



# basic education

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

## **SENIOR CERTIFICATE EXAMNATIONS** ***SENIORSERTIFIKAAT-EKSAMEN***

**MATHEMATICS P1/*WISKUNDE VI***

**2017**

**MARKING GUIDELINES/*NASIENRIGLYNE***

**MARKS: 150**  
***PUNTE: 150***

**These marking guidelines consist of 20 pages.**  
***Hierdie nasienriglyne bestaan uit 20 bladsye.***

**NOTE:**

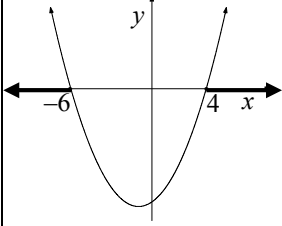
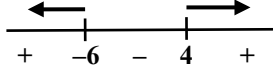
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent Accuracy applies in all aspects of the marking memorandum.

**LET WEL:**

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

**QUESTION/VRAAG 1**

|       |   |  |
|-------|---|--|
| 1.1.1 | $3x^2 + 10x + 6 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-10 \pm \sqrt{(10)^2 - 4(3)(6)}}{2(3)}$ $x = -2,55 \text{ or } x = -0,78$ <p><b>OR/OF</b></p> $x^2 + \frac{10}{3}x + \frac{100}{36} = -2 + \frac{100}{36}$ $\left(x + \frac{5}{3}\right)^2 = \frac{7}{9}$ $x + \frac{5}{3} = \pm \frac{\sqrt{7}}{3}$ $x = \frac{-5 \pm \sqrt{7}}{3}$ $x = -0,78 \text{ or } x = -2,55$ | <p>✓ substitution into correct formula</p> <p>✓ <math>x = -2,55</math></p> <p>✓ <math>x = -0,78</math></p> <p>(3)</p> <p>✓ for adding <math>\frac{100}{36}</math> on both sides</p> <p>✓ <math>x = -2,55</math></p> <p>✓ <math>x = -0,78</math></p> <p>(3)</p> |
| 1.1.2 | $\sqrt{6x^2 - 15} = x + 1$ $6x^2 - 15 = (x + 1)^2$ $6x^2 - 15 = x^2 + 2x + 1$ $5x^2 - 2x - 16 = 0$ $(5x + 8)(x - 2) = 0$ $x = -\frac{8}{5} \text{ or } x = 2$ $\therefore x = 2$  | <p>✓ concept of squaring both sides</p> <p>✓ standard form (accurate)</p> <p>✓ factors</p> <p>✓ both answers</p> <p>✓ correct selection</p> <p>(5)</p>   |

|              |  |  |
|--------------|--|--|
| <p>1.1.3</p> | $x^2 + 2x - 24 \geq 0$ $(x + 6)(x - 4) \geq 0$  <p style="text-align: center;"><b>OR</b></p>  $x \leq -6 \text{ or } x \geq 4$   | <ul style="list-style-type: none"> <li>✓ factors</li> <li>✓✓ <math>x \leq -6</math> or <math>x \geq 4</math></li> </ul> <p style="text-align: right;">(3)</p>  |
| <p>1.2</p>   | $y = -5x + 3$ $3x^2 - 2x(-5x + 3) = (-5x + 3)^2 - 105$ $3x^2 + 10x^2 - 6x = 25x^2 - 30x + 9 - 105$ $-12x^2 + 24x + 96 = 0$ $x^2 - 2x - 8 = 0$ $(x - 4)(x + 2) = 0$ $x = -2 \text{ or } x = 4$ $y = 13 \text{ or } y = -17$ <p style="text-align: center;"><b>OR/OF</b></p> $x = \frac{3 - y}{5}$ $3\left(\frac{3 - y}{5}\right)^2 - 2y\left(\frac{3 - y}{5}\right) = y^2 - 105$ $3\left(\frac{9 - 6y + y^2}{25}\right) - 2y\left(\frac{3 - y}{5}\right) = y^2 - 105$ $27 - 18y + 3y^2 - 30y + 10y^2 = 25y^2 - 2625$ $12y^2 + 48y - 2652 = 0$ $y^2 + 4y - 221 = 0$ $(y - 13)(y + 17) = 0$ $y = -17 \text{ or } y = 13$ $x = \frac{3 + 17}{5} \text{ or } x = \frac{3 - 13}{5}$ $x = 4 \text{ or } x = -2$ | <ul style="list-style-type: none"> <li>✓ y subject of formula</li> <li>✓ substitution</li> <li>✓ simplification</li> <li>✓ factors</li> <li>✓ values of x</li> <li>✓ values of y</li> <li>✓ x subject of formula</li> <li>✓ substitution</li> <li>✓ simplification</li> <li>✓ factors</li> <li>✓ values of y</li> <li>✓ values of x</li> </ul> <p style="text-align: right;">(6)</p> |
| <p>1.3.1</p> | $p^2 - 48p - 49 = 0$ $(p - 49)(p + 1) = 0$ $p = -1 \text{ or } p = 49$   | <ul style="list-style-type: none"> <li>✓ factors</li> <li>✓ <math>p = -1</math></li> <li>✓ <math>p = 49</math></li> </ul> <p style="text-align: right;">(3)</p>  |
| <p>1.3.2</p> | $7^x = -1 \quad \text{or} \quad 7^x = 49$ <p>no solution                      <math>x = 2</math></p>   | <ul style="list-style-type: none"> <li>✓ <math>7^x = -1</math> or <math>7^x = 49</math></li> <li>✓ no solution</li> <li>✓ <math>x = 2</math></li> </ul> <p style="text-align: right;">(3)</p>  |

**QUESTION/VRAAG 2**

|       |  |  |
|-------|--|--|
| 2.1.1 | $3; 2; k; \dots$<br>$r = \frac{2}{3}$  | $\checkmark r = \frac{2}{3} / 0,67$<br><br>(1)   |
| 2.1.2 | $r = \frac{T_3}{T_2}$<br>$T_3 = r \times T_2$<br>$= \frac{2}{3} \times 2$<br>$= \frac{4}{3}$<br>Thus $k = \frac{4}{3}$   | $\checkmark \frac{2}{3} \times 2$<br><br>$\checkmark \frac{4}{3} / 1,34$<br><br>(2)  |
| 2.1.3 | $T_n = a.r^{n-1}$<br>$\frac{128}{729} = 3 \times \left(\frac{2}{3}\right)^{n-1}$<br>$\left(\frac{2}{3}\right)^{n-1} = \frac{128}{2187}$<br>$\left(\frac{2}{3}\right)^{n-1} = \left(\frac{2}{3}\right)^7$<br>$n-1 = 7$<br>$n = 8$<br><br><b>OR / OF</b><br>$T_n = a.r^{n-1}$<br>$\frac{128}{729} = 3 \times \left(\frac{2}{3}\right)^{n-1}$<br>$\left(\frac{2}{3}\right)^{n-1} = \frac{128}{2187}$<br>$n-1 = \log_{\frac{2}{3}} \frac{128}{2189}$<br>$n-1 = 7$<br>$n = 8$ | $\checkmark \frac{128}{729} = 3 \times \left(\frac{2}{3}\right)^{n-1}$<br>$\checkmark \left(\frac{2}{3}\right)^{n-1} = \frac{128}{2187}$<br>$\checkmark \left(\frac{2}{3}\right)^7$<br><br>$\checkmark$ answer<br><br><b>OR / OF</b><br>$\checkmark \frac{128}{729} = 3 \times \left(\frac{2}{3}\right)^{n-1}$<br>$\checkmark \left(\frac{2}{3}\right)^{n-1} = \frac{128}{2187}$<br>$\checkmark n-1 = \log_{\frac{2}{3}} \frac{128}{2189}$<br>$\checkmark$ answer<br><br>(4) |
| 2.2.1 | $T_n = a + (n-1)d$<br>$T_{18} = 100 + (18-1)(150)$<br>$= R 2\ 650$   | $\checkmark$ substitution of $n$ ,<br>$a$ and $d$ into AS<br>$\checkmark 2\ 650$<br><br>(2)  |

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|-------|---|---|
| 2.2.2 | $S_n = \frac{n}{2}[2a + (n-1)d]$ $30\,500 = \frac{n}{2}[2(100) + (n-1)(150)]$ $61\,000 = n(150n + 50)$ $61\,000 = 150n^2 + 50n$ $3n^2 + n - 1\,220 = 0$ $(3n + 61)(n - 20) = 0$ $n = -\frac{61}{3} \text{ or } n = 20$ <p style="text-align: center;">N/A</p> $x = 100 + (20-1)(150)$ $= R\,2\,950$ | <p>✓ substitute 30 500, <math>a</math> and <math>d</math> into sum formula for AS</p> <p>✓ simplification<br/>✓ factors or quad formula<br/>✓ <math>n = 20</math></p> <p>✓ substitution <math>T_n</math> of AS<br/>✓ 2 950</p> <p style="text-align: right;">(6)<br/>[15]</p> |
|-------|---|---|

**QUESTION/VRAAG 3**

|     |  |  |
|-----|--|--|
| 3.1 | <p>First differences: 17; 15<br/>Second difference: -2</p> $T_n = an^2 + bn + c$ $a = \frac{\text{second difference}}{2} = \frac{-2}{2} = -1$ $3a + b = 17$ $3(-1) + b = 17$ $b = 20$ $a + b + c = 0$ $-1 + 20 + c = 0$ $c = -19$ $T_n = -n^2 + 20n - 19$ <p><b>OR / OF</b></p> <p>First differences: 17; 15</p> $T_n = T_1 + (n-1)d_1 + \frac{(n-1)(n-2)}{2}d_2$ $= (0) + (n-1)(17) + \frac{(n-1)(n-2)}{2}(-2)$ $= 17n - 17 - n^2 + 3n - 2$ $= -n^2 + 20n - 19$ | <p>✓17; 15</p> <p>✓ value of <math>a</math></p> <p>✓ value of <math>b</math></p> <p>✓ value of <math>c</math></p> <p>✓17; 15<br/>✓ value of <math>a</math><br/>✓ value of <math>b</math><br/>✓ value of <math>c</math></p> <p style="text-align: right;">(4)</p> |
|-----|--|--|

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|------------|--|---|
| <p>3.2</p> | $56 = -n^2 + 20n - 19$ $n^2 - 20n + 75 = 0$ $(n - 15)(n - 5) = 0$ $n = 5 \text{ or } n = 15$   | <p>✓ <math>T_n = 56</math></p> <p>✓ factors</p> <p>✓ both answers</p> <p>(3)</p>  |
| <p>3.3</p> | $\sum_{n=5}^{10} T_n - \sum_{n=11}^{15} T_n$ $= T_5 + T_6 + T_7 + T_8 + T_9 + T_{10} - T_{11} - T_{12} - T_{13} - T_{14} - T_{15}$ $= (T_5 - T_{15}) + (T_6 - T_{14}) + \dots + (T_9 - T_{13}) + T_{10}$ $= T_{10}$ <p>because by symmetry <math>T_5 = T_{15}</math> ; <math>T_6 = T_{14}</math> .....</p> $T_{10} = -(10)^2 + 20(10) - 19$ $= 81$ <p><b>OR/OF</b></p> $0; 17; 32; 45; \overset{T_5}{56}; 65; 72; 77; 80; \overset{T_{10}}{81}; 80; 77; 72; 65; \overset{T_{15}}{56}$ <p>Hence,</p> $\sum_{n=5}^{10} T_n - \sum_{n=11}^{15} T_n$ $= (56 + 65 + 72 + 77 + 80 + 81) - (80 + 77 + 72 + 65 + 56)$ $= 81$ | <p>✓✓ symmetry of terms</p> <p>✓ <math>T_{10}</math></p> <p>✓ 81</p> <p>(4)</p> <p>✓ writing out the symmetry of terms</p> <p>✓</p> <p>56 + 65 + 72 + 77 + 80 + 81</p> <p>✓</p> <p>80 + 77 + 72 + 65 + 56</p> <p>✓ 81</p> <p>(4)</p> <p><b>[11]</b></p> |

**QUESTION/VRAAG 4**

|     |   |   |
|-----|---|---|
| 4.1 | A (4; 3)  | ✓(4; 3)<br>(1)  |
| 4.2 | $y = \frac{6}{-4} + 3$ $= \frac{3}{2}$ $B\left(0; \frac{3}{2}\right)$                             | ✓ x = 0<br>✓ y = $\frac{3}{2}$<br>(2)   |
| 4.3 | $0 = \frac{6}{x-4} + 3$ $-3 = \frac{6}{x-4}$ $-3(x-4) = 6$ $-3x + 12 = 6$ $x = 2$ C(2 ; 0)        | ✓ y = 0<br><br>✓ x = 2<br>(2)   |
| 4.4 | Average gradient = $\frac{0 - \frac{3}{2}}{2 - 0}$<br>$= -\frac{3}{4}$                            | $\frac{0 - \frac{3}{2}}{2 - 0}$<br>✓ $-\frac{3}{4}$<br>(2)  |
| 4.5 | $y = -x + 7$<br><br><b>OR/OF</b><br><br>$m = -1$<br>$\therefore y - 3 = -(x - 4)$<br>$y = -x + 7$ | ✓ $m = -1$<br>✓ $y = -x + 7$<br><b>OR/OF</b><br>✓ $m = -1$<br>✓ $y = -x + 7$<br>(2)<br><b>[9]</b> |





**QUESTION/VRAAG 5**

|            |   |   |
|------------|---|---|
| <p>5.1</p> |   | <p>f:</p> <ul style="list-style-type: none"> <li>✓ x-intercepts</li> <li>✓ y-intercept</li> <li>✓ shape</li> <li>✓ TP</li> </ul> <p>g:</p> <ul style="list-style-type: none"> <li>✓ x-intercept and y-intercept</li> <li>✓ shape</li> </ul> <p style="text-align: right;">(6)</p> |
| <p>5.2</p> | $y = -20\frac{1}{4}$  | <ul style="list-style-type: none"> <li>✓✓ <math>y = -20\frac{1}{4} / -\frac{81}{4}</math></li> </ul> <p style="text-align: right;">(2)</p>  |
| <p>5.3</p> | $-20\frac{1}{4} < k < -14$  | <ul style="list-style-type: none"> <li>✓ <math>-20\frac{1}{4} &lt; k</math></li> <li>✓ <math>k &lt; -14</math></li> </ul> <p style="text-align: right;">(2)</p>   |
| <p>5.4</p> | <p>Reflecting in the x-axis: <math>y = -2x + 14</math></p> $y = -2(x + 7) + 14$ <p>Shifting 7 units to the left: <math>= -2x - 14 + 14</math></p> $= -2x$ | <ul style="list-style-type: none"> <li>✓ <math>y = -2x + 14</math></li> <li>✓ <math>y = -2x</math></li> </ul> <p style="text-align: right;">(2)<br/><b>[12]</b></p>   |

**QUESTION/VRAAG 6**

|     |  |   |
|-----|--|---|
| 6.1 | $f : y = b^x$<br>$f^{-1} : x = b^y$<br>$y = \log_b x$  | ✓ interchange $x$ and $y$<br>✓ answer<br>(2)  |
| 6.2 | $y = x$  | ✓ answer (1)  |
| 6.3 | P(0; 1)  | ✓ answer (1)  |
| 6.4 | T(1; 0)<br><br>$y = mx + c$<br>$y = -x + 1$  | ✓ coordinates of T<br><br>✓ $y = -x + 1$ (2)  |
| 6.5 | At point R, PT and OR intersect:<br>$-x + 1 = x$<br>$2x = 1$<br>$x = \frac{1}{2}$<br>$y = \frac{1}{2}$<br>Substitute $\left(\frac{1}{2}; \frac{1}{2}\right)$ into the equation of $f$ :<br><br>$y = b^x$<br>$\frac{1}{2} = b^{\frac{1}{2}}$<br>$b = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$<br><b>OR/OF</b><br>At point R, PT and OR intersect:<br>$-x + 1 = x$<br>$2x = 1$<br>$x = \frac{1}{2}$<br>$y = \frac{1}{2}$<br>Substitute $\left(\frac{1}{2}; \frac{1}{2}\right)$ into the equation of $g$ :<br><br>$y = \log_b x$<br>$\frac{1}{2} = \log_b \left(\frac{1}{2}\right)$<br>$b^{\frac{1}{2}} = \frac{1}{2}$<br>$b = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$ | ✓ $-x + 1 = x$<br><br>✓ $x = \frac{1}{2}$<br>✓ $y = \frac{1}{2}$<br><br>✓ substitution<br>✓ $b = \frac{1}{4}$<br><br>(5)<br><br>✓ $-x + 1 = x$<br><br>✓ $x = \frac{1}{2}$<br>✓ $y = \frac{1}{2}$<br><br>✓ substitution<br><br>✓ $b = \frac{1}{4}$<br><br>(5)<br><b>[11]</b> |

**QUESTION/VRAAG 7**

|     |   |   |
|-----|---|---|
| 7.1 | $A = P(1-i)^n$ $331527 = 500000(1-i)^3$ $(1-i)^3 = \frac{331527}{500000}$ $1-i = \sqrt[3]{\frac{331527}{500000}}$ $i = 0,12800\dots$ $= 12,8\%$   | <p>✓ substitution of A, P &amp; n in correct formula</p> <p>✓ <math>1-i = \sqrt[3]{\frac{331527}{500000}}</math> or</p> <p><math>1-i = \sqrt[3]{0,663054}</math></p> <p>✓ answer</p> <p style="text-align: right;">(3)</p>  |
| 7.2 | $P = \frac{x[1-(1+i)^{-n}]}{i}$ $46\ 000 = \frac{1900 \left[ 1 - \left( 1 + \frac{0,24}{12} \right)^{-n} \right]}{\frac{0,24}{12}}$ $\frac{46}{95} = 1 - \left( 1 + \frac{0,24}{12} \right)^{-n}$ $\left( 1 + \frac{0,24}{12} \right)^{-n} = \frac{49}{95}$ $n = -\log_{\left( 1 + \frac{0,24}{12} \right)} \frac{49}{95} \quad \text{OR/OF} \quad -n \log \left( 1 + \frac{0,24}{12} \right) = \log \frac{49}{95}$ $= 33,43276544\dots \text{ months}$ <p>It will take him 34 months to pay back the loan.</p> | <p>✓ <math>i = \frac{0,24}{12} / 0,02 / \frac{1}{50}</math></p> <p>✓ substitution of P, x and i in correct formula</p> <p>✓ 33,43</p> <p>✓ answer</p> <p style="text-align: right;">(4)</p>   |
| 7.3 | $F = \frac{x[(1+i)^n - 1]}{i}$ $= \frac{3500 \left[ \left( 1 + \frac{0,075}{4} \right)^{4 \times 6,5} - 1 \right]}{\frac{0,075}{4}}$ $= R\ 115\ 902,69$ $A = P(1+i)^n$ $= 115\ 902,69 \left( 1 + \frac{0,075}{4} \right)^{4 \times 3,5}$ $= R\ 150\ 328,12$   | <p>✓ <math>i = \frac{0,075}{4} / 0,01875</math></p> <p>✓ <math>n = 4 \times 6,5 = 26</math></p> <p>✓ substitution into correct formula</p> <p>✓ 115 902,69</p> <p>✓ substitution into correct formula</p> <p>✓ 150 328,12</p> <p style="text-align: right;">(6)</p> <p style="text-align: right;"><b>[13]</b></p> |

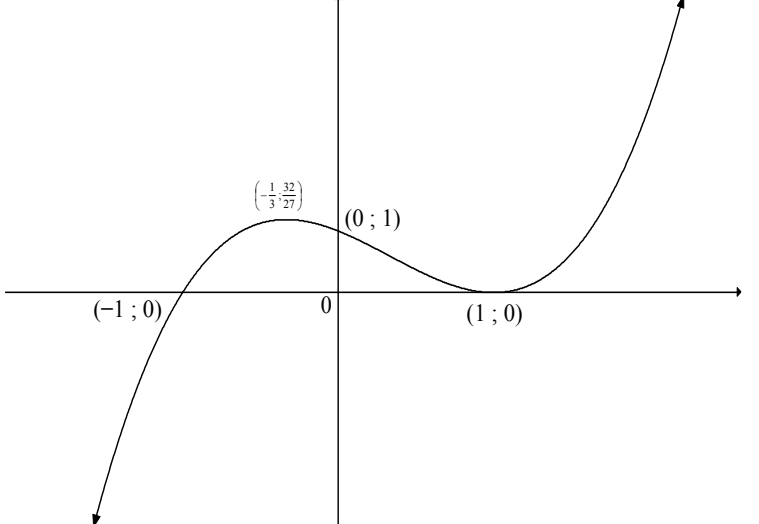
**QUESTION/VRAAG 8**

|     |   |  |
|-----|---|--|
| 8.1 | $f(x+h) = 3 - 2(x+h)^2$ $= 3 - 2x^2 - 4xh - 2h^2$ $f(x+h) - f(x) = 3 - 2x^2 - 4xh - 2h^2 - 3 + 2x^2$ $= -4xh - 2h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{-4xh - 2h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-4x - 2h)}{h}$ $= \lim_{h \rightarrow 0} (-4x - 2h)$ $= -4x$ <p><b>OR/OF</b></p> $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{3 - 2(x+h)^2 - (3 - 2x^2)}{h}$ $= \lim_{h \rightarrow 0} \frac{3 - 2x^2 - 4xh - 2h^2 - 3 + 2x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{-4xh - 2h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-4x - 2h)}{h}$ $= \lim_{h \rightarrow 0} (-4x - 2h)$ $= -4x$ | $\checkmark 3 - 2x^2 - 4xh - 2h^2$ $\checkmark -4xh - 2h^2$ $\checkmark f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $\checkmark \lim_{h \rightarrow 0} (-4x - 2h)$ $\checkmark -4x \quad (5)$<br>$\checkmark f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $\checkmark 3 - 2x^2 - 4xh - 2h^2$ $\checkmark -4xh - 2h^2$ $\checkmark \lim_{h \rightarrow 0} (-4x - 2h)$ $\checkmark -4x \quad (5)$ |
| 8.2 | $y = \frac{12x^2 + 2x + 1}{6x}$ $= 2x + \frac{1}{3} + \frac{1}{6x}$ $= 2x + \frac{1}{3} + \frac{1}{6}x^{-1}$ $\frac{dy}{dx} = 2 - \frac{1}{6}x^{-2}$ $= 2 - \frac{1}{6x^2}$   | $\checkmark \frac{12x^2}{6x} + \frac{2x}{6x} + \frac{1}{6x}$ $\checkmark \frac{1}{6}x^{-1}$ $\checkmark 2$ $\checkmark -\frac{1}{6}x^{-2}$ <p style="text-align: right;">(4)</p>   |

|   |  |
|---|--|
| <p>8.3</p> $y = x^3 + bx^2 + cx - 4$ $y' = 3x^2 + 2bx + c$ $y'' = 6x + 2b$ <p>At point of inflection:</p> $y'' = 6x + 2b = 0$ <p>Substitute <math>x = 2</math>:</p> $6(2) + 2b = 0$ $2b = -12$ $b = -6$ $y = x^3 - 6x^2 + cx - 4$ <p>Substitute (2; 4):</p> $4 = 2^3 - 6(2)^2 + c(2) - 4$ $2c = 24$ $c = 12$ $y = x^3 - 6x^2 + 12x - 4$ | <p>✓ <math>y' = 3x^2 + 2bx + c</math></p> <p>✓ <math>y'' = 6x + 2b</math></p><br><p>✓ <math>y'' = 0</math></p> <p>✓ sub <math>x = 2</math> into <math>y'' = 0</math></p> <p>✓ value of <math>b</math></p><br><p>✓ substitute (2; 4)</p> <p>✓ value of <math>c</math></p> |
|   | <p>(7)</p> <p><b>[16]</b></p>  |

**QUESTION/VRAAG 9**

