



# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE/  
NASIONALE SENIOR  
SERTIFIKAAT**

**GRADE 12/GRAAD 12**

**MATHEMATICS P1/WISKUNDE VI  
NOVEMBER 2019  
MARKING GUIDELINES/NASIENRIGLYNE**

**MARKS/PUNTE: 150**

**These marking guidelines consist of 18 pages.  
*Hierdie nasienriglyne bestaan uit 18 bladsye.***

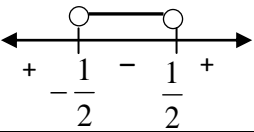
**NOTE:**

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent Accuracy applies in all aspects of the marking memorandum.

**LET WEL:**

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk slegs die EERSTE poging.
- Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyne van toepassing.

**QUESTION/VRAAG 1**

<p>1.1.1</p>	$x^2 + 5x - 6 = 0$ $(x + 6)(x - 1) = 0$ $x = -6 \text{ or } x = 1$	<p>✓ factors</p> <p>✓ <math>x = -6</math> ✓ <math>x = 1</math> (3)</p>
<p>1.1.2</p>	$4x^2 + 3x - 5 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-3 \pm \sqrt{(3)^2 - 4(4)(-5)}}{2(4)}$ $x = \frac{-3 \pm \sqrt{89}}{8}$ $x = -1,55 \text{ or } x = 0,8$	<p>✓ substitution into the correct formula</p> <p>✓ <math>x = -1,55</math> ✓ <math>x = 0,8</math> (3)</p>
<p>1.1.3</p>	$4x^2 - 1 < 0$ $(2x + 1)(2x - 1) < 0$ $-\frac{1}{2} < x < \frac{1}{2}$ 	<p>✓ factors</p> <p>✓ method</p> <p>✓ answer (3)</p>
<p>1.1.4</p>	$\left(\sqrt{\sqrt{32} + x}\right)\left(\sqrt{\sqrt{32} - x}\right) = x$ $\sqrt{32 - x^2} = x$ $32 - x^2 = x^2$ $-2x^2 = -32$ $x^2 = 16$ $x = \pm 4$ $\therefore x = 4$	<p>✓ <math>\sqrt{32 - x^2}</math></p> <p>✓ squaring both sides</p> <p>✓ <math>x^2 = 16</math></p> <p>✓ <math>x = 4</math> (selection) (4)</p>

<p>1.2</p>	<p><math>y + x = 12</math></p> <p><math>y = -x + 12 \dots\dots\dots(1)</math></p> <p><math>xy = 14 - 3x \dots\dots\dots(2)</math></p> <p>Sub (1) into (2)</p> <p><math>x(-x + 12) = 14 - 3x</math></p> <p><math>-x^2 + 12x - 14 + 3x = 0</math></p> <p><math>-x^2 + 15x - 14 = 0</math></p> <p><math>x^2 - 15x + 14 = 0</math></p> <p><math>(x - 14)(x - 1) = 0</math></p> <p><math>x = 14</math> or <math>x = 1</math></p> <p><math>y = -2</math> or <math>y = 11</math></p> <p><b>OR/OF</b></p> <p><math>y + x = 12</math></p> <p><math>x = -y + 12 \dots\dots\dots(1)</math></p> <p><math>xy = 14 - 3x \dots\dots\dots(2)</math></p> <p>Sub (1) into (2)</p> <p><math>y(-y + 12) = 14 - 3(-y + 12)</math></p> <p><math>12y - y^2 - 14 + 36 - 3y = 0</math></p> <p><math>-y^2 + 9y + 22 = 0</math></p> <p><math>y^2 - 9y - 22 = 0</math></p> <p><math>(y + 2)(y - 11) = 0</math></p> <p><math>y = -2</math> or <math>y = 11</math></p> <p><math>x = 14</math> or <math>x = 1</math></p>	<p>✓ y subject of the formula</p> <p>✓ substitution</p> <p>✓ simplification</p> <p>✓ both values of x</p> <p>✓ both values of y (5)</p> <p><b>OR/OF</b></p> <p>✓ x subject of the formula</p> <p>✓ substitution</p> <p>✓ simplification</p> <p>✓ both values of y</p> <p>✓ both values of x (5)</p>
<p>1.3</p>	<p>3 6 9 12 15 18 21 24 27 30</p> <p>3 3 3<sup>2</sup> 3 3 3<sup>2</sup> 3 3 3<sup>3</sup> 3</p> <p>∴ k = 14</p>	<p>✓ identifying multiples of 3</p> <p>✓ ten multiples of 3</p> <p>✓ powers of 3</p> <p>✓ answer (4)</p>
<p><b>[22]</b></p>		

