Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ NASIONALE SENIOR SERTIFIKAAT

GRADE/GRAAD 12

JUNE/JUNIE 2016

MATHEMATICS P1/WISKUNDE V1 MEMORANDUM

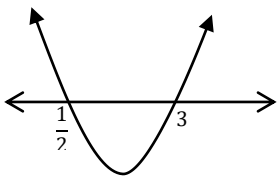
MARKS/PUNTE: 150

This memorandum consists of 12 pages./
Hierdie memorandum bestaan uit 12 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	$2x^2 - 7x = 0$ $x(2x - 7) = 0$ $x = 0$ or/of $2x - 7 = 0$ $x = \frac{7}{2}$	✓ factorisation / faktorisering ✓✓ x-values / waardes (3)
1.1.2	$4x + \frac{4}{x} + 11 = 0$ $4x^2 + 11x + 4 = 0$ $x = \frac{-11 \pm \sqrt{(11)^2 - 4(4)(4)}}{2(4)}$ $x = \frac{-11 \pm \sqrt{57}}{8}$ $x = -0{,}43$ or/of $x = -2{,}32$ Penalise 1 mark for incorrect rounding off./ Penaliseer 1 punt vir verkeerde afronding. If stopped at $\frac{-11 \pm \sqrt{57}}{8}$: max. 2 marks As stop by $\frac{-11 \pm \sqrt{57}}{8}$: maks. 2 punte	✓ standard form / standaardvorm ✓ substitution / vervanging ✓✓ x-values / waardes (4)
1.1.3	$(2x - 1)(x - 3) > 0$ + 0 − 0 + $\frac{1}{2}$ 3  $\therefore x < \frac{1}{2}$ or/of $x > 3$	✓ critical values with method kritieke waardes met metode ✓✓ answer / antwoord (3)
1.1.4	$3^x . 3^{x+1} = 27^x$ $3^{2x+1} = 3^{3x}$ $\therefore 2x + 1 = 3x$ $x = 1$	✓ 3^{2x+1} ✓ 3^{3x} ✓ equating / gelykstel ✓ answer / antwoord (4)

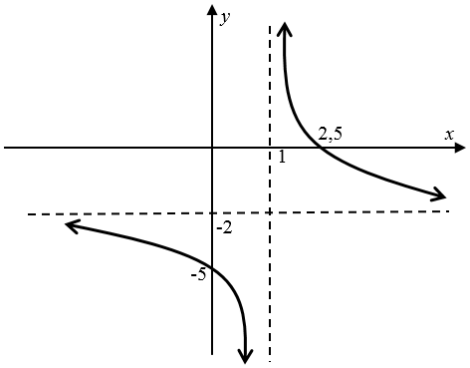
1.2	$3 + y = 2x$ $y = 2x - 3$ …….. (1) $4x^2 + y^2 = 2xy + 7$ $4x^2 + (2x - 3)^2 = 2x(2x - 3) + 7$ $4x^2 + 4x^2 - 12x + 9 = 4x^2 - 6x + 7$ $4x^2 + 4x^2 - 12x + 9 - 4x^2 + 6x - 7 = 0$ $4x^2 - 6x + 2 = 0$ $2x^2 - 3x + 1 = 0$ $(2x - 1)(x - 1) = 0$ $x = \frac{1}{2}$ or/of $x = 1$ $y = -2$ or/of $y = -1$ If formula is used, award factor's mark for substitution. As formule gebruik word, ken faktore punt toe vir substitusie.	✓ substitution / vervanging ✓ removing brackets / verwyder hakies ✓ standard form / standaardvorm ✓ factors / faktore ✓ x-values / waardes ✓ y-values / waardes (6)
1.3	$f(x) = (x - 2)(x^2 - 6x + 10)$ Consider the quadratic factor : $(x^2 - 6x + 10)$ $\Delta = b^2 - 4ac$ $= (-6)^2 - 4(1)(10)$ $= 36 - 40$ $= -4$ $\Rightarrow \Delta < 0$, therefor NO Solutions $x = 2$ is the only solution.	✓ substitution into delta / vervanging in delta ✓ answer / antwoord ✓ conclusion / gevolgtrekking (4)
		[23]

