



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 12

JUNE/JUNIE 2018

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

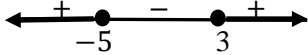
MARKS/PUNTE: 150

This marking guideline consists of 15 pages./
Hierdie nasienriglyn bestaan uit 15 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	$(x - 2)(3x - 1) = 0$ $x - 2 = 0$ or/of $3x - 1 = 0$ $x = 2$ or/of $x = \frac{1}{3}$	$\checkmark\checkmark$ x-values / waardes (2)
1.1.2	$2x^2 + 3x - 7 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(3) \pm \sqrt{(3)^2 - 4(2)(-7)}}{2(2)}$ $x = \frac{-3 \pm \sqrt{65}}{4}$ $\therefore x = 1,27$ or / of $x = -2,77$	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> Penalise 1 mark for incorrect rounding off./ <i>Penaliseer 1 punt vir verkeerde afronding.</i> </div> \checkmark substitution / vervanging $\checkmark\checkmark$ x-values / waardes (3)
1.1.3	$-x^2 - 2x + 15 < 0$ $x^2 + 2x - 15 > 0$ $(x + 5)(x - 3) > 0$  $\therefore x < -5$ or / of $x > 3$	\checkmark factors / faktore \checkmark critical values with method/ <i>kritieke waardes met metode</i> $\checkmark\checkmark$ answer (accuracy) / <i>antwoord (akkuraatheid)</i> (4)

<p>1.1.4</p>	$\frac{3^{x+1} - 3^x}{3^{x-1}} = 2\left(\frac{1}{9}\right)^{x-1}$ $\frac{3^x(3-1)}{3^x\left(\frac{1}{3}\right)} = 2(3^{-2})^{x-1}$ $6 = 2 \times 3^{-2x+2}$ $3^{-2x+2} = 3^1$ $-2x + 2 = 1$ $-2x = -1$ $x = \frac{1}{2}$	<ul style="list-style-type: none"> ✓ simplifying LHS / vereenvoudiging LK ✓ simplifying RHS / vereenvoudiging RK ✓ same base / dieselfde basis ✓ equating exponents / gelykstel van eksponente ✓ answer / antwoord <p style="text-align: right;">(5)</p>
<p>1.2</p>	<p>$x - 3y = 1 \dots\dots\dots(1)$</p> <p>$y^2 + 2xy - x^2 = -7 \dots\dots(2)$</p> <p><i>from / vanaf</i> (1): $x = 3y + 1 \dots\dots(3)$</p> <p>(3) in (2): $y^2 + 2y(3y + 1) - (3y + 1)^2 = -7$</p> $y^2 + 6y^2 + 2y - 9y^2 - 6y - 1 + 7 = 0$ $-2y^2 - 4y + 6 = 0$ $y^2 + 2y - 3 = 0$ $(y + 3)(y - 1) = 0$ $y = -3 \text{ or / of } y = 1$ $x = -8 \text{ or / of } x = 4$	<ul style="list-style-type: none"> ✓ x subject of the formula / x onderwerp van die formule ✓ substitution / vervanging ✓ removing brackets / verwyder hakies ✓ standard form / standaardvorm ✓ y-values / waardes ✓ x-values / waardes <p style="text-align: right;">(6)</p>

1.3	<p><i>For equal roots / Vir gelyke wortels :</i></p> $n^2 + 4mn = 0$ $n(n + 4m) = 0$ $\therefore n = 0 \text{ or / of } n = -4m$ $n = 0 \Rightarrow x = \frac{0 \pm \sqrt{(0)^2 - 4m(0)}}{2m}$ $x = 0$ $n = -4m \Rightarrow x = \frac{(-4m) \pm \sqrt{(-4m)^2 + 4m(-4m)}}{2m}$ $x = -2$	<p>✓ $\Delta = 0$</p> <p>✓ both n-values / beide n-waardes</p> <p>✓ substitution / vervanging</p> <p>✓ $x = 0$</p> <p>✓ $x = -2$</p> <p style="text-align: right;">(5)</p>
[25]		