**QUESTION/VRAAG 2**

2.1.1	209 ; 186	✓209 ✓186 (2)
2.1.2	$  \begin{array}{ccccccc}  & 321 & ; & 290 & ; & 261 & ; & 234 \\  & \swarrow & & \swarrow & & \swarrow & & \swarrow \\  1st \text{ diff} & & -31 & & -29 & & -27 & \\  & & \swarrow & & \swarrow & & & \\  2nd \text{ diff} & & & 2 & & 2 & & \\  \\  2a = 2 & 3a + b = -31 & a + b + c = 321 \\  a = 1 & 3(1) + b = -31 & 1 + (-34) + c = 321 \\  & b = -34 & c = 354 \\  \\  T_n = n^2 - 34n + 354  \end{array}  $	<p>✓ 2<sup>nd</sup> diff = 2</p> <p>✓ a = 1</p> <p>✓ b = -34</p> <p>✓ c = 354</p> <p>(4)</p>
2.1.3	$  \begin{aligned}  n^2 - 34n + 354 &= 74 \\  n^2 - 34n + 280 &= 0 \\  (n - 14)(n - 20) &= 0 \\  n = 14 \text{ or } n &= 20  \end{aligned}  $	<p>✓ equating <math>T_n</math> to 74</p> <p>✓ standard form</p> <p>✓ 14 ✓ 20 (4)</p>
2.1.4	$  \begin{aligned}  f'(n) &= 0 \\  2n - 34 &= 0 \\  2n &= 34 \\  n &= 17  \end{aligned}  $ <p>Term 17 will have the smallest value</p> <p><b>OR/OF</b></p> $  \begin{aligned}  n &= \frac{-b}{2a} \\  n &= \frac{34}{2} \\  n &= 17  \end{aligned}  $ <p>Term 17 will have the smallest value</p> <p><b>OR/OF</b></p> $  n = \frac{14 + 20}{2} = 17  $ <p>Term 17 will have the smallest value</p>	<p>✓ <math>2n - 34 = 0</math></p> <p>✓ answer (2)</p> <p><b>OR/OF</b></p> <p>✓ substitution</p> <p>✓ answer (2)</p> <p><b>OR/OF</b></p> <p>✓ substitution</p> <p>✓ answer (2)</p>

<p>2.2.1</p>	$a = \frac{5}{8} ; r = \frac{1}{2} ; n = 21$ $S_n = \frac{a(1-r^n)}{1-r}$ $S_{21} = \frac{\frac{5}{8} \left( 1 - \left( \frac{1}{2} \right)^{21} \right)}{1 - \frac{1}{2}}$ $= 1,2499\dots$ $= 1,25$	<p>✓ <math>r</math></p> <p>✓ substitution into the correct formula</p> <p>✓ answer (3)</p>
<p>2.2.2</p>	$T_n > \frac{5}{8192}$ $ar^{n-1} > \frac{5}{8192}$ $\frac{5}{8} \left( \frac{1}{2} \right)^{n-1} > \frac{5}{8192}$ $\left( \frac{1}{2} \right)^{n-1} > \frac{1}{1024}$ $\left( \frac{1}{2} \right)^{n-1} > \left( \frac{1}{2} \right)^{10} \quad \text{or} \quad 2^{-n+1} > 2^{-10}$ $\therefore n-1 < 10 \qquad -n+1 > -10$ $n < 11 \qquad n < 11$ $\therefore n = 10 \qquad \therefore n = 10$ <p><b>OR/OF</b></p> <p>8 ; 16 ; 32 ; ... ; 8192</p> $8 \cdot 2^{n-1} < 8192$ $2^{n-1} < 1024$ $2^{n-1} < 2^{10}$ $n-1 < 10$ $n < 11$ $\therefore n = 10$	<p>✓ substitution into the correct formula</p> <p>✓ method /same base or log</p> <p>✓ calculating <math>n</math></p> <p>✓ answer (4)</p> <p><b>OR/OF</b></p> <p>✓ substitution into the correct formula</p> <p>✓ method</p> <p>✓ calculating <math>n</math></p> <p>✓ answer (4)</p>
		<p>[19]</p>

