $-\frac{4}{3}\neq 2$ $\qquad$ $2=2$ $\therefore\ x=4$ *is the only solution.* **OR/OF** $3x-5\sqrt{x}=2$ $3x-5x^{\frac{1}{2}}-2=0$ $\left(3x^{\frac{1}{2}}+1\right)\left(x^{\frac{1}{2}}-2\right)=0$ $3x^{\frac{1}{2}}=-1\quad or/of\quad x^{\frac{1}{2}}=2$ $x^{\frac{1}{2}}=-\frac{1}{3}\quad or/of\quad x=4$ since $x^{\frac{1}{2}}$ must be >0 $x=4$ is the only valid answer	✓ isolating/isoleer $5\sqrt{x}$ ✓ squaring both sides / kwadreer albei kante ✓ standard form / standaardvorm ✓ answers / antwoorde ✓ testing and conclusion / toets en gevolgtrekking ✓ standard form / standaardvorm ✓✓ factors / faktore ✓ answers / antwoorde ✓ conclusion / gevolgtrekking (5)
1.2	$y-x-6=0$.....(1) $(x-3)^2+(y-3)^2=18$....(2) *from / vanaf* (1): $y=x+6$.....(3) (3) *in* (2): $(x-3)^2+(x+6-3)^2=18$ $x^2-6x+9+x^2+6x+9=18$ $2x^2=0$ $\therefore x=0$ $y=0+6$ $=6$	✓ substitution / vervanging ✓ removing brackets / verwyder hakies ✓ standard form / standaardvorm ✓ x-value / waarde ✓ y-value / waarde (5)

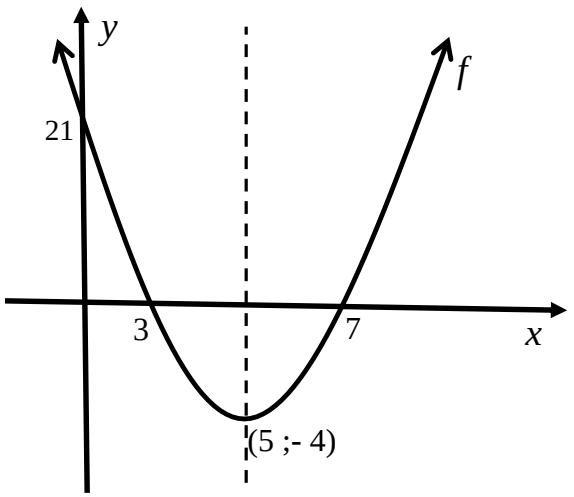
1.3	$1+\dfrac{1}{x+\dfrac{1}{x}}=\dfrac{7}{5}$ $\dfrac{1}{\dfrac{x^2+1}{x}}=\dfrac{2}{5}$ $\dfrac{x}{x^2+1}=\dfrac{2}{5}$ $2x^2+2=5x$ $2x^2-5x+2=0$ $(2x-1)(x-2)=0$ $x=\frac{1}{2}$ *or / of* $x=2$ If candidate after step 3 concludes x = 2, then max of (2/5) As kandidaat na stap 3 aflei dat x = 2 is, dan maks van (2/5)	✓ adding denominator / optel van noemer ✓ simplification / vereenvoudiging ✓ standard form / standaardvorm ✓ factors or formula / faktore of formule ✓ answers / antwoorde (5)
		[25]

