Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ NASIONALE SENIOR SERTIFIKAAT

GRADE/GRAAD 12

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MATHEMATICS P1/WISKUNDE V1 MEMORANDUM

MARKS/PUNTE: 150

This memorandum consists of 16 pages./
Hierdie memorandum bestaan uit 16 bladsye.

NOTE:

- If a candidate answered a question TWICE, mark the FIRST attempt ONLY.
- Consistent accuracy applies in ALL aspects of the memorandum.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
- The mark for substitution is awarded for substitution into the correct formula.

LET OP:

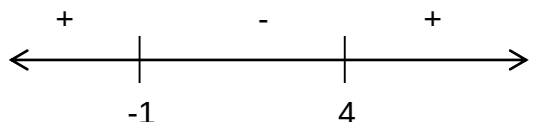
- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, merk SLEGS die EERSTE poging.*
- *Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die memorandum.*
- *Indien 'n kandidaat 'n poging vir 'n vraag deurgetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deurgetrek is.*
- *Die punt vir substitusie word vir substitusie in die korrekte formule toegeken.*

QUESTION 1/*VRAAG 1*

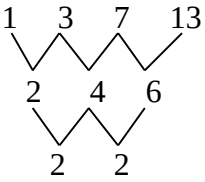
1.1.1	$x^2 - 4x - 12 = 0$ $(x - 6)(x + 2) = 0$ $x = 6$ or/of $x = -2$	✓ standard form/*standaard vorm* ✓ $x = 6$ (CA applies) ✓ $x = -2$ (CA applies) (3)
1.1.2	$3x^2 + 2x - 6 = 0$ $x = \frac{-(2) \pm \sqrt{(2)^2 - 4(3)(-6)}}{2(3)}$ $x = \frac{-2 \pm \sqrt{76}}{6}$ $x = -1{,}79$ or/*of* $x = 1{,}12$ Penalise 1 mark for incorrect rounding off. *Penaliseer 1 punt vir verkeerde afronding.*	✓ substitution/*substitusie* ✓ $x = -1{,}79$ ✓ $x = 1{,}12$ (3)
1.1.3	$3^{x^2-1} = \frac{27^{-x}}{3}$ $3^{x^2-1} = 3^{-3x-1}$ $\therefore x^2 - 1 = -3x - 1$ $x^2 + 3x = 0$ $x(x + 3) = 0$ $x = 0$ or/*of* $x = -3$ **OR/*OF*** $3^{x^2-1} = \frac{27^{-x}}{3}$ $3^{x^2-1}.3 = 27^{-x}$ $3^{x^2-1+1} = 3^{-3x}$ $\therefore x^2 = -3x$ $x^2 + 3x = 0$ $x(x + 3) = 0$ $x = 0$ or/ of $x = -3$	✓ 3^{-3x-1} ✓ equating exponents/ *gelykstelling van eksponente* ✓ factors/*faktore* ✓ both *x-values/beide x-waardes* ✓ $x^2 - 1 + 1 = -3x$ ✓ equating exponents/ *gelykstelling van eksponente* ✓ factors/*faktore* ✓ both *x*-values/*beide x-waardes.* (4)

1.2.1	$1+\frac{1}{x}=0$ $\frac{x+1}{x}=0$ $x=-1$ or/*of* $x=0$	✓ $x=-1$ ✓ $x=0$ (2)
1.2.2	$\frac{x-\frac{1}{x}}{1+\frac{1}{x}}=1$ $x-\frac{1}{x}=1+\frac{1}{x}$ $x^2-1=x+1$ $x^2-x-2=0$ $(x+1)(x-2)=0$ $x=-1$ or/*of* $x=2$ $x=2$ only/*alleenlik*	✓ manipulation of equation/ *manipulasie* van *vergelyking* ✓ standardform/*standaard vorm* ✓ factors/ *faktore* ✓ both *x*-values/*beide x-waardes* ✓ choosing $x=2$/*keuse van* $x=2$ (5) **[17]**