**QUESTION/VRAAG 3**

<p>3.1</p>	$\sum_{y=3}^{10} \frac{1}{y-2} - \sum_{y=3}^{10} \frac{1}{y-1}$ $= \left( \frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{8} \right) - \left( \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{8} + \frac{1}{9} \right)$ $= 1 - \frac{1}{9}$ $= \frac{8}{9}$	<p>✓ <math>\left( \frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{8} \right)</math>                  ✓ <math>\left( \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{8} + \frac{1}{9} \right)</math>                  ✓ answer (3)</p>
<p>3.2</p>	$\left( \frac{1}{3} \times \frac{2}{3} \right) + \left( \frac{2}{3} \times \frac{2}{3} \right) + \left( 1 \times \frac{2}{3} \right) + \dots + \left( 4 \times \frac{2}{3} \right)$ $= \frac{2}{9} + \frac{4}{9} + \frac{2}{3} + \dots + \frac{8}{3}$ <p><math>a = \frac{2}{9}</math>      and      <math>d = \frac{2}{3} - \frac{4}{9} = \frac{2}{9}</math></p> <p><math>S_n = \frac{n}{2} [2a + (n-1)d]</math>      OR      <math>S_n = \frac{n}{2} (a + l)</math></p> $S_{12} = \frac{12}{2} \left[ 2 \left( \frac{2}{9} \right) + (12-1) \frac{2}{9} \right]$ $= \frac{52}{3} \text{ m}^2$ $S_{12} = \frac{12}{2} \left( \frac{2}{9} + \frac{8}{3} \right)$ $= \frac{52}{3} \text{ m}^2$ <p>∴ for both sides = <math>2 \times \frac{52}{3} = \frac{104}{3} = 34,67 \text{ m}^2</math></p> <p><b>OR/OF</b></p> $\frac{2}{9} \times (1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 + 12) \times 2$ $= 34,67 \text{ m}^2$ <p><b>OR/OF</b></p> $T_1 = \frac{2}{9} \times 12 = \frac{8}{3}$ $l = \frac{2}{9} \times 1 = \frac{2}{9}$ $2S_{12} = 2 \left( \frac{12}{2} \right) \left( \frac{8}{3} + \frac{2}{9} \right)$ $= 34,67 \text{ m}^2$	<p>✓✓ a                  ✓ d                  ✓ substitution into the correct formula                  ✓ answer                  ✓ answer for both sides (6)</p> <p><b>OR/OF</b>                  ✓✓ a                  ✓✓ (1 + ... + 12)                  ✓ × 2                  ✓ answer (6)</p> <p><b>OR/OF</b>                  ✓✓ a                  ✓ <math>T_1 = \frac{8}{3}</math> ✓ <math>l = \frac{2}{9}</math>                  ✓ substitution into correct formula                  ✓ answer (6)</p>
<b>[9]</b>		