QUESTION 2/*VRAAG 2*

2.1.1	1 ; 5 ; 12 ; 22 ; x ; y 4 7 10 - 1st differences 3 3 - 2nd differences $T_5 = 35$ and/en $T_6 = 51$	✓✓ answers / antwoorde (2)
2.1.2	$2a = 3$ $3a + b = 4$ $a + b + c = 1$ $a = \frac{3}{2}$ $3\left(\frac{3}{2}\right) + b = 4$ $\frac{3}{2} - \frac{1}{2} + c = 1$ $b = -\frac{1}{2}$ $c = 0$ $\therefore T_n = \frac{3}{2}n^2 - \frac{1}{2}n$	✓ $a = \frac{3}{2}$ ✓ $b = -\frac{11}{2}$ ✓ $c = 4$ ✓ answer / antwoord (4)
2.1.3	$\frac{3}{2}n^2 - \frac{1}{2}n = 3432$ $\frac{3}{2}n^2 - \frac{1}{2}n - 3432 = 0$ $3n^2 - n - 6864 = 0$ $(3n + 143)(n - 48) = 0$ $n = -\frac{143}{3}$ *or / of* $n = 48$	✓ equation / vergelyking ✓ standard form / standaardvorm ✓ factors or formula / faktore of formule ✓ answer $n = 48$ / antwoord $n = 48$ (4)
2.2.1	$T_2 - T_1 = T_3 - T_2$ $m + \sqrt{2} = 3\sqrt{2} - m$ $2m = 2\sqrt{2}$ $m = \sqrt{2}$ **OR/OF** $m = \frac{-\sqrt{2} + 3\sqrt{2}}{2}$ $m = \frac{2\sqrt{2}}{2}$ $m = \sqrt{2}$	✓ method / metode ✓ answer / antwoord ✓ method / metode ✓ answer / antwoord (2)
2.2.2	$T_{51} = a + 50d$ $= -\sqrt{2} + 50\left(2\sqrt{2}\right)$ $= 99\sqrt{2}$	✓ value of d / waarde van d ✓ substitution into correct formula / vervanging in korrekte formule ✓ answer / antwoord (3)

2.3	Terms between 50 and 500 divisible by 7 First term = 56 and Last term = 497 $56+(n-1)(7)=497$ $56+7n-7=497$ $7n=448$ $n=64$ *terms / terme* **OR/OF** $\left(\frac{497-56}{7}\right)+1$ $=64\,terms/terme$ **If /As: (500 – 50)/7 = 64,29 ∴ n = 64 max/maks. (1/3)**	✓ identification of first and last terms / vasstel van eerste en laaste terme ✓ substitution / vervanging ✓ answer / antwoord (3)
2.4.1	$a=2$ & $r=\frac{1}{3}$ *OR / OF* $\frac{2}{1}\ ;\ \frac{2}{3}\ ;\ \frac{2}{9}$ $T_n=2\left(\frac{1}{3}\right)^{n-1}$ $T_n=\frac{2}{3^{n-1}}$ $=2\left(\frac{1}{3}\right)^{n}\left(\frac{1}{3}\right)^{-1}$ $=\frac{2}{\left(3^n\right)\left(3^{-1}\right)}$ $=6\left(\frac{1}{3}\right)^{n}$ $=6.(3)^{-n}$ $=6\left(\frac{1}{3}\right)^{n}$	✓ method / metode ✓ substitution / vervanging ✓ answer / antwoord $=6\left(\frac{1}{3}\right)^{n}$ (3)
2.4.2	Yes, because $-1<r<1$ $-1<\frac{1}{3}<1$	✓ Yes ✓ reason (2)
2.4.3	$3^p=S_\infty-S_4$ $3^p=\frac{2}{1-\frac{1}{3}}-\frac{2\left(1-\left(\frac{1}{3}\right)^4\right)}{1-\frac{1}{3}}$ $3^p=3-\frac{80}{27}$ $3^p=\frac{81}{27}-\frac{80}{27}$ $3^p=\frac{1}{27}$ $3^p=3^{-3}$ $\therefore p=-3$	✓✓ substitution / vervanging ✓ simplification / vereenvoudiging ✓ exponential law / eksponensiële wet ✓ answer / antwoord (5)
2.5	$\sum_{k=1}^{6}\left(\sum_{n=1}^{k}1\right)=1+(1+1)+(1+1+1)+(1+1+1+1)+(1+1+1+1+1)+(1+1+1+1+1+1)$ $=1+2+3+4+5+6$ $=21$	✓ expansion / uitbreiding ✓ answer / antwoord (2)
		[30]

QUESTION 3/*VRAAG 3*

3.1.1	$x = 5$	✓ answer / antwoord (1)
3.1.2	$(x-5)^2 = 4$ $x-5 = \pm 2$ $x = 3$ or/of $x = 7$ **OR / OF** $x^2 - 10x + 25 = 4$ $x^2 - 10x + 21 = 0$ $(x-3)(x-7) = 0$ $x = 3$ or/of $x = 7$	✓ let / stel $y = 0$ ✓ square root / vierkantswortel ✓ answer / antwoord (3) ✓ let / stel $y = 0$ ✓ factors / faktore ✓ answers / antwoorde
3.1.3		✓ x-intercepts / x-afsnitte ✓ y-intercepts / y-afsnit ✓ turning point / draaipunt ✓ shape / vorm (4)
3.1.4	Range of $f: y \in [-4; \infty]$ or/of $y \geq -4$ $y \in R$	✓ answer / antwoord (1)
3.1.5	Reflection about the x-axis / Refleksie in die x-as $y = -(x-5)^2 + 4$	✓ answer / antwoord ✓ equation / vergelyking (2)