QUESTION 2/VRAAG 2

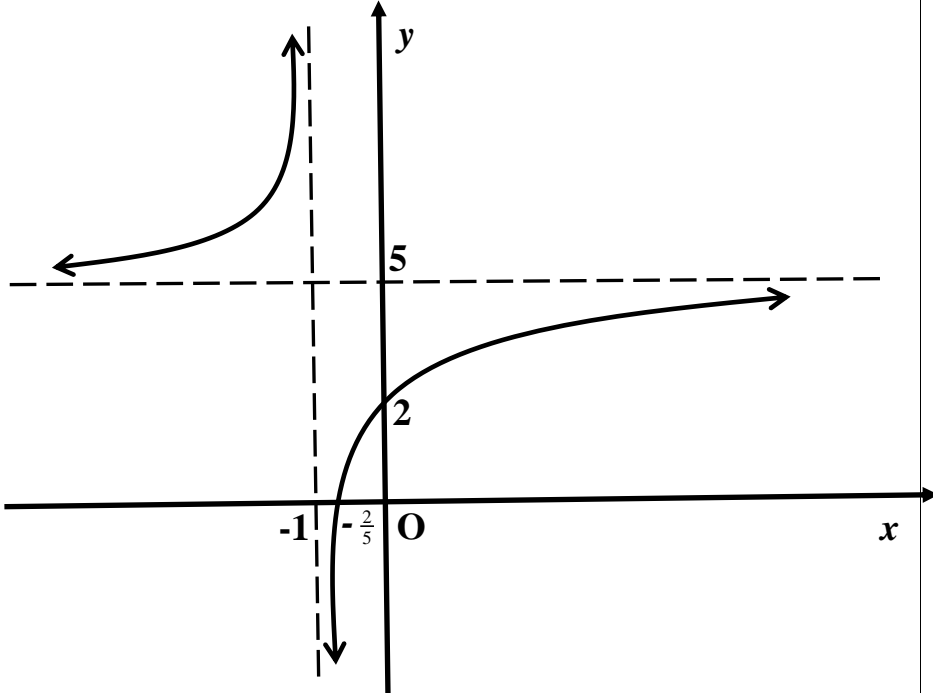
2.1.1	$15 \quad ; \quad 10 \quad ; \quad 7 \quad ; \quad x \quad ; \quad 7$ $\begin{array}{cccc} -5 & -3 & (x-7) & (7-x) \\ 2 & (x-4) & (-2x+14) & \end{array}$ <p>- 1st differences/1^{ste} verskille - 2nd differences/2^{de} verskille</p> $x-4=2 \quad \text{or / of} \quad -2x+14=x-4$ $x=6 \quad \text{or / of} \quad -3x=-18$ $x=6$	<p>✓ 2nd differences / 2^{de} verskille</p> <p>✓ equating / gelyk stel</p> <p>✓ answer / antwoord</p> <p>(3)</p>
2.1.2	$2a = 2 \quad 3a + b = -5 \quad a + b + c = 1$ $a = 1 \quad 3(1) + b = -5 \quad 1 - 8 + c = 15$ $b = -8 \quad c = 22$ $\therefore T_n = n^2 - 8n + 22$	<p>✓ $a = 1$</p> <p>✓ $b = -8$</p> <p>✓ $c = 22$</p> <p>✓ answer / antwoord</p> <p>(4)</p>
2.1.3	$T_{50} = (50)^2 - 8(50) + 22$ $= 2122$	<p>✓ substitution / vervanging</p> <p>✓ answer / antwoord</p> <p>(2)</p>
2.2.1	$a + 14d = 74$ $a + 6d = 34$ $\therefore 8d = 40$ $d = 5$	<p>✓ setting up 2 equations / opstel van 2 vergelykings</p> <p>✓ method / metode</p> <p>✓ answer / antwoord</p> <p>(3)</p>
2.2.2	$a + 6(5) = 34$ $a = 4$ $S_{40} = \frac{40}{2} [2(4) + (40-1)(5)]$ $= 4060$	<p>✓ value of a / waarde van a</p> <p>✓ substitution into correct formula / vervanging in korrekte formule</p> <p>✓ answer / antwoord</p> <p>(3)</p>
2.2.3	$\sum_{n=1}^{40} (5n-1)$	<p>✓✓ answer / antwoord (accuracy as one unit)</p> <p>(2)</p>