QUESTION 2/*VRAAG 2*

2.1.1	$0\ ;\ -1\ ;\ 1\ ;\ 6\ ;\ 14\ ;\ \ldots$ $-1 \quad 2 \quad 5 \quad 8$ - 1st differences $3 \quad 3 \quad 3$ - 2nd differences	✓ first differences / eerste verskille ✓ second differences / twee verskille (2)
2.1.2	Next term/volgende term = 25	✓ answer/antwoord (1)
2.1.3	$2a = 3 \qquad 3a + b = -1 \qquad a + b + c = 0$ $a = \frac{3}{2} \qquad 3\left(\frac{3}{2}\right) + b = -1 \qquad \frac{3}{2} - \frac{11}{2} + c = 0$ $b = -\frac{11}{2} \qquad c = 4$ $\therefore T_n = \frac{3}{2}n^2 - \frac{11}{2}n + 4$	✓ $a = \frac{3}{2}$ ✓ $b = -\frac{11}{2}$ ✓ $c = 4$ ✓ answer / antwoord (4)
2.1.4	$T_{30} = \frac{3}{2}(30)^2 - \frac{11}{2}(30) + 4$ $= 1189$	✓ substitution / vervanging ✓ answer / antwoord (2)
2.2.1	$T_3 - T_2 = T_4 - T_3$ $b - 13 = 27 - b$ $2b = 40$ $b = 20$ $13 - a = 7$ $a = 6$	✓ method / metode ✓ values of a and b / waardes van a en b (2)
2.2.2	$a + (n-1)d = T_n$ $6 + (n-1)(7) = 230$ $7n = 231$ $n = 33$	✓ formula / formule ✓ substitution / vervanging ✓ answer / antwoord (3)
2.3	$r = \frac{1-k}{5}$ $-1 < \frac{1-k}{5} < 1$ $-5 < 1 - k < 5$ $-6 < -k < 4$ $-4 < k < 6$	✓ $r = \frac{1-k}{5}$ ✓ substitution / vervanging ✓ answer / antwoord (3)
2.4.1	$S_n = \frac{a(1-r^n)}{1-r} + n.a$ $S_{40} = \frac{16\left(1 - \left(\frac{1}{2}\right)^{20}\right)}{1 - \frac{1}{2}} + 20(3)$ $= 31{,}99 + 60$ ≈ 92	✓ method / metode ✓ substitution / vervanging ✓ simplification / vereenvoudiging ✓ answer / antwoord (4)

2.4.2	$\sum_{k=1}^{\infty} 16\left(\frac{1}{2}\right)^{k-1}$	✓ $\sum_{k=1}^{\infty}$ ✓ $16\left(\frac{1}{2}\right)^{k-1}$ (2)
2.4.3	$S_\infty = \frac{a}{1-r}$ $= \frac{16}{1-\frac{1}{2}}$ $= 32$	✓ substitution / vervanging ✓ answer / antwoord (2)
		[25]

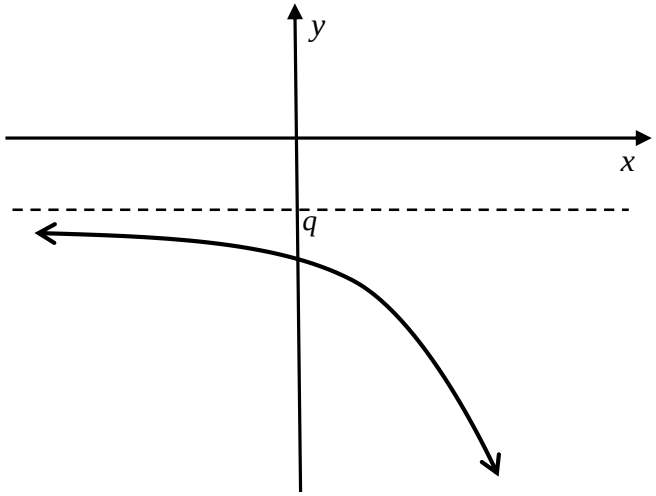
QUESTION 3/*VRAAG 3*

3.1.1	$y = -2$ (horizontal asymptote / horisontale asimptoot)	✓ answer / antwoord (1)
3.1.2	$x = 1$ (vertical asymptote / vertikale asimptoot)	✓ answer / antwoord (1)
3.2	$\frac{3}{x-1} - 2 = 0$ $\frac{3}{x-1} = 2$ $3 = 2x - 2$ $5 = 2x$ $x = \frac{5}{2}$ $y = \frac{3}{0-1} - 2$ $y = -5$	✓ $y = 0$ ✓ x – intercept / afsnit ✓ y – intercept / afsnit (3)
3.3		✓ asymptotes / asimptote ✓ x-and y-intercepts / x-en y-afsnitte ✓ shape / vorm (3)
3.4	(4 ; 5)	(2)
		[10]