3.2	$x^2+3=kx-1$ $x^2-kx+4=0$ For $g(x)$ to be a tangent, roots are equal. $b^2-4ac=0$ $(-k)^2-4(1)(4)=0$ $k^2-16=0$ $k^2=16$ / $(k+4)(k-4)=0$ $k=\pm 4$ / $k=-4$ or/of $k=4$	✓ equating / gelykstel ✓ standard form / standaardvorm ✓ $\Delta=0$ ✓ substitution / vervanging ✓ answers / antwoord (5)
		[16]

QUESTION 4/*VRAAG 4*

4.1	$p=1$ and/en $q=2$	✓ value of p / waarde van p ✓ value of q / waarde van q (2)
4.2	$y=\frac{a}{(x+1)}+2$ $4=\frac{a}{0+1}+2$ $a=2$ $\therefore y=\frac{2}{(x+1)}+2$	✓ substitution of point / vervanging van punt ✓ value of a / waarde van a ✓ equation / vergelyking (3)
4.3	Point of intersection of axes of symmetry of f is (– 1 ; 2) Point of intersection of axes of symmetry of g is: $x-3=-x+1$ $2x=4$ $x=2$ $y=-1$ Transformation is from $(-1;2)\rightarrow(2;-1)$ $\therefore$ 3 units to the right and 3 units down	✓ point of intersection / snypunt ✓ equating / gelykstel ✓ x-value and y-value / x-waarde en y-waarde ✓method / metode ✓answer / antwoord (5)
		[10]

QUESTION 5/*VRAAG 5*

5.1	$\frac{5}{6} = a^1 + \frac{1}{2}$ $\therefore a = \frac{1}{3}$	✓ substitution / vervanging ✓ answer / antwoord (2)
5.2	$p = \left(\frac{1}{3}\right)^{-2} + \frac{1}{2} = 9\frac{1}{2}$	✓ substitution / vervanging ✓ answer / antwoord (2)
5.3	$g: y = \left(\frac{1}{3}\right)^{-x} + \frac{1}{2}$ $= 3^x + \frac{1}{2}$	✓ answer / antwoord (1)
5.4	$h(x) = 3^x$ $h^{-1}: y = \log_3 x$ or/of $\frac{\log x}{\log 3}$	✓ answer / antwoord h ✓ answer / antwoord h^{-1} (2)
5.5	Points : (-2 ; $9\frac{1}{2}$) and $\left(0\ ;\ \frac{3}{2}\right)$ $m = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{\frac{19}{2} - \frac{3}{2}}{-2 - 0}$ $= \frac{8}{-2}$ $= -4$	✓ coordinates of A / koördinate van A. ✓ substitution / vervanging ✓ answer / antwoord (3)
		[10]

QUESTION 6/*VRAAG 6*

6.1	$1+i_{eff}=\left(1+\frac{i_{nom}}{n}\right)^{n}$ $i_{eff}=\left(1+\frac{15}{1200}\right)^{12}-1$ $=0{,}1607545177$ $effective\ rate\ /\ effektiewe\ koers = 16{,}08\%\ p.a$	✓ formula / formule ✓ substitution / vervanging ✓ answer / antwoord (3)
6.2.1	$A=P(1+in)$ $=75\,000(1+12\%\times 8)$ $=R147\,000$ Monthly installment: $=\frac{R147\,000}{96\,months}$ $=R1531{,}25$	✓ substitution / vervanging ✓ answer / antwoord ✓ answer / antwoord (3)
6.2.2	$A=P(1+i)^{n}$ $147\,000=75\,000(1+i)^{8}$ $(1+i)^{8}=1{,}96$ $1+i=\sqrt[8]{1{,}96}$ $i=1{,}087757306-1$ $i=0{,}08775.....$ $rate\ /\ koers = 8{,}78\%$	✓ substitution / vervanging ✓ simplification / vereenvoudiging ✓ making i subject of the formula / maak i die onderwerp van die formule ✓ answer / antwoord (4)
6.3	$A=60\,000\left(1+\frac{0{,}07}{4}\right)^{6}\left(1+\frac{0{,}05}{12}\right)^{42}-5\,000\left(1+\frac{0{,}05}{12}\right)^{24}$ $\therefore\ =R73\,762{,}19$ OR/OF $A=\left[60\,000\left(1+\frac{0{,}07}{4}\right)^{6}\left(1+\frac{0{,}05}{12}\right)^{18}-5\,000\right]\left(1+\frac{0{,}05}{12}\right)^{24}$ $=R73\,762{,}19$	✓ ✓✓ setting up equation / opstel van vergelyking ✓ answer / antwoord (4)
		[14]