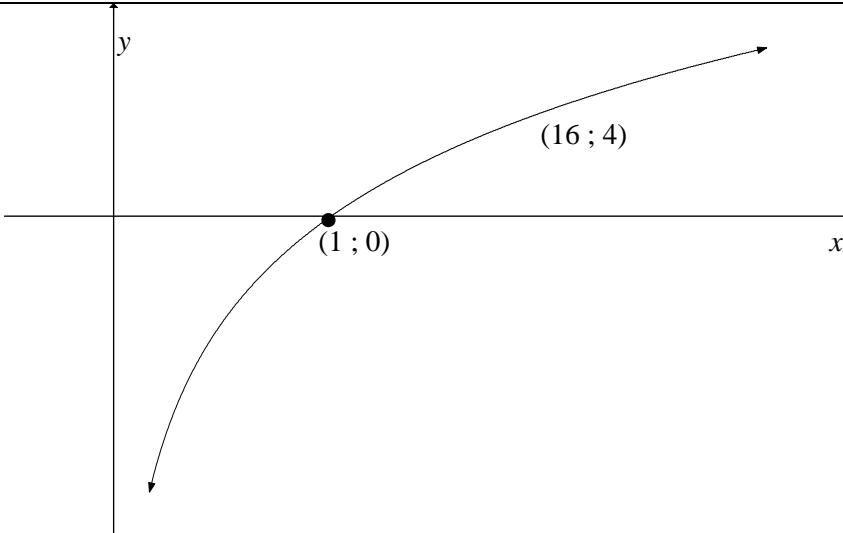
**QUESTION/VRAAG 4**

4.1	$p = -1$	✓ $p = -1$ (1)
4.2	$y = \frac{a}{x-1}$ $-3 = \frac{a}{0-1}$ $a = 3$ $y = x^2 + bx - 3$ $0 = (1)^2 + (1)b - 3$ $b = 2$	✓ coordinates D(0 ; -3) ✓ substitute (0 ; -3)  ✓ substitute (1 ; 0) (3)
4.3	$y = x^2 + 2x - 3$ $\text{axis of sym: } x = \frac{-b}{2a}$ $x = \frac{-2}{2(1)}$ $x = -1$ $y = (-1)^2 + 2(-1) - 3 = -4$ $C(-1; -4)$ <p><b>OR/OF</b></p> $\frac{dy}{dx} = 0$ $2x + 2 = 0$ $x = -1$ $y = (-1)^2 + 2(-1) - 3 = -4$ $C(-1; -4)$	✓ substitution ✓ $x = -1$  ✓ substitution ✓ $y = -4$ (4) <p><b>OR/OF</b></p> ✓ derivative ✓ $x = -1$ ✓ substitution ✓ $y = -4$ (4)
4.4	$y \in [-4; \infty)$ or $y \geq -4$	✓ -4 ✓ answer (2)
4.5	$m = \tan 45^\circ = 1$ $y = mx + c$ $-4 = (1)(-1) + c$ $c = -3$ $y = x - 3$	✓ gradient  ✓ subs $m$ and $(-1; -4)$  ✓ equation (3)
4.6	No, the line passes through C and D  <b>OR/OF</b> No, a tangent through turning point C will have a gradient of 0	✓ No ✓ reason (2) <p><b>OR/OF</b></p> ✓ No ✓ reason (2)

4.7	$f(m-x) = f[-(x-m)]$ <p><math>f</math> is reflected in the <math>y</math>-axis and translated 1 unit to the left and 4 units upwards.</p> <p>Therefore: <math>m = -1</math> <math>q = 4</math></p> <p><b>OR/OF</b></p> <p>Substitute <math>x = 0</math> and <math>q = 4</math> for one <math>x</math>-intercept</p> $h(x) = (m-x)^2 + 2(m-x) - 3 + q$ $h(0) = (m-0)^2 + 2(m-0) - 3 + 4$ $0 = m^2 + 2m + 1$ $0 = (m+1)^2$ $m = -1$ $q = 4$	<p>✓✓ value of <math>m</math> ✓✓ value of <math>q</math> (4)</p> <p><b>OR/OF</b></p> <p>✓✓ value of <math>m</math> ✓✓ value of <math>q</math> (4)</p>
		<b>[19]</b>



**QUESTION/VRAAG 5**

5.1	$f(x) = k^x$ $16 = k^4$ $k = 2$	✓ substitution (4 ; 16) ✓ answer (2)
5.2	$f : y = 2^x$ $f^{-1} : x = 2^y$ $y = \log_2 x$	✓ $x = 2^y$ ✓ $y = \log_2 x$ (2)
5.3		✓ asymptote ✓ shape ✓ for any two valid points eg. (16 ; 4) or (2 ; 1) or (4 ; 2) or (1 ; 0) (4)
5.4.1	$x \in (1; \infty)$ or $x > 1$	✓ 1 ✓ answer (2)
5.4.2	$0 < x \leq \frac{1}{2}$ or $x \in \left(0; \frac{1}{2}\right]$	✓ $\frac{1}{2}$ ✓ answer (2)