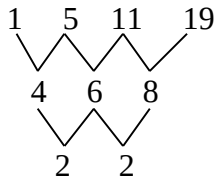
QUESTION 2/*VRAAG 2*

2.1	$x - y = 3$; $xy = 28$ $x - y = 3$ ... ... (1) $xy = 28$ ... ... (2) From/*vanaf* (1) $x = y + 3$ Substitute in (2)/*vervang in* (2) $y(y + 3) = 28$ $y^2 + 3y - 28 = 0$ $(y - 4)(y + 7) = 0$ $y = 4$ or / of $y = -7$ $x = 7$ or/*of* $x = -4$ **OR/*OF*** From/*vanaf* (1) $y = x - 3$ Substitute in (2)/*vervang in* (2) $x(x - 3) = 28$ $x^2 - 3x - 28 = 0$ $(x + 4)(x - 7) = 0$ $x = -4$ or / of $x = 7$ $y = -7$ or / of $y = 4$	✓ $x = y + 3$ ✓ substitute in (2)/*vervanging in (2)* ✓ standard form/*standaardvorm* ✓ factors/*faktore* ✓ *y*-values/*y-waardes* ✓ *x*-values/*x-waardes* ✓ $y = x - 3$ ✓ substitute in (2)/*vervanging in (2)* ✓ standard form/*standaardvorm* ✓ factors/*faktore* ✓ *x*-values/*x-waardes* ✓ *y*-values/*y-waardes* (6)
2.2	$x^2 \leq 4 + 3x$; $x > 0$ $x^2 - 3x - 4 \leq 0$ $(x + 1)(x - 4) \leq 0$  Solution/*Oplossing* $-1 \leq x \leq 4$ But/*maar* $x > 0$ $0 < x \leq 4$	✓ standard form/*standaardvorm* ✓ factors/f*aktore* ✓ solution/o*plossing* $-1 \leq x \leq 4$ ✓ final answer/*finale antwoord* $0 \leq x \leq 4$ (4) **[10]**

QUESTION 3/*VRAAG 3*

3.1	 $T_n = an^2 + bn + c$ $2a = 2$ $a = 1$ $3a + b = 2$ $3 + b = 2$ $b = -1$ $a + b + c = 1$ $1 - 1 + c = 1$ $c = 1$ $T_n = n^2 - n + 1$ **Row/*Ry* 80 Term 1** $T_{80} = 80^2 - 80 + 1$ $T_{80} = 6321$	✓ $a = 1$ ✓ $b = -1$ ✓ $c = 1$ ✓ $T_n = n^2 - n + 1$ ✓ 6321 (5)
3.2	**Row 80/*Ry* 80** **6321 6323 6325 6327 ...** $S_n = \frac{n}{2}[2(a) + (n-1)d]$ $S_{80} = \frac{80}{2}[2(6321) + (80-1)(2)]$ Row 80/*Ry* 80 $S_{80} = 512000$ **OR/*OF*** **Row/*Ry* 80 Term 80** $T_{80} = 6321 + (79 \times 2)$ $T_{80} = 6479$ $S_n = \frac{n}{2}[a + l]$ $S_{80} = \frac{80}{2}[6321 + 6479]$ Row 80/*Ry* 80 $S_{80} = 512000$	✓ $n = 80$ ✓ $d = 2$ ✓ sub into correct formula/ *vervang in korrekte formule* ✓ answer/*antwoord* (4) ✓ calculating term 80 of row 80/*bepaling van term 80 van ry 80* ✓ 6479 ✓ sub into correct formula/ *vervang in korrekte formule* ✓ answer/*antwoord* (4)

OR/*OF*



$2a = 2$
$a = 1$

$3a + b = 4$
$3 + b = 4$
$b = 1$

$a + b + c = 1$
$1 + 1 + c = 1$
$c = -1$

$$T_n = n^2 + n - 1$$

$T_n = n^2 + n - 1$
$T_{80} = 80^2 + 80 - 1$
$T_{80} = 6479$

$S_n = \frac{n}{2}[a + l]$
$S_{80} = \frac{80}{2}[6321 + 6479]$ Row 80/*Ry* 80
$S_{80} = 512000$

✓ $T_n = n^2 + n - 1$

✓ $T_{80} = 6479$

✓ sub into formula/*sub in korrekte formule*
✓ answer/*antwoord*

(4)
[9]