QUESTION 7/*VRAAG 7*

7.1	$f(x) = -2x^2$ $f(x+h) = -2(x+h)^2$ $= -2(x^2+2xh+h^2)$ $= -2x^2-4xh-2h^2$ $f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0}\frac{-2x^2-4xh-2h^2-(-2x^2)}{h}$ $= \lim_{h\to 0}\frac{-4xh-2h^2}{h}$ $= \lim_{h\to 0}\frac{h(-4x-2h)}{h}$ $= \lim_{h\to 0}(-4x-2h)$ $= -4x$ Answer ONLY: 0 marks SLEGS antwoord: 0 punte	✓ $-2x^2-4xh-2h^2$ Penalise 1 mark for incorrect use of formula. Must show $f'(x)$. Penaliseer 1 punt vir verkeerde gebruik van formule. Moet $f'(x)$ toon. ✓ substitution / vervanging ✓ common factor / gemene faktor ✓ answer / antwoord (4)
7.2.1	$y = 6x + 4x\sqrt{x}$ $y = 6x + 4x^{\frac{3}{2}}$ $\frac{dy}{dx} = 6 + 6x^{\frac{1}{2}}$	Penalise 1 mark for incorrect notation. Penaliseer 1 punt vir verkeerde notasie. ✓ $4x^{\frac{3}{2}}$ ✓ 6 ✓ $6x^{\frac{1}{2}}$ (3)
7.2.2	$\mathrm{D}_t\left[\frac{1-3t^2}{6t^2}\right]$ $= \mathrm{D}_t\left[\frac{1}{6t^2}-\frac{3t^2}{6t^2}\right]$ $= \mathrm{D}_t\left[\frac{1}{6}t^{-2}-\frac{1}{2}\right]$ $= -\frac{1}{3}t^{-3}$ / $-\frac{1}{3t^3}$	✓ $\frac{1}{6}t^{-2}-\frac{1}{2}$ ✓✓ answer / antwoord (3)
		[10]

QUESTION 8/*VRAAG 8*

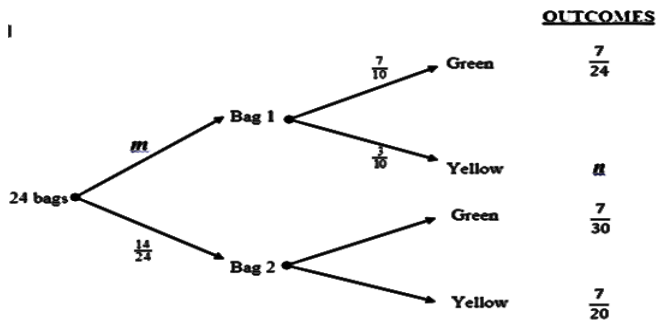
8.1	$y = 1(x-1)(x-1)(x-4)$ $= (x^2 - 2x + 1)(x-4)$ $= x^3 - 4x^2 - 2x^2 + 8x + x - 4$ $= x^3 - 6x^2 + 9x - 4$ $\therefore b = -6$ and $c = 9$ **OR/OF** $1 + b + c - 4 = 0$ $b + c = 3$.....(1) $64 + 16b + 4c - 4 = 0$ $16b + 4c = -60$.....(2) $(2) - (1) \times 4$: $16b + 4c = -60$ $4b + 4c = 12$ $\therefore \quad 12b = -72$ $b = -6$ $-6 + c = 3$ $\therefore c = 9$	✓ substitution / vervanging ✓ expanding / uitbreiding ✓ answer / antwoord ✓ both equations / albei vergelykings ✓ subtraction / aftrekking ✓ answers / antwoorde (3)
8.2	$f(x) = x^3 - 6x^2 + 9x - 4$ $f'(x) = 3x^2 - 12x + 9 = 0$ $(3x - 9)(x - 1) = 0$ $3x - 9 = 0 \ or/of \ x - 1 = 0$ $x = 3 \quad or/of \ x = 1$ $y = -4$ $B(3\,;-4)$	✓ $f'(x) = 0$ ✓ factors / faktore ✓ x-values / waardes ✓ coordinates of B / koördinate van B (4)
8.3	$x < 1 \ or/of \ x > 3$	✓ $x < 1$ ✓ $x > 3$ (2)