QUESTION 4/*VRAAG 4*

4.1	$x = \frac{-b}{2a}$ $= \frac{-(-2)}{2(-1)}$ $= -1$ $y = -(-1)^2 - 2(-1) + 3$ $= -1 + 2 + 3$ $= 4$ $\quad C(-1\,;4)$	✓ *x*-coordinate / koördinaat ✓ *y*-coordinate / koördinaat ✓ coordinates of C / koördinate van C (3)
4.2	$-x^2 - 2x + 3 = 0$ $x^2 + 2x - 3 = 0$ $(x + 3)(x - 1) = 0$ $x + 3 = 0 \ \ or \ \ x - 1 = 0$ $x = -3 \ or \ x = 1$ $A(-3;0) \quad B(1;0)$	✓ standard form / standaardvorm ✓ factors / faktore ✓ both values / beide waardes (3)
4.3	$m = 2$ & $c = 6$ $y = 2x + 6$	✓ value of *m* / waarde van *m* ✓ value of *c* / waarde van *c* (2)
4.4	$CE^2 = (1)^2 + (2)^2$ $= 5$ $CE = \sqrt{5}$ **OR** C(-1 ; 4) and/en E(0 ; 6) $CE = \sqrt{(0+1)^2 + (6-4)^2}$ $= \sqrt{5}$	✓ method / metode ✓ substitution / vervanging ✓ answer / antwoord (3)
4.5	$x > 1$	✓✓ answer / antwoord (2)
		[13]

QUESTION 5/*VRAAG 5*

5.1.1	$f(x) = a^x$ $\frac{27}{8} = a^3$ $\left(\frac{3}{2}\right)^3 = a^3$ $\therefore a = \frac{3}{2}$	✓ substitution / vervanging ✓ answer / antwoord (2)
5.1.2	$y = \left(\frac{3}{2}\right)^x$ $x = \left(\frac{3}{2}\right)^y$ $y = log_{\frac{3}{2}}x$	✓ swop x and y / ruil x en y om ✓ answer / antwoord (2)
5.1.3	$log_{\frac{3}{2}}x = -1$ OR other method (eg. sketch) $x = \left(\frac{3}{2}\right)^{-1}$ $x = \frac{2}{3}$	✓ equating / gelykstel ✓ answer / antwoord (2)
5.1.4	$x \in \mathbf{R}$	✓ answer / antwoord (1)
5.2		✓ asymptote / asimptoot ✓ negative *y*-intercept / negatiewe *y*-afsnit ✓ shape / vorm (3)
		[10]

QUESTION 6/*VRAAG 6*

6.1.1	$1 + i_{eff} = \left(1 + \frac{i_{nom}}{n}\right)^n$ $i_{eff} = \left(1 + \frac{8,5}{400}\right)^4 - 1$ $= 0,0877$ $effective\ rate\ /\ effektiewe\ koers = 8,77\%\ p.a$	✓ formula / formule ✓ substitution / vervanging ✓ answer / antwoord (3)
6.1.2	$A = P(1+i)^n$ $= 12\,000\left(1 + \frac{8,5}{400}\right)^{20}$ $= R18\,273,54$	✓ formula / formule ✓ substitusie / vervanging ✓ answer / antwoord (3)
6.2	$A = P(1-i)^n$ $41\,611,57 = 120\,000\left(1 - \frac{12,4}{100}\right)^n$ $0,3467630833 = 0,876^n$ $n = \frac{\log(0,3467630833)}{\log(0,876)}$ $n \approx 8\ years$	✓ substitution / vervanging ✓ simplification / vereenvoudiging ✓ correct use of logs / korrekte gebruik van logs ✓ answer / antwoord (4)
6.3	$20\,000 = x\left(1 + \frac{8}{400}\right)^{12} + x\left(1 + \frac{8}{400}\right)^8 + x\left(1 + \frac{8}{400}\right)^4$ $20\,000 = x\left[\left(1 + \frac{8}{400}\right)^{12} + \left(1 + \frac{8}{400}\right)^8 + \left(1 + \frac{8}{400}\right)^4\right]$ $x = \frac{20\,000}{\left[\left(1 + \frac{8}{400}\right)^{12} + \left(1 + \frac{8}{400}\right)^8 + \left(1 + \frac{8}{400}\right)^4\right]}$ $x = R5\,678,05$	✓ ✓ setting up equation / opstel van vergelyking ✓ *x* the subject of the formula / *x* die onderwerp van die formule ✓ answer / antwoord (4)
		[14]