QUESTION 4/*VRAAG 4*

4.1.1	$T_{10} = S_{10} - S_9$ $T_{10} = 10(11)(12) - 9(10)(11)$ $T_{10} = 330$	✓ setting up of equation/ *opstel van vergelyking* ✓ substitution/*vervanging* ✓ answer/*antwoord* (3)
4.2	p ; $3p$; $5p$; ... ... $d = 2p$ $S_n = \frac{n}{2}[2a + (n-1)d]$ $S_p = \frac{p}{2}[2p + (p-1)2p]$ $S_p = \frac{p}{2}(2p + 2p^2 - 2p)$ $S_p = p^3$ **OR/*OF*** $a = p$ $l = 2p^2 - p$ $S_n = \frac{n}{2}[a + l]$ $S_p = \frac{p}{2}[p + 2p^2 - p]$ $S_p = p^3$	✓ first three terms/*eerste drie terme* ✓ $d = 2p$ ✓ substitution/*vervanging* ✓ answer/*antwoord* (4) ✓ $a = p$ ✓ $l = 2p^2 - p$ ✓ substitution/*vervanging* ✓ answer/*antwoord* (4) **[7]**

QUESTION 5/*VRAAG 5*

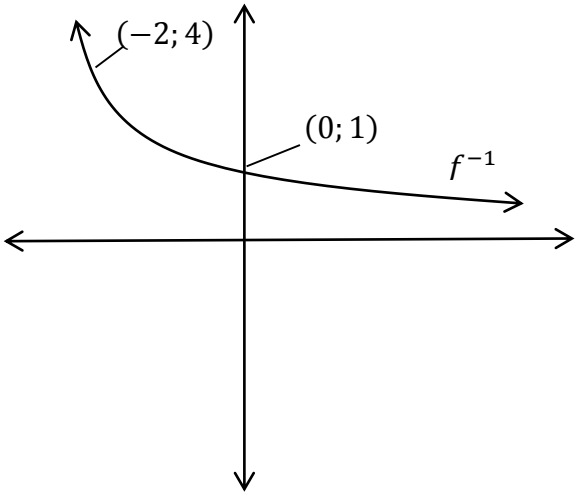
5.1	$r = \frac{x+2}{x}$ $T_3 = \frac{(x+2)^2}{x}$ Answer only/*antwoord alleenlik* $\frac{2}{2}$	✓ ratio/*verhouding* ✓ answer/*antwoord* (2)
5.2	$S_\infty = \frac{a}{1-r}$ $-8 = \frac{x}{1-\frac{(x+2)}{x}}$ $-8 = \frac{x^2}{x-x-2}$ $x^2 = 16$ $x = \pm 4$ -1 mark for (±) -1 *punt vir* (±)	✓ substitution/*vervanging* ✓ simplification/ *vereenvoudiging* ✓ $x^2 = 16$ ✓ both answers/*beide antwoorde* (4) **[6]**

QUESTION 6/*VRAAG 6*

6.1	$A = P(1-i)^n$ $A = 635000\left(1-\frac{15}{100}\right)^5$ $A = 281\,752{,}87$	✓ $i = \frac{15}{100}$ and/*en* $n = 5$ ✓ sub into correct formula/ *vervanging in korrekte formule* ✓ answer/*antwoord* (3)
6.2.1	$P_v = \frac{x[1-(1+i)^{-n}]}{i}$ $50000 = \frac{x\left[1-\left(1+\frac{16.75}{1200}\right)^{-48}\right]}{\frac{16.75}{1200}}$ $x = R\ 1\,436{,}29$	✓ $i = \frac{16.75}{1200}$ ✓ $n = -48$ ✓ sub into correct formula/ *vervanging in korrekte formule* ✓ answer/*antwoord* (4)
6.2.2	$P_v = \frac{x[1-(1+i)^{-n}]}{i}$ $P_v = \frac{1436.29\left[1-\left(1+\frac{16.75}{1200}\right)^{-18}\right]}{\frac{16.75}{1200}}$ $P_v = R22\,721{,}97704$ $P_v = R22\,722$ **OR/*OF*** Outstanding balance/*Uitstaande balans* (OB) OB $= 50000\left(1+\frac{16.75}{1200}\right)^{30} - \left[\frac{1436.29\left[\left(1+\frac{16.75}{1200}\right)^{30}-1\right]}{\frac{16.75}{1200}}\right]$ OB = R 22722,14 OB $= R22722$	✓ $n = -18$ ✓ $i = \frac{16{,}75}{1200}$ ✓ substitution/*substitusie* ✓ answer/*antwoord* ✓ rounding/*afronding* (5) ✓ $n = 30$ ✓ $i = \frac{16{,}75}{1200}$ ✓ sub into both formulae/ *vervang in beide formules* ✓ answer/antwoord ✓ rounding/afronding (5)
6.3	$A = P(1+i)^n$ $A = 2x$ and/en $P = x$ $2x = x\left(1+\frac{14.75}{100}\right)^n$ $n = \frac{\log 2}{\log\left(1+\frac{14.75}{100}\right)}$ $n = 5.04\ years/jare$	✓ $A = 2x$ and/en $P = x$ ✓ sub into correct formula/ *vervanging in korrekte formule* ✓ using of logs/*gebruik van logaritmes* ✓ answer/*antwoord* (4) **[16]**