8.4	$f'(x) = 3x^2 - 12x + 9$ $f''(x) = 6x - 12 = 0$ $x = 2$ $y = -2$ Point of inflection/infleksie punt: (2 ; -2) equation of line / vergelyking van lyn: $y = x - 4$ $-2 = 2 - 4$ $-2 = -2$	✓ $f''(x) = 0$ ✓ coordinates / koördinate ✓ equation of line / vergelyking van lyn ✓ method / metode (4)
		[13]

QUESTION 9/*VRAAG 9*

9.1	height of Δ APQ = $(8 - y)$ $\frac{x}{10} = \frac{8-y}{8}$ $(\Delta \text{APQ} \text{ ||| } \Delta \text{ABC})$ $8x = 80 - 10y$ $10y = -8x + 80$ $y = -\frac{8}{10}x + 8$	✓ ratios / verhoudings ✓ answer / antwoord (2)
9.2	$A = l \times b$ $= x \times \left(-\frac{8}{10}x + 8\right)$ $= -\frac{8}{10}x^2 + 8x$ No mark for the answer / Geen punt vir die antwoord	✓ formula / formule ✓ substitution / vervanging (2)
9.3	$A(x) = 8x - \frac{8x^2}{10}$ $A'(x) = -\frac{16}{10}x + 8 = 0$ $x = -8 \times -\frac{10}{16}$ $x = 5\,cm$ $y = -\frac{8}{10}(5) + 8 = 4\,cm$ **OR** to get y / **OF** om vir y te kry $A = 8(5) - \frac{8(5)^2}{10}$ $= 20\,cm^2$ $\therefore y = 4\,cm$	✓ $A'(x)$ ✓ $= 0$ ✓ length of x / lenghte van x ✓ length of y / lengte van y (4)
		[8]

QUESTION 10/*VRAAG 10*

10.1.1	$\text{P(A or/of B)}' = 1 - \text{P(A or/of B)}$ $= 0,3$	✓ answer / antwoord (1)
10.1.2	$P(A \text{ or/of } B) = P(A) + P(B)$ $0,7 = 0,4 + k$ $\therefore k = 0,3$	✓ rule / reël ✓ answer / antwoord (2)
10.1.2	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$ $0,7 = 0,4 + k - P(A \cap B)$ $\therefore\ P(A \cap B) = k - 0,3$ $P(A \cap B) = P(A) \times P(B)$ $k - 0,3 = 0,4 \times k$ $0,6k = 0,3$ $\therefore\ k = 0,5$	✓ substitution in rule / vervanging in reël ✓ answer / antwoord ✓ substitution in rule / vervanging in reël ✓ answer / antwoord (4)
10.2		
10.2.1	$m = \frac{10}{24} / \frac{5}{12}$ and/en $n = \frac{30}{240} / \frac{3}{24} / \frac{1}{8}$	✓ answer ***m*** / antwoord ***m*** ✓ answer ***n*** / answer ***n*** (2)
10.2.2	$\frac{14}{24} \times \frac{9}{x+9} = \frac{7}{20}$ or/of $\frac{14}{24} \times \frac{x}{x+9} = \frac{7}{30}$ $\frac{126}{24x+216} = \frac{7}{20}$ or/of $\frac{14x}{24x+216} = \frac{7}{30}$ $168x + 1512 = 2520$ $420x = 168x + 1512$ $168x = 1008$ $252x = 1512$ $x = 6$ $x = 6$	✓ $\frac{9}{x+9} / \frac{x}{x+9}$ ✓ equation / vergelyking ✓ answer / antwoord (3)
10.2.3	$P(Green \backslash Groen) = \frac{7}{24} + \frac{7}{30}$ $= \frac{21}{40}$ (0,525)	✓ addition / optelling ✓ answer / antwoord (2)
		[14]
		TOTAL/TOTAAL: 150