<p>5.5</p>	$2^x - 2^{-x} = \frac{15}{4}$ $2^x - \frac{1}{2^x} = \frac{15}{4}$ $2^{2x} - 1 = \frac{15}{4} \times 2^x$ $4 \cdot 2^{2x} - 4 = 15 \times 2^x$ $4 \cdot 2^{2x} - 15 \cdot 2^x - 4 = 0$ $(4 \cdot 2^x + 1)(2^x - 4) = 0$ $4 \cdot 2^x + 1 = 0 \text{ or } 2^x - 4 = 0$ $2^x = \frac{-1}{4} \text{ or } 2^x = 2^2$ <p>N/A <math>x = 2</math></p> <p><b>OR/OF</b></p> $2^x - 2^{-x} = \frac{15}{4}$ $2^x - \frac{1}{2^x} = \frac{15}{4}$ <p>Let <math>k = 2^x</math></p> $k^2 - 1 = \frac{15}{4} \times k$ $4 \cdot k^2 - 4 = 15 \times k$ $4 \cdot k^2 - 15 \cdot k - 4 = 0$ $(4 \cdot k + 1)(k - 4) = 0$ $k = \frac{-1}{4} \text{ or } k = 4$ $2^x = \frac{-1}{4} \text{ or } 2^x = 2^2$ <p>N/A <math>x = 2</math></p>	$\checkmark 2^x - 2^{-x} = \frac{15}{4}$ $\checkmark \text{standard form}$ $\checkmark \text{factors}$ $\checkmark \text{answer}$ <p style="text-align: right;">(4)</p> <p><b>OR/OF</b></p> $\checkmark$ $2^x - 2^{-x} = \frac{15}{4}$ $\checkmark \text{standard form}$ $\checkmark \text{factors}$ $\checkmark \text{answer}$ <p style="text-align: right;">(4)</p>
		<b>[16]</b>

**QUESTION/VRAAG 6**

<p>6.1</p>	<p>Kuda: <math>A = P(1 + in)</math>  <math>= 5\,000(1 + 0,083 \times 4)</math>  <math>= R6\,660,00</math>                  Final Answer: <math>R6\,660,00 + R266,40</math>  <math>= R6\,926,40</math></p> <p><b>OR/OF</b></p> <p>Kuda: <math>A = P(1 + in) \times 1,04</math>  <math>= 5\,000(1 + 0,083 \times 4) \times 1,04</math>  <math>= R6\,926,40</math></p> <p>Thabo: <math>A = P(1 + i)^n</math>  <math>= 5\,000 \left(1 + \frac{0,081}{12}\right)^{12 \times 4}</math>  <math>= R6\,905,71</math></p> <p>Kuda will have a better investment</p>	<p>✓ substitution into the correct formula</p> <p>✓ final answer</p> <p><b>OR/OF</b></p> <p>✓ substitution into the correct formula</p> <p>✓ final answer</p> <p>✓ substitution into the correct formula</p> <p>✓ answer</p> <p>✓ conclusion (5)</p>
<p>6.2.1</p>	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $525\,000 = \frac{6\,000 \left[1 - \left(1 + \frac{0,1}{12}\right)^{-n}\right]}{\frac{0,1}{12}}$ $\frac{35}{48} = 1 - \left(1 + \frac{0,1}{12}\right)^{-n}$ $-n \log\left(1 + \frac{0,1}{12}\right) = \log \frac{13}{48}$ $-n = \frac{\log \frac{13}{48}}{\log\left(1 + \frac{0,1}{12}\right)}$ $n = 157,40$ $n = 158 \text{ payments}$ <p><b>OR/OF</b></p>	<p>✓ <math>\frac{0,1}{12}</math></p> <p>✓ substitution into the correct formula</p> <p>✓ simplification</p> <p>✓ use of logs</p> <p>✓ answer (5)</p> <p><b>OR/OF</b></p>

