



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**

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This memorandum consists of 12 pages./  
Hierdie memorandum bestaan uit 12 bladsye.

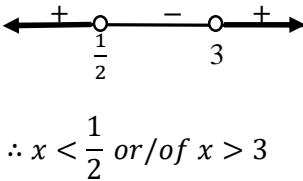
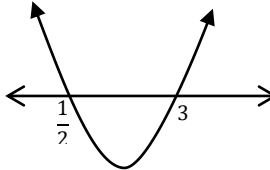
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## NOTE/LET OP:

- 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	$2x^2 - 7x = 0$ $x(2x - 7) = 0$ $x = 0 \text{ or/of } 2x - 7 = 0$ $x = \frac{7}{2}$	✓ factorisation / faktorisering ✓✓ x-values / waardes	(3)
1.1.2	$4x + \frac{4}{x} + 11 = 0$ $4x^2 + 11x + 4 = 0$ $x = \frac{-11 \pm \sqrt{(11)^2 - 4(4)(4)}}{2(4)}$ $x = \frac{-11 \pm \sqrt{57}}{8}$ $x = -0,43 \text{ or/of } x = -2,32$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">           Penalise 1 mark for incorrect rounding off./            Penaliseer 1 punt vir verkeerde afronding.         </div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">           If stopped at <math>\frac{-11 \pm \sqrt{57}}{8}</math> : max. 2 marks            As stop by <math>\frac{-11 \pm \sqrt{57}}{8}</math> : maks. 2 punte         </div>	✓ standard form / standaardvorm  ✓ substitution / vervanging  ✓✓ x-values / waardes	(4)
1.1.3	$(2x - 1)(x - 3) > 0$   $\therefore x < \frac{1}{2} \text{ or/of } x > 3$	✓ critical values with method kritieke waardes met metode  ✓✓ answer / antwoord	(3)
1.1.4	$3^x \cdot 3^{x+1} = 27^x$ $3^{2x+1} = 3^{3x}$ $\therefore 2x + 1 = 3x$ $x = 1$	✓ $3^{2x+1}$ ✓ $3^{3x}$ ✓ equating / gelykstel ✓ answer / antwoord	(4)

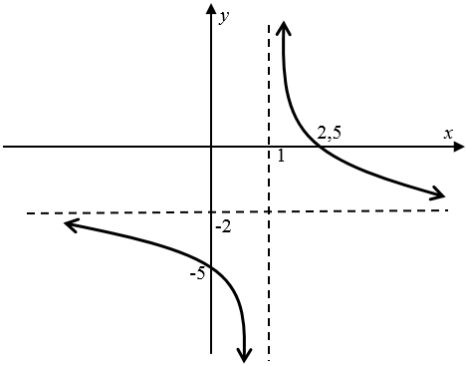
<p>1.2</p>	<p> <math>3 + y = 2x</math>  <math>y = 2x - 3 \dots\dots\dots (1)</math>   <math>4x^2 + y^2 = 2xy + 7</math>  <math>4x^2 + (2x - 3)^2 = 2x(2x - 3) + 7</math>  <math>4x^2 + 4x^2 - 12x + 9 = 4x^2 - 6x + 7</math>  <math>4x^2 + 4x^2 - 12x + 9 - 4x^2 + 6x - 7 = 0</math>  <math>4x^2 - 6x + 2 = 0</math>  <math>2x^2 - 3x + 1 = 0</math>  <math>(2x - 1)(x - 1) = 0</math>  <math>x = \frac{1}{2}</math> or/of <math>x = 1</math>  <math>y = -2</math> or/of <math>y = -1</math> </p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>If formula is used, award factor's mark for substitution. As formule gebruik word, ken faktore punt toe vir substitusie.</p> </div>	<ul style="list-style-type: none"> <li>✓ substitution / vervanging</li> <li>✓ removing brackets / verwyder hakies</li> <li>✓ standard form / standaardvorm</li> <li>✓ factors / faktore</li> <li>✓ x-values / waardes</li> <li>✓ y-values / waardes</li> </ul> <p style="text-align: right;">(6)</p>
<p>1.3</p>	<p> <math>f(x) = (x - 2)(x^2 - 6x + 10)</math>                       Consider the quadratic factor : <math>(x^2 - 6x + 10)</math>  <math>\Delta = b^2 - 4ac</math>  <math>= (-6)^2 - 4(1)(10)</math>  <math>= 36 - 40</math>  <math>= -4</math>  <math>\Rightarrow \Delta &lt; 0</math>, therefor NO Solutions  <math>x = 2</math> is the only solution.                 </p>	<ul style="list-style-type: none"> <li>✓ substitution into delta / vervanging in delta</li> <li>✓ answer / antwoord</li> <li>✓ conclusion / gevolgtrekking</li> </ul> <p style="text-align: right;">(4)</p>
<b>[23]</b>		