QUESTION 7/*VRAAG 7*

7.1.1	$x = 0$	✓ answer/*antwoord* (1)
7.1.2	$x > -2 \quad ; \quad x \neq 0$	✓ $x > -2$ ✓ $x \neq 0$ (2)
7.1.3	$y = -4$	✓ answer/*antwoord* (1)
7.1.4	$y = b^x - 4$ $5 = b^2 - 4$ $b^2 = 9$ $b = \pm 3$ $y = 3^x - 4$	✓ sub of/*van* -4 ✓ sub of point (2;5)/ *vervanging van punt* (2;5) ✓ $b = \pm 3$ ✓ answer with correct *b* value/ *antwoord met korrekte b waarde* (4)
7.1.5	$x = -2$ $y = -1$	✓ $x = -2$ ✓ $y = -1$ (2)
7.1.6	$y = \frac{a}{x+2} - 1$ $-3 = \frac{a}{0+2} - 1$ $a = -4$ $y = \frac{-4}{x+2} - 1$	✓ sub of asymptotes/ *vervanging van asimptote* ✓ sub of point/*vervanging van punt* (0;-3) ✓ $a = -4$ (3)
7.1.7	$y = x + 2 - 1$ $\boldsymbol{y = x + 1}$ $y = -(x + 2) - 1$ $\boldsymbol{y = -x - 3}$	✓ $y = x + 1$ ✓ $y = -(x + 2) - 1$ ✓ $y = -x - 3$ (3)

7.2.1	$y = \log_{\frac{1}{2}} x$ $f^{-1} : x = \log_{\frac{1}{2}} y$ $y = \left(\frac{1}{2}\right)^x$ **OR/*OF*** $y = 2^{-x}$	✓ swopping of *x* and *y* / *omruiling van* ***x*** *en* ***y*** ✓ answer/*antwoord* (2)
7.2.2		✓ Shape/*vorm* ✓ y-intercept/*y-afsnit* ✓ any other correct point/ *enige ander korrekte punt* (3)
7.2.3	$g(x) = \left(\frac{1}{2}\right)^{-x}$ **OR/*OF*** $g(x) = 2^x$	✓✓ Answer/*antwoord* ✓✓ Answer/*antwoord* (2)
7.2.4	$x > 1$	✓ ✓ $x > 1$ (2) **[25]**