	$P = \frac{x[1 - (1 + i)^{-n}]}{i}$ $525\,000 = \frac{6\,000 \left[ 1 - \left( 1 + \frac{0,1}{12} \right)^{-12n} \right]}{\frac{0,1}{12}}$ $\frac{35}{48} = 1 - \left( 1 + \frac{0,1}{12} \right)^{-12n}$ $-12n \log \left( 1 + \frac{0,1}{12} \right) = \log \frac{13}{48}$ $-12n = \frac{\log \frac{13}{48}}{\log \left( 1 + \frac{0,1}{12} \right)}$ $n = \frac{\log \frac{13}{48}}{\log \left( 1 + \frac{0,1}{12} \right)} \times \frac{1}{12}$ $n = 13,11686841$ <p>Number of payments = <math>13,11686841 \times 12 = 157,40</math>  <math>n = 158</math> payments</p>	<p>✓ <math>\frac{0,1}{12}</math></p> <p>✓ substitution into the correct formula</p> <p>✓ simplification</p> <p>✓ use of logs</p> <p>✓ answer</p> <p style="text-align: right;">(5)</p>
<p>6.2.2</p>	<p>Difference: R6 000 – R5 066,36 = R933,64</p> $F = \frac{x[(1 + i)^n - 1]}{i}$ $F = \frac{933,64 \left[ \left( 1 + \frac{0,1}{12} \right)^{108} - 1 \right]}{\frac{0,1}{12}}$ <p>= R162 503,51</p> <p><b>OR/OF</b></p>	<p>✓ R933,64</p> <p>✓ <math>n = 108</math></p> <p>✓ substitution into the correct formula</p> <p>✓ answer</p> <p style="text-align: right;">(4)</p> <p><b>OR/OF</b></p>

	$F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{6000 \left[ \left( 1 + \frac{0,1}{12} \right)^{108} - 1 \right]}{\frac{0,1}{12}}$ $= R1\ 044\ 322,28$ $F = \frac{5\ 066,36 \left[ \left( 1 + \frac{0,1}{12} \right)^{108} - 1 \right]}{\frac{0,1}{12}}$ $F = R\ 881\ 818,77\dots$ <p>Amount available for withdrawal  <math>= R1\ 044\ 322,28 - R\ 881\ 818,77</math>  <math>= R162\ 503,51</math></p> <p><b>OR/OF</b></p> <p>Outstanding balance with monthly repayment of R5 066,35</p> $= 525\ 000 \left( 1 + \frac{0,1}{12} \right)^{108} - \frac{5\ 066,36 \left[ \left( 1 + \frac{0,1}{12} \right)^{108} - 1 \right]}{\frac{0,1}{12}}$ $= R404\ 666,23$ <p>Outstanding balance with monthly repayment of R6 000</p> $= 525\ 000 \left( 1 + \frac{0,1}{12} \right)^{108} - \frac{6\ 000 \left[ \left( 1 + \frac{0,1}{12} \right)^{108} - 1 \right]}{\frac{0,1}{12}}$ $= R242\ 162,72$ <p>Amount available for withdrawal  <math>R404\ 666,23 - R242\ 162,72 = R162\ 512,18</math></p>	<p>✓ <math>n = 108</math>                  ✓ substitution into correct formula</p> <p>✓ substitution into correct formula</p> <p>✓ final answer (4)</p> <p><b>OR/OF</b></p> <p>✓ <math>n = 108</math>                  ✓ substitution into the correct formula</p> <p>✓ substitution into the correct formula</p> <p>✓ final answer (4)</p>
		<p>[14]</p>