QUESTION 7/*VRAAG 7*

7.1	$f(x) = 2x^2 - 3x$ $f(x+h) = 2(x+h)^2 - 3(x+h)$ $= 2(x^2 + 2xh + h^2) - 3(x+h)$ $= 2x^2 + 4xh + 2h^2 - 3x - 3h$ $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h\to 0} \frac{2x^2 + 4xh + 2h^2 - 3x - 3h - (2x^2 - 3x)}{h}$ $= \lim_{h\to 0} \frac{2x^2 + 4xh + 2h^2 - 3x - 3h - 2x^2 + 3x}{h}$ $= \lim_{h\to 0} \frac{4xh + 2h^2 - 3h}{h}$ $= \lim_{h\to 0} \frac{h(4x + 2h - 3)}{h}$ $= \lim_{h\to 0} (4x + 2h - 3)$ $= 4x - 3$ Answer ONLY: 0 marks SLEGS antwoord: 0 punte	✓ substitute / vervang $(x+h)$ ✓ formula / formule Penalise 1 mark for incorrect use of formula. Must show $f'(x)$. Penaliseer 1 punt vir verkeerde gebruik van formule. Moet $f'(x)$ toon. ✓ simplification / vereenvoudiging ✓ common factor / gemene faktor ✓ answer / antwoord (5)
7.2	$y = 2\sqrt{x} - \frac{3x}{5x^2}$ $y = 2x^{\frac{1}{2}} - \frac{3}{5}x^{-1}$ $\frac{dy}{dx} = x^{-\frac{1}{2}} + \frac{3}{5}x^{-2}$ $= \frac{1}{\sqrt{x}} + \frac{3}{5x^2}$	Penalise 1 mark for incorrect notation. Penaliseer 1 punt vir verkeerde notasie. ✓ $2x^{\frac{1}{2}}$ ✓ $\frac{3}{5}x^{-1}$ ✓ $x^{-\frac{1}{2}}$ ✓ $\frac{3}{5}x^{-2}$ (4)
		[9]

QUESTION 8/*VRAAG 8*

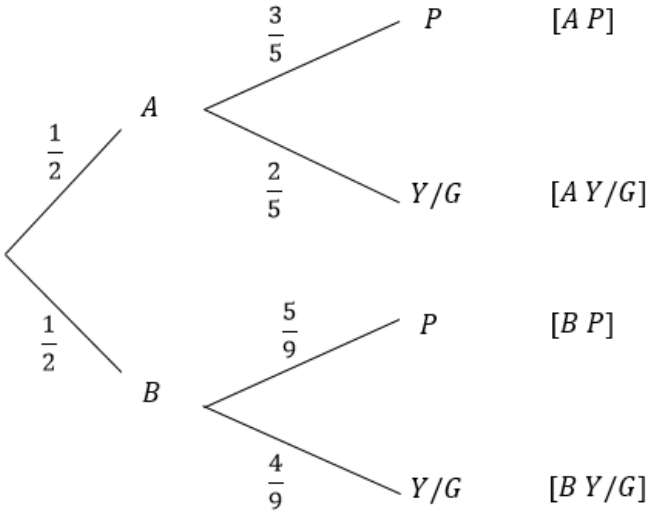
8.1.1	$f(x) = x^3 - 4x^2 - 11x + 20$ $f'(x) = 3x^2 - 8x - 11 = 0$ $(3x - 11)(x + 1) = 0$ $3x - 11 = 0 \ or \ x + 1 = 0$ $x = \frac{11}{3}(3{,}7) \quad or \quad x = -1$ $y = -\frac{400}{27}\ (-14{,}8) \ \ or \ \ y = 36$ $A(-1\,;36)$ & $B\left(\frac{11}{3}\,;\,-\frac{400}{27}\right)$ / (3,7 ; -14,8)	✓ $f'(x) = 0$ ✓ factors / faktore ✓ *x*-values / waardes ✓ *y*-values / waardes ✓ coordinates / koördinate (5)
8.1.2	$f''(x) = 6x - 8 = 0$ $6x = 8$ $x = \frac{8}{6}$ or/of $1\frac{1}{3}$ or/of $1,33$ OR $x = \frac{-1+\frac{11}{3}}{2}$ $= \frac{4}{3}$ or/of 1,33	✓ $f''(x) = 0$ ✓ answer / antwoord (2)
8.1.3	$m = f'(2) = 3(2)^2 - 8(2) - 11$ $= -15$ $f(2) = (2)^3 - 4(2)^2 - 11(2) + 30$ $= 0$ $y - y_1 = m(x - x_1)$ $y - 0 = -15(x - 2)$ $y = -15x + 30$	✓ $m = -15$ ✓ $f(2) = 0$ ✓ substitution / vervanging ✓ answer / antwoord (4)
8.1.4	36 units downwards 14,8 units upwards	✓ answer / antwoord ✓ answer / antwoord (2)
8.2.1	$m = -9$	✓ answer / antwoord (1)
8.2.2	$x = 1 \ or \ x = 5$	✓✓ answers / antwoorde (2)
8.2.3	$x < 1 \ or \ x > 5$	✓ $x < 1$ ✓ $x > 5$ (2)
		[18]