QUESTION 8/*VRAAG 8*

8.1	$x = -3$	✓ $x = -3$ (1)
8.2	$y = a(x+3)^2 - 5$ $4 = a(9) - 5$ $9a = 9$ $a = 1$ $y = x^2 + 6x + 9 - 5$ $y = x^2 + 6x + 4$ $a = 1$ and/*en* $b = 6$	✓ sub of turning point $(-3; 5)$/*substitusie van draaipunt* $(-3; 5)$ ✓ sub of $(0; 4)$/ *vervanging van* $(0; 4)$ ✓ simplification/ *vereenvoudiging* (3)
8.3	$\Delta = b^2 - 4ac$ $\Delta = 36 - 4(1)(4)$ $\Delta = 20$ *Roots are Irrational and Unequal* / *Wortels is Irrasionaal en ongelyk*	✓ $\Delta = 20$ ✓ irrational/*irrasionaal* ✓ unequal/*ongelyk* (3)
8.4	$g(x) = 2x$ $x^2 + 6x + 4 = 2x$ $x^2 + 4x + 4 = 0$ $(x+2)^2 = 0$ $x = -2$ $g(-2) = -4$ Point/*punt* $(-2; -4)$ **OR/*OF*** $f(x) = x^2 + 6x + 4$ $f'(x) = 2x + 6$ and/*en* $m = 2$ $2x + 6 = 2$ $2x = -4$ $x = -2$ $y = -4$ Point/*punt* $(-2; -4)$	✓ $g(x) = 2x$ ✓ equating equations/ *gelykstelling van vergelykings* ✓ $x = -2$ ✓ $y = -4$ ✓ derivative/*afgeleide* $f'(x) = 2x + 6$ ✓ equating to gradient of *g*/ *gelykstelling aan gradiënt van g.* ✓ *x*-value/*x-waarde* ✓ *y*-value/*y-waarde* (4) **[11]**

QUESTION 9/*VRAAG 9*

9.1	$f(x) = 3x^2 - 1$ $f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0}\frac{3(x+h)^2 - 1 - (3x^2-1)}{h}$ $= \lim_{h\to 0}\frac{3(x^2+2xh+h^2) - 1 - 3x^2 + 1}{h}$ $= \lim_{h\to 0}\frac{3x^2+6xh+3h^2 - 1 - 3x^2 + 1}{h}$ $= \lim_{h\to 0}\frac{6xh}{h}$ $= 6x$ Answer ONLY: 0 marks *SLEGS antwoord: 0 punte* Penalise 1 mark for incorrect use of formula. Must show $f'(x)$. *Penaliseer 1 punt vir verkeerde gebruik van formule. Moet $f'(x)$ toon.*	✓ formula/*formule* ✓ substitution of/*substitusie van* $(x+h)$ ✓ simplification/*vereenvoudiging* $3x^2+6xh+3h^2-1-3x^2+1$ ✓ $= \lim_{h\to 0}\frac{6xh}{h}$ ✓ answer/*antwoord* (5)
9.2.1	$y = 5x^2 + \sqrt{x}$ $y = 5x^2 + x^{\frac{1}{2}}$ $\frac{dy}{dx} = 10x + \frac{1}{2}x^{-\frac{1}{2}}$ Penalise 1 mark for incorrect notation. *Penaliseer 1 punt vir verkeerde notasie.*	✓ $x^{\frac{1}{2}}$ ✓ $10x$ ✓$\frac{1}{2}x^{-\frac{1}{2}}$ (3)
9.2.2	$D_x\left[\frac{6x-4}{3x}\right]$ $D_x\left[\frac{6x}{3x} - \frac{4}{3x}\right]$ $D_x\left[2 - \frac{4}{3}x^{-1}\right]$ $= \frac{4}{3}x^{-2}$ or/*of* $\frac{4}{3x^2}$	✓ 2 ✓ $-\frac{4}{3}x^{-1}$ ✓ answer/*antwoord* (3)
9.2.3	$m = s'(t) = 3t^2$ $t^2 \geq 0$ $3t^2 \geq 0$ ∴ no value of t will make $s'(t)$ negative. ∴ *geen waarde van* t *sal* $s'(t)$ *negatief maak nie.*	✓ derivative/*afgeleide* ✓ $3t^2 \geq 0$ (2) **[13]**