**QUESTION/VRAAG 7**

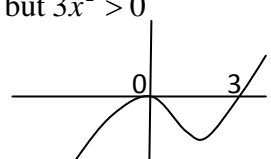
7.1	$f(x) = 4 - 7x$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{4 - 7(x+h) - (4 - 7x)}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-7)}{h}$ $= -7$	<p>✓ <math>4 - 7(x+h)</math></p> <p>✓ substitution</p> <p>✓ simplification</p> <p>✓ answer (4)</p>
7.2	$y = 4x^8 + \sqrt{x^3}$ $= 4x^8 + x^{\frac{3}{2}}$ $\frac{dy}{dx} = 32x^7 + \frac{3}{2}x^{\frac{1}{2}}$	<p>✓ <math>x^{\frac{3}{2}}</math></p> <p>✓ <math>32x^7</math></p> <p>✓ <math>\frac{3}{2}x^{\frac{1}{2}}</math> (3)</p>
7.3.1	$y = ax^2 + a$ $\frac{dy}{dx} = 2ax + 0$ $\frac{dy}{dx} = 2ax$	<p>✓ <math>2ax</math> (1)</p>
7.3.2	$y = ax^2 + a$ $\frac{dy}{da} = x^2 + 1$	<p>✓ ✓ answer (2)</p>

<p>7.4</p>	<p>Substitute (2 ; b) in <math>y = x + \frac{12}{x}</math></p> $b = 2 + \frac{12}{2}$ $b = 8$ <p><math>m_{\text{tangent}} = \frac{dy}{dx}</math></p> $\frac{dy}{dx} = 1 - \frac{12}{x^2}$ $m_{\text{tangent}} = 1 - \frac{12}{2^2} = -2$ <p><math>m_{\text{perp}} = \frac{1}{2}</math></p> <p>Equation of perpendicular line:</p> $y - y_1 = m(x - x_1) \quad \text{OR} \quad y = mx + c$ $y - 8 = \frac{1}{2}(x - 2) \quad \quad \quad 8 = \frac{1}{2}(2) + c$ $y = \frac{1}{2}x + 7 \quad \quad \quad c = 7$ $y = \frac{1}{2}x + 7$	<p>✓ value of <math>b</math></p> <p>✓ <math>\frac{dy}{dx} = 1 - \frac{12}{x^2}</math></p> <p>✓ gradient of perpendicular line</p> <p>✓ equation (4)</p>
		<b>[14]</b>

**QUESTION/VRAAG 8**

<p>8.1</p>	<p>36cm</p>	<p>✓ answer (1)</p>
<p>8.2</p>	<p><math>\therefore t = 6 \quad (-2t^2 + 3t - 6)</math> have no real roots Insect reaches the floor only once.</p>	<p>✓✓✓ only once (3)</p>
<p>8.3</p>	<p><math>h(t) = -2t^3 + 15t^2 - 24t + 36</math></p> <p><math>h'(t) = -6t^2 + 30t - 24</math></p> <p><math>-6t^2 + 30t - 24 = 0</math></p> <p><math>t^2 - 5t + 4 = 0</math></p> <p><math>(t - 4)(t - 1) = 0</math></p> <p><math>t = 4 \quad \text{or} \quad t = 1</math></p> <p>Only <math>t = 4</math> because maximum value required</p> <p><math>h = -2(4)^3 + 15(4)^2 - 24(4) + 36 = 52 \text{ cm}</math></p>	<p>✓ expansion</p> <p>✓ <math>-6t^2 + 30t - 24 = 0</math></p> <p>✓ both values</p> <p>✓ answer (4)</p>
		<b>[8]</b>