## QUESTION 2/VRAAG 2

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

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

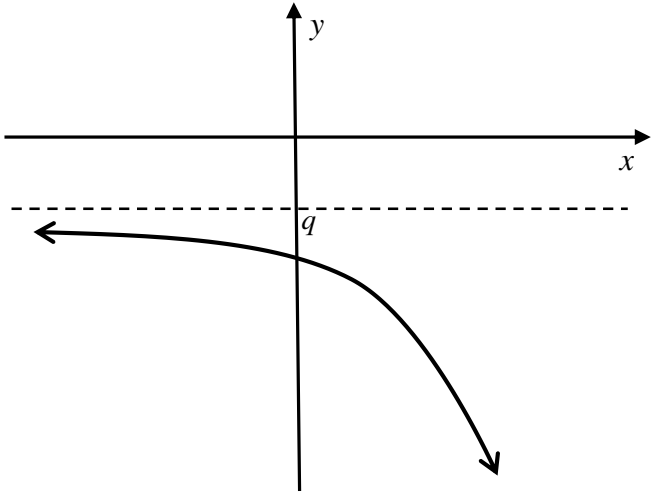
**QUESTION 3/VRAAG 3**

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

## QUESTION 4/VRAAG 4

4.1	$x = \frac{-b}{2a}$ $= \frac{-(-2)}{2(-1)}$ $= -1$ $y = -(-1)^2 - 2(-1) + 3$ $= -1 + 2 + 3$ $= 4$ $C(-1; 4)$	<ul style="list-style-type: none"> <li>✓ <i>x</i>-coordinate / koördinaat</li> <li>✓ <i>y</i>-coordinate / koördinaat</li> <li>✓ coordinates of C / koördinate van C</li> </ul> <p style="text-align: right;">(3)</p>
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 $x = 1$ $A(-3; 0)$ $B(1; 0)$	<ul style="list-style-type: none"> <li>✓ standard form / standaardvorm</li> <li>✓ factors / faktore</li> <li>✓ both values / beide waardes</li> </ul> <p style="text-align: right;">(3)</p>
4.3	$m = 2$ & $c = 6$ $y = 2x + 6$	<ul style="list-style-type: none"> <li>✓ value of <i>m</i> / waarde van <i>m</i></li> <li>✓ value of <i>c</i> / waarde van <i>c</i></li> </ul> <p style="text-align: right;">(2)</p>
4.4	$CE^2 = (1)^2 + (2)^2$ $= 5$ $CE = \sqrt{5}$ <b>OR</b> $C(-1; 4)$ and/en $E(0; 6)$ $CE = \sqrt{(0 + 1)^2 + (6 - 4)^2}$ $= \sqrt{5}$	<ul style="list-style-type: none"> <li>✓ method / metode</li> <li>✓ substitution / vervanging</li> <li>✓ answer / antwoord</li> </ul> <p style="text-align: right;">(3)</p>
4.5	$x > 1$	<ul style="list-style-type: none"> <li>✓✓ answer / antwoord</li> </ul> <p style="text-align: right;">(2)</p>
		<b>[13]</b>

QUESTION 5/VRAAG 5

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



## QUESTION 6/VRAAG 6

6.1.1	$1 + i_{eff} = \left(1 + \frac{i_{nom}}{n}\right)^n$ $i_{eff} = \left(1 + \frac{8,5}{400}\right)^4 - 1$ $= 0,0877$ <p><i>effective rate / effektiewe koers = 8,77% p.a</i></p>	<ul style="list-style-type: none"> <li>✓ formula / formule</li> <li>✓ substitution / vervanging</li> <li>✓ answer / antwoord (3)</li> </ul>
6.1.2	$A = P(1 + i)^n$ $= 12\,000 \left(1 + \frac{8,5}{400}\right)^{20}$ $= R18\,273,54$	<ul style="list-style-type: none"> <li>✓ formula / formule</li> <li>✓ substitusie / vervanging</li> <li>✓ answer / antwoord (3)</li> </ul>
6.2	$A = P(1 - i)^n$ $41\,611,57 = 120\,000 \left(1 - \frac{12,4}{100}\right)^n$ $0,3467630833 = 0,876^n$ $n = \frac{\log(0,3467630833)}{\log(0,876)}$ $n \approx 8 \text{ years}$	<ul style="list-style-type: none"> <li>✓ substitution / vervanging</li> <li>✓ simplification / vereenvoudiging</li> <li>✓ correct use of logs / korrekte gebruik van logs</li> <li>✓ answer / antwoord (4)</li> </ul>
6.3	$20\,000 = x \left(1 + \frac{8}{400}\right)^{12} + x \left(1 + \frac{8}{400}\right)^8 + x \left(1 + \frac{8}{400}\right)^4$ $20\,000 = x \left[ \left(1 + \frac{8}{400}\right)^{12} + \left(1 + \frac{8}{400}\right)^8 + \left(1 + \frac{8}{400}\right)^4 \right]$ $x = \frac{20\,000}{\left[ \left(1 + \frac{8}{400}\right)^{12} + \left(1 + \frac{8}{400}\right)^8 + \left(1 + \frac{8}{400}\right)^4 \right]}$ $x = R5\,678,05$	<ul style="list-style-type: none"> <li>✓ ✓ setting up equation / opstel van vergelyking</li> <li>✓ <math>x</math> the subject of the formula / <math>x</math> die onderwerp van die formule</li> <li>✓ answer / antwoord (4)</li> </ul>
		<b>[14]</b>