2.3.1	$T_k = \frac{3^k}{15}$ $= \frac{3^k}{5 \times 3}$ $= \frac{1}{5} \times 3^{k-1}$	<p>✓ factors of 15 / <i>faktore van 15</i></p> <p>✓ answer / <i>antwoord</i></p> <p>(2)</p>
2.3.2	$S_n = \frac{a(r^n - 1)}{r - 1}$ $24 \frac{1}{5} = \frac{\frac{1}{5}(3^n - 1)}{3 - 1}$ $48 \frac{2}{5} = \frac{1}{5}(3^n - 1)$ $242 = 3^n - 1$ $243 = 3^n$ $3^5 = 3^n$ $\therefore n = 5$	<p>✓ <i>a</i> and/en <i>r</i></p> <p>✓ substitution into correct formula / <i>vervanging in korrekte formule</i></p> <p>✓ exponential equation / <i>eksponensiële vergelyking</i></p> <p>✓ answer / <i>antwoord</i></p> <p>(4)</p>
2.3.3	<p>NO / NEE.</p> <p>$r = 3 > 1$</p> <p><i>r</i> not in the interval $-1 < r < 1, r \neq 0$ (<i>nie in die interval</i>)</p>	<p>✓ NO / NEE</p> <p>✓ reason / <i>rede</i></p> <p>(2)</p>
2.4	<p>$P = 9^{\frac{1}{3}} \times 9^{\frac{1}{9}} \times 9^{\frac{1}{27}} \times \dots$ to infinity / tot oneindigend</p> <p>$= 9^{\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots}$ to infinity / tot oneindigend</p> $S_\infty = \frac{a}{1 - r}$ $= \frac{\frac{1}{3}}{1 - \frac{1}{3}}$ $= \frac{1}{2}$ <p>$\therefore P = 9^{\frac{1}{2}}$</p> $= \sqrt{9}$ $= 3$	<p>✓ adding exponents / <i>optel van eksponente</i></p> <p>✓ sum to infinity / <i>Som tot oneindigend</i></p> <p>✓ answer / <i>antwoord</i></p> <p>✓ $P = 9^{\frac{1}{2}} / \sqrt{9}$</p> <p>(4)</p>
		[29]

QUESTION 3/VRAAG 3

3.1.1	$P(2;4)$ $Q(0;1)$	✓ coordinates of P / <i>koördinate van P</i> ✓ coordinates of Q / <i>koördinate van Q</i> (2)
3.1.2	$y = a(x-2)^2 + 4$ $1 = a(0-2)^2 + 4$ $-3 = 4a$ $\therefore a = -\frac{3}{4}$ $y = b^x$ $4 = b^2$ $\therefore b = 2$	✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> ✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> (4)
3.1.3	$x \geq 2 / x \leq 2$	✓✓ answer / <i>antwoord</i> (2)
3.1.4	$h(x) = 2^{f(x)}$ is a maximum when $f(x)$ is a maximum <i>(is 'n maksimum wanneer $f(x)$ 'n maksimum is)</i> max value of $f(x) = 4$ / <i>maks. waarde van $f(x) = 4$</i> \therefore max of $h(x) = 2^4 = 16$ / <i>maks van $h(x) = 2^4 = 16$</i>	✓ max. value of $f(x)$ / <i>maks. waarde van $f(x)$</i> ✓ answer / <i>antwoord</i> (2)
3.2.1	$y \geq 1, y \in R$ OR/OF $y \in (1; \infty)$	✓ answer / <i>antwoord</i> (1)
3.2.2	$p(x) = x^2 + 1$ / $r(x) = x^2 + 2x$ $p(x+1) - 2 = (x+1)^2 + 1 - 2$ $= x^2 + 2x + 1 + 1 - 2$ $= x^2 + 2x$ <i>Shift 1 unit to the left and 2 units down</i> <i>Skui 1 eenheid na links en 2 eenhede af</i> OR/OF Turning Point of $p(x)$ / <i>Draaipunt van $p(x) = (0 ; 1)$</i> Turning Point of $r(x)$ / <i>Draaipunt van $r(x) = (-1 ; -1)$</i> \therefore Shift 1 unit to the left and 2 units down / <i>Skui 1 eenheid na links en 2 eenhede af</i>	✓ calculation / <i>berekening</i> ✓ 1 unit to the left / <i>1 eenheid na links</i> ✓ 2 units down / <i>2 eenhede af</i> (3)
		[14]