**QUESTION/VRAAG 9**

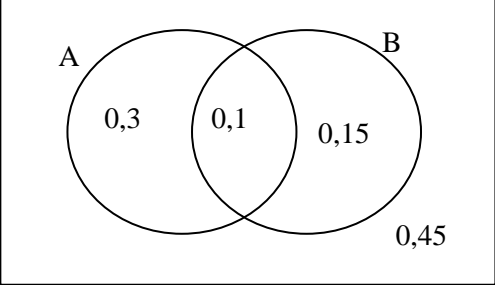
9.1	$f'(x) = 9x^2$ $3x^3 = 9x^2$ $3x^3 - 9x^2 = 0$ $3x^2(x - 3) = 0$ $x = 0$ or $x = 3$	$\checkmark f'(x) = 9x^2$  $\checkmark x = 0$ $\checkmark x = 3$ (3)
9.2.1	For $f$ and $f'$	$\checkmark$ answer (1)
9.2.2	The point (0 ; 0) is : A point of inflection of $f$ A turning point of $f'$	$\checkmark f$ : inflection point $\checkmark f'$ : turning point (2)
9.3	$f''(x) = 18x$ Distance = $f''(1) - f'(1)$ $= 18(1) - 9(1)^2$ $= 9$	$\checkmark f''(x) = 18x$  $\checkmark$ substitution $\checkmark$ answer (3)
9.4	$3x^3 - 9x^2 < 0$ $3x^2(x - 3) < 0$ but $3x^2 > 0$  $\therefore x - 3 < 0$ $\therefore x < 3, x \neq 0$	$\checkmark 3x^3 - 9x^2 < 0$ $\checkmark$ factors  $\checkmark x < 3$ $\checkmark x \neq 0$ (4)
		<b>[13]</b>

**QUESTION/VRAAG 10**

10.1	$P(\text{same day}) = \frac{4}{16}$ or $\frac{1}{4}$ or 0,25 or 25%	$\checkmark 4$ numerator $\checkmark 16$ denominator (2)
10.2	$P(2 \text{ consecutive days}) = \frac{3 \times 2}{16} = \frac{3}{8}$	$\checkmark 3 \checkmark \times 2$ $\checkmark$ answer (3)
		<b>[5]</b>



**QUESTION/VRAAG 11**

<p>11.1.1</p>	<p><math>P(A) \times P(B)</math> independent events  <math>= 0,40 \times 0,25 = 0,1</math></p> 	<p>✓0,1                   ✓0,15 and 0,3                  ✓0,45 (3)</p>
<p>11.1.2</p>	<p><math>P(A \text{ or not } B) = P(A) + P(\text{not } B) - P(A \text{ and not } B)</math>  <math>= 0,4 + 0,75 - 0,3</math>  <math>= 0,85</math></p> <p><b>OR/OF</b></p> <p><math>P(A \text{ or not } B) = 1 - P(\text{only } B)</math>  <math>= 1 - 0,15</math>  <math>= 0,85</math></p> <p><b>OR/OF</b>                  From Venn diagram:  <math>0,3 + 0,1 + 0,45 = 0,85</math></p>	<p>✓ substitution                  ✓ answer (2)</p> <p><b>OR/OF</b></p> <p>✓ <math>1 - 0,15</math>                  ✓ answer (2)</p> <p><b>OR/OF</b>                  ✓ substitution                  ✓ answer (2)</p>
<p>11.2</p>	<p><math>(5 \times 1 \times 5) + (5 \times 1 \times 6) + (5 \times 1 \times 6) + (5 \times 1 \times 5) = 110</math></p> <p><math>110 \times 5 = 550 &gt; 500</math></p> <p>Not possible, because not enough space</p> <p><b>OR/OF</b></p> <p><math>(5 \times 2 \times 5) + (5 \times 2 \times 6) = 110</math></p> <p><math>110 \times 5 = 550 &gt; 500</math></p> <p>Not possible because not enough space</p> <p><b>OR/OF</b></p>	<p>✓ <math>5 \times 1 \times 5</math>                  ✓ <math>5 \times 1 \times 6</math>                  ✓ <math>5 \times 1 \times 6</math>                  ✓ <math>5 \times 1 \times 5</math>                  ✓ 110                  ✓ conclusion (6)</p> <p><b>OR/OF</b></p> <p>✓✓ <math>5 \times 2 \times 5</math>                  ✓✓ <math>5 \times 2 \times 6</math>                  ✓ 110                  ✓ conclusion (6)</p> <p><b>OR/OF</b></p>

	$5 \times 4 \times 6 = 120$ $5 \times 2 = 10$ $\therefore 120 - 10 = 110$ $110 \times 5 = 550 > 500$ Not possible because not enough space	$\checkmark\checkmark 5 \times 4 \times 6 = 120$ $\checkmark 5 \times 2 = 10$ $\checkmark 120 - 10$ $\checkmark 110$ $\checkmark$ conclusion (6)
		[11]

**TOTAL/TOTAAL: 150**