QUESTION 9/*VRAAG 9*

9.1	$V = x^2h$ $8 = x^2h$ $\therefore h = \frac{8}{x^2}$	✓ substitution / vervanging ✓ answer / antwoord (2)
9.2	$A = 2x^2 + 4xh$ $= 2x^2 + 4x\left(\frac{8}{x^2}\right)$ $= 2x^2 + \frac{32}{x}$ No mark for the answer / Geen punt vir die antwoord	✓ $2x^2$ ✓ $4xh$ ✓ substitution / vervanging (3)
9.3	$A(x) = 2x^2 + 32x^{-1}$ $A'(x) = 4x - 32x^{-2} = 0$ $4x^3 - 32 = 0$ $4x^3 = 32$ $x^3 = 8$ $= 2^3$ $\therefore x = 2$	✓ $A'(x) = 0$ ✓ standard form / standaardvorm ✓ exponential law / eksponent wet ✓ value of *x* / waarde van *x* ✓ dimensions / dimensies (5)
		[10]

QUESTION 10/*VRAAG 10*

10.1.1	$P(A \text{ and/en } B) = P(A) \times P(B)$ $= 0{,}4 \times 0{,}5$ $= 0{,}2$	✓ rule / reël ✓ answer / antwoord (2)
10.1.2	$P(A \text{ or/of } B) = P(A) + P(B) - P(A \text{ and/en } B)$ $= 0{,}4 + 0{,}5 - 0{,}2$ $= 0{,}7$	✓ rule / reël ✓ answer / antwoord (2)
10.1.3	$P(not\ A \text{ and/en } not\ B) = 1 - P(A \text{ or/of } B)$ $= 1 - 0{,}7$ $= 0{,}3$	✓ rule / reël ✓ answer / antwoord (2)

10.2.1		✓ first branch / eerste vertakking ✓ second branches / tweede vertakkings ✓ outcomes/uitkomste If probabilities not listed, maximum 1 mark / Indien waarskynlikhede nie gelys is nie, maksimum 1 punt (3)
10.2.2	$P(Yellow \text{ from } Bag\ A) \backslash P(Geel\ uit\ Sak\ A) = \frac{2}{5}$	✓ answer / antwoord (1)
10.2.3	$P(Pink \backslash Pienk) = \frac{3}{10} + \frac{5}{18}$ $= \frac{26}{45}$ (0,58)	✓ $\frac{3}{10}$ ✓ $\frac{5}{18}$ ✓ answer / antwoord (3)
10.3.1	$a = 288 - x$ $b = 372 - x$	✓ answer / antwoord ✓ answer / antwoord (2)
10.3.2	$288 - x + x + 372 - x + 56 = 600$ $-x = -116$ $x = 116$	✓ equation / vergelyking ✓ answer / antwoord (2)
10.3.3	No/Nee. P(A and/en B) ≠ 0	✓ answer / antwoord (1)
		[18]
		TOTAL/TOTAAL: 150