QUESTION 4/VRAAG 4

4.1	$y = \frac{-3}{0+1} + 5$ $= 2$	✓ y-intercept / y-afsnit (1)
4.2	$\frac{-3}{x+1} + 5 = 0$ $\frac{-3}{x+1} = -5$ $-5x - 5 = -3$ $-5x = 2$ $x = -\frac{2}{5}$	✓ simplification / vereenvoudiging ✓ answer / antwoord (2)
4.3		✓ asymptotes / asimptote ✓ x- and y-intercepts x- en y-afsnitte ✓ shape / vorm (3)
4.4	$f(x) = \frac{-3}{x+1} + 5$ $f(x-3) = \frac{-3}{(x-3)+1} + 5$ $= \frac{-3}{x-2} + 5$ $f(x) = \frac{3}{x-2} - 5$	✓ substitution / vervanging ✓ simplification / vereenvoudiging ✓ reflection / refleksie (3)

[9]

QUESTION 5/VRAAG 5

5.1	$f(x) = \log_3 x$ $x = \log_3 y$ $f^{-1}(x) = 3^x$	✓ interchanging x and y / <i>omruil van x en y</i> ✓ answer / <i>antwoord</i> (2)
5.2	f^{-1} is a reflection of f in the line $y = x$ / f^{-1} is 'n <i>refleksie van f in die lyn $y = x$</i>	✓✓ answer / <i>antwoord</i> (2)
5.3	$y = \log_3 x$ $-2 = \log_3 k$ $\therefore k = 3^{-2}$ $= \frac{1}{9}$	✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> (2)
5.4	$0 < x < \frac{1}{9}$ OR / OF $\log_3 x < -2$ and / en $x > 0$ $x < \frac{1}{9}$ and / en $x > 0$ $0 < x < \frac{1}{9}$	✓✓ answer / <i>antwoord</i> (2)
5.5	$x \geq 1$	✓✓ answer / <i>antwoord</i> (2)
[10]		

QUESTION 6/VRAAG 6

6.1	$1 + i_{eff} = \left(1 + \frac{i_{nom}}{n}\right)^n$ $i_{eff} = \left(1 + \frac{23}{1200}\right)^{12} - 1$ $= 0,2558637702$ <p>effective rate / <i>effektiewe koers</i> = 25,59% p.a</p>	<p>✓ formula / <i>formule</i></p> <p>✓ substitution / <i>vervanging</i></p> <p>✓ answer / <i>antwoord</i> (3)</p>
6.2	$P = \frac{A}{(1+i)^n}$ $= \frac{15768,39}{\left(1 + \frac{4,38}{400}\right)^{40}}$ $= R10\,200,00$	<p>✓ <i>i</i> and/en <i>n</i></p> <p>✓ substitution / <i>vervanging</i></p> <p>✓ answer / <i>antwoord</i> (3)</p>
6.3.1	$n = \frac{\log\left[\frac{A}{P}\right]}{\log(1-i)}$ $n = \frac{\log\left[\frac{50710,00}{200000,00}\right]}{\log\left(1 - \frac{24}{100}\right)}$ <p><i>n</i> = 5 years</p>	<p>✓ <i>A</i> and/en <i>P</i></p> <p>✓ substitution / <i>vervanging</i></p> <p>✓ making <i>n</i> subject of the formula / <i>maak n die onderwerp van die formule</i></p> <p>✓ answer / <i>antwoord</i> (4)</p>
6.3.2	$A = P(1+i)^n$ $= 200000\left(1 + \frac{18}{100}\right)^5$ $= R457\,551,55$	<p>✓ substitution / <i>vervanging</i></p> <p>✓ answer / <i>antwoord</i> (2)</p>
6.3.3	<p>Amount/<i>Bedrag</i> = R457 551,55 – R50 710.00 = R406 841,55</p>	<p>✓ answer / <i>antwoord</i> (1)</p>
[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	$f(x) = 1 - 3x^2$ $f(x + h) = 1 - 3(x + h)^2$ $= 1 - 3(x^2 + 2xh + h^2)$ $= 1 - 3x^2 - 6xh - 3h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{1 - 3x^2 - 6xh - 3h^2 - (1 - 3x^2)}{h}$ $= \lim_{h \rightarrow 0} \frac{-6xh - 3h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-6x - 3h)}{h}$ $= \lim_{h \rightarrow 0} (-6x - 3h)$ $= -6x$	<p>✓ $1 - 3x^2 - 6xh - 3h^2$</p> <p>✓ substitution / <i>vervang</i></p> <p>✓ common factor / <i>gemene faktor</i></p> <p>✓ answer / <i>antwoord</i></p> <p style="text-align: right;">(4)</p>
7.2	$y = \left(\sqrt{x} - \frac{1}{\sqrt{x}} \right)^2$ $y = x + 2 + \frac{1}{x}$ $y = x + 2 + x^{-1}$ $\frac{dy}{dx} = 1 - x^{-2}$	<p>✓ $y = x + 2 + x^{-1}$</p> <p>✓ 1 ✓ $-x^{-2}$</p> <p style="text-align: right;">(3)</p>
7.3	$y = 3x^2 - 2x + 1$ $y' = 6x - 2$ $6x - 2 = 4$ $6x = 6$ $x = 1$ $y = 2 \quad (1; 2)$	<p>✓ $y' = 6x - 2$</p> <p>✓ $6x - 2 = 4$</p> <p>✓ <i>x</i>-coordinate / <i>x</i>-<i>koördinaat</i></p> <p>✓ answer / <i>antwoord</i></p> <p style="text-align: right;">(4)</p>
[11]		

Answer ONLY: 0 marks /
SLEGS antwoord: 0 punte

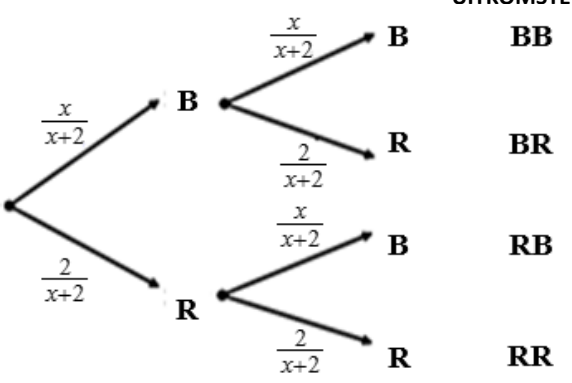
QUESTION 8/VRAAG 8

8.1.1	$f(x) = a(x+2)\left(x - \frac{2}{3}\right)(x-3)$ $-16 = a(2+2)\left(2 - \frac{2}{3}\right)(2-3)$ $-16 = -\frac{16}{3}a$ $a = 3$ $f(x) = 3(x+2)\left(x - \frac{2}{3}\right)(x-3)$ $= 3\left(x - \frac{2}{3}\right)(x^2 - x - 6)$ $= 3\left(x^3 - x^2 - 6x - \frac{2}{3}x^2 + \frac{2}{3}x + 4\right)$ $= 3x^3 - 5x^2 - 16x + 12$	<ul style="list-style-type: none"> ✓ substitution of x-coordinates / <i>vervanging van x-koördinate</i> ✓ substitution of point / <i>vervanging van punt</i> ✓ value of a / <i>waarde van a</i> ✓ substitution / <i>vervanging</i> ✓ removing brackets / <i>verwyder hakies</i> <p style="text-align: right;">(5)</p>
8.1.2	$f(x) = 3x^3 - 5x^2 - 16x + 12$ $f'(x) = 9x^2 - 10x - 16 = 0$ $(9x + 8)(x - 2) = 0$ $9x + 8 = 0 \text{ or/of } x - 2 = 0$ $x = -\frac{8}{9} \text{ or/of } x = 2$ $y = \frac{4900}{243} (20,16)$ $B\left(-\frac{8}{9}; 20,16\right)$	<ul style="list-style-type: none"> ✓ $f'(x) = 0$ ✓ factors / <i>faktore</i> ✓ x-values / <i>waardes</i> ✓ coordinates of P / <i>koördinate van P</i> <p style="text-align: right;">(4)</p>
8.1.3	<p>The graph shows a cubic function on a Cartesian coordinate system. The x-axis is labeled with intercepts at -2, $\frac{2}{3}$, and 3. The y-axis is labeled with an intercept at 12. The curve has a local maximum at point P with coordinates $\left(-\frac{8}{9}; 20.16\right)$ and a local minimum at point Q with coordinates $(2; -16)$.</p>	<ul style="list-style-type: none"> ✓ x-intercepts / <i>x-afsnitte</i> ✓ y-intercept / <i>y-afsnit</i> ✓ turning pts / <i>draaipunte</i> ✓ shape / <i>vorm</i> <p style="text-align: right;">(4)</p>

QUESTION 9/VRAAG 9

9.1	$EF = a - 2x$ $\frac{DE}{BE} = \tan 60^\circ$ $DE = x \tan 60^\circ$ $= \sqrt{3}x$ $\text{Area} = l \times b$ $= \sqrt{3}x \times (a - 2x)$ $= \sqrt{3}ax - 2\sqrt{3}x^2$	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> No mark for the answer / Geen punt vir die antwoord </div>	<ul style="list-style-type: none"> ✓ $EF = (a - 2x)$ ✓ <i>tan ratio / tan verhouding</i> ✓ <i>answer / antwoord</i> ✓ <i>substitution / vervanging</i> <p style="text-align: right;">(4)</p>
9.2	$A(x) = \sqrt{3}ax - 2\sqrt{3}x^2$ $A'(x) = \sqrt{3}a - 4\sqrt{3}x = 0$ $x = \frac{-\sqrt{3}a}{-4\sqrt{3}}$ $x = \frac{a}{4}$ $\text{Area} = \sqrt{3}a \left(\frac{a}{4} \right) - 2\sqrt{3} \left(\frac{a}{4} \right)^2$ $= \frac{\sqrt{3}}{4} a^2 - \frac{\sqrt{3}}{8} a^2$ $= \frac{\sqrt{3}}{8} a^2$		<ul style="list-style-type: none"> ✓ <i>derivative / afgeleide</i> ✓ $f'(x) = 0$ ✓ <i>answer / antwoord</i> ✓ <i>substitution / vervanging</i> ✓ <i>answer / antwoord</i> <p style="text-align: right;">(5)</p>
[9]			

QUESTION 10/VRAAG 10

10.1.1	$P(F \text{ and } S) = \frac{67}{236} / 0,28$	✓ answer / <i>antwoord</i> (1)
10.1.2	$P(M) \times P(\text{not } S)$ $= \frac{120}{236} \times \frac{100}{236}$ $= 0,22$ $P(M \cap \text{not } S) = \frac{51}{236}$ $= 0,22$ $\therefore P(M) \times P(\text{not } S) = P(M \cap \text{not } S)$ $\Rightarrow \text{events are independent /}$ $\text{gebeurtenisse is onafhanklik}$	✓ $P(M) \times P(\text{not } S)$ ✓ answer / <i>antwoord</i> ✓ answer / <i>antwoord</i> ✓ conclusion / <i>gevolgtrekking</i> (4)
10.2.1	 <p style="text-align: right;">OUTCOMES UITKOMSTE</p> <p style="text-align: right;">BB BR RB RR</p>	✓ 1 st branch / 1 ^{ste} <i>tak</i> ✓ 2 nd branch / 2 ^{de} <i>tak</i> ✓ outcomes / <i>uitkomst</i> (3)
10.2.2	$\left(\frac{x}{x+2} \times \frac{2}{x+2}\right) + \left(\frac{2}{x+2} \times \frac{x}{x+2}\right) = 0,375$ $\left(\frac{2x}{(x+2)^2}\right) + \left(\frac{2x}{(x+2)^2}\right) = \frac{3}{8}$ $\frac{4x}{(x+2)^2} = \frac{3}{8}$ $3x^2 + 12x + 12 = 32x$ $3x^2 - 20x + 12 = 0$ $(3x - 2)(x - 6) = 0$ $x = \frac{2}{3} \text{ or / of } x = 6$	✓ setting up equation / <i>opstel van vergelyking</i> ✓ standard form / <i>standaardvorm</i> ✓ answer / <i>antwoord</i> (3)
[11]		
TOTAL/TOTAAL: 150		