QUESTION 10/*VRAAG 10*

10.1	$f(x) = x^3 - x^2 - 8x + 12$ $(x-2)(x^2+x-6) = 0$ $(x-2)(x-2)(x+3) = 0$ $x = 2$ or/*of* $x = 2$ or/*of* $x = -3$ $A(-3;0)$ **OR/*OF*** $x^2 - 4x + 4 \overline{)\ x^3 - x^2 - 8x + 12}$ $\quad x + 3$ $x^3 - 4x^2 + 4x$ $3x^2 - 12x + 12$ $3x^2 - 12x + 12$ $f(x) = (x^2 - 4x + 4)(x + 3)$ $A(-3;0)$	✓ $(x-2)$ ✓(x^2+x-6) ✓ $(x-2)(x+3)(x-2)$ ✓ coordinates of $A\ (-3;0)$/ *koördinate van* $A\ (-3;0)$ ✓ $x^2 - 4x + 4$ ✓✓ $x + 3$ ✓ coordinates of $A\ (-3;0)$/ *koördinate van* $A\ (-3;0)$ (4)
10.2	$f'(x) = 3x^2 - 2x - 8 = 0$ $(3x+4)(x-2) = 0$ $x = \frac{-4}{3}$ or/*of* $x = 2$ $f\left(-\frac{4}{3}\right) = \left(-\frac{4}{3}\right)^3 - \left(-\frac{4}{3}\right)^2 - 8\left(-\frac{4}{3}\right) + 12$ B $\left(\frac{-4}{3}; \frac{500}{27}\right)$	✓ $f'(x)$ ✓$f'(x) = 0$ ✓ factors/*faktore* ✓ correct x value/*korrekte* x *waarde* $x = -\frac{4}{3}$ ✓ $y = \frac{500}{27}$ (5)
10.3	$f''(x) = 6x - 2$ $6x - 2 = 0$ $x = \frac{1}{3}$ **OR/*OF*** $x = \frac{-\frac{4}{3}+2}{2}$ $x = \frac{1}{3}$	✓ $f''(x) = 6x - 2$ ✓ $x = \frac{1}{3}$ (2) ✓ finding x value of midpoint/ *bepaal van x waarde van middelpunt* ✓ $x = \frac{1}{3}$ (2)
10.4	$x < -\frac{4}{3}$ or/*of* $x > 2$	✓$x < -\frac{4}{3}$ ✓ $x > 2$ (2)
10.5	$y = k\ ; k < 0$ Only **one** Real Root/*Net **een** reële wortel*	✓ answer/*antwoord* (2) **[15]**

QUESTION 11/*VRAAG 11*

11.1	$D(0) = 3 + \frac{1}{2}(0)^2 - \frac{1}{4}(0)^3$ $D(0) = 3\,m$	✓ $D(0) = 3\,m$ (1)
11.2	$D'(t) = t - \frac{3}{4}t^2$ $D'(3) = 3 - \frac{3}{4}(3)^2$ $= 3 - \frac{27}{4}$ $= -\frac{15}{4}$ m/h / m/u	✓ $D'(t)$ ✓ $D'(3)$ ✓ $-\frac{15}{4}$ or/*of* -3.75 (3)
11.3	Decreasing/*vemindering*	✓ decreasing/*vermindering* (1)
11.4	$D'(t) = 0$ $t - \frac{3}{4}t^2 = 0$ $4t - 3t^2 = 0$ $t(4 - 3t) = 0$ $t = 0$ or/*of* $t = \frac{4}{3}$ $\frac{4}{3} = 1h20min$ Time: at 08h00 or 9h20 / *Tyd*: 08h00 *of* 9h20	✓ $D'(t) = 0$ ✓ factors/*faktore* ✓ $t - values\ /\ t - waardes$ ✓ answer/*antwoord* (4) **[9]**

QUESTION 12/*VRAAG 12*

12.1	12.1.1	$P(A') = 1 - P(A)$ $= 1 - 0,35$ $= 0,65$	✓ $P(A') = 1 - P(A)$ ✓ answer/*antwoord* (2)
	12.1.2	$P(A \text{ and } B) = 0$ $P(A \text{ en } B) = 0$	✓ answer/*antwoord* (1)
	12.1.3	$P(A \text{ or\of } B) = 0,35 + 0,52$ $= 0,87$	✓ $P(A \text{ or } B) = P(A) + P(B)$ ✓ answer/*antwoord* (2)
12.2	12.2.1	6! = 720	✓ 6! or/of 720 (1)
	12.2.2	4! $= 24$	✓ 4! ✓ 24 (2)
	12.2.3	$\frac{2!.5!}{6!} = \frac{240}{720} = \frac{1}{3}$ ***OR/OF*** 0,333	✓ 2! ✓ 5! ✓ 6! ✓ answer/*antwoord* (4) **[12]**
			TOTAL/*TOTAAL*: 150