QUESTION 7/VRAAG 7

<p>7.1</p>	$f(x) = 2x^2 - 3x$ $f(x + h) = 2(x + h)^2 - 3(x + h)$ $= 2(x^2 + 2xh + h^2) - 3(x + h)$ $= 2x^2 + 4xh + 2h^2 - 3x - 3h$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x + h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{2x^2 + 4xh + 2h^2 - 3x - 3h - (2x^2 - 3x)}{h}$ $= \lim_{h \rightarrow 0} \frac{2x^2 + 4xh + 2h^2 - 3x - 3h - 2x^2 + 3x}{h}$ $= \lim_{h \rightarrow 0} \frac{4xh + 2h^2 - 3h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(4x + 2h - 3)}{h}$ $= \lim_{h \rightarrow 0} (4x + 2h - 3)$ $= 4x - 3$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-left: auto; margin-right: auto;">                 Answer ONLY: 0 marks                  SLEGS antwoord: 0 punte             </div>	<ul style="list-style-type: none"> <li>✓ substitute / vervang <math>(x + h)</math></li>   <li>✓ formula / formule</li> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;">                     Penalise 1 mark for incorrect use of formula. Must show <math>f'(x)</math>.                      Penaliseer 1 punt vir verkeerde gebruik van formule. Moet <math>f'(x)</math> toon.                 </div> <li>✓ simplification / vereenvoudiging</li>   <li>✓ common factor / gemene faktor</li>   <li>✓ answer / antwoord</li> </ul> <p style="text-align: right;">(5)</p>
<p>7.2</p>	$y = 2\sqrt{x} - \frac{3x}{5x^2}$ $y = 2x^{\frac{1}{2}} - \frac{3}{5}x^{-1}$ $\frac{dy}{dx} = x^{-\frac{1}{2}} + \frac{3}{5}x^{-2}$ $= \frac{1}{\sqrt{x}} + \frac{3}{5x^2}$	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">                 Penalise 1 mark for incorrect notation.                  Penaliseer 1 punt vir verkeerde notasie.             </div> <ul style="list-style-type: none"> <li>✓ <math>2x^{\frac{1}{2}}</math>    ✓ <math>\frac{3}{5}x^{-1}</math></li>   <li>✓ <math>x^{-\frac{1}{2}}</math>    ✓ <math>\frac{3}{5}x^{-2}</math></li> </ul> <p style="text-align: right;">(4)</p>
		<b>[9]</b>

## 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 $x + 1 = 0$ $x = \frac{11}{3}(3,7)$ or $x = -1$ $y = -\frac{400}{27}(-14,8)$ 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)
			<b>[18]</b>

**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	$A = 2x^2 + 4xh$ $= 2x^2 + 4x\left(\frac{8}{x^2}\right)$ $= 2x^2 + \frac{32}{x}$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: 20px;">                     No mark for the answer /                      Geen punt vir die antwoord                 </div>	✓ $2x^2$ ✓ $4xh$ ✓ 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)
		<b>[10]</b>

**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	$P(\text{not } A \text{ and/en not } B) = 1 - P(A \text{ or/of } B)$ $= 1 - 0,7$ $= 0,3$	✓ rule / reël ✓ answer / antwoord (2)

<p>10.2.1</p>	<p style="text-align: right;"> <math>[A P]</math>  <math>[A Y/G]</math>  <math>[B P]</math>  <math>[B Y/G]</math> </p>	<p>✓ first branch / eerste vertakking</p> <p>✓ second branches / tweede vertakkings</p> <p>✓ outcomes/uitkomst</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>If probabilities not listed, maximum 1 mark / Indien waarskynlikhede nie gelys is nie, maksimum 1 punt</p> </div> <p style="text-align: right;">(3)</p>
<p>10.2.2</p>	<p><math>P(\text{Yellow from Bag A}) \setminus P(\text{Geel uit Sak A}) = \frac{2}{5}</math></p>	<p>✓ answer / antwoord (1)</p>
<p>10.2.3</p>	<p><math>P(\text{Pink} \setminus \text{Pienk}) = \frac{3}{10} + \frac{5}{18}</math>  <math>= \frac{26}{45} (0,58)</math></p>	<p>✓ <math>\frac{3}{10}</math>      ✓ <math>\frac{5}{18}</math></p> <p>✓ answer / antwoord (3)</p>
<p>10.3.1</p>	<p><math>a = 288 - x</math> <math>b = 372 - x</math></p>	<p>✓ answer / antwoord ✓ answer / antwoord (2)</p>
<p>10.3.2</p>	<p><math>288 - x + x + 372 - x + 56 = 600</math> <math>-x = -116</math> <math>x = 116</math></p>	<p>✓ equation / vergelyking ✓ answer / antwoord (2)</p>
<p>10.3.3</p>	<p>No/Nee. <math>P(A \text{ and/en } B) \neq 0</math></p>	<p>✓ answer / antwoord (1)</p>
		<b>[18]</b>
		<b>TOTAL/TOTAAL: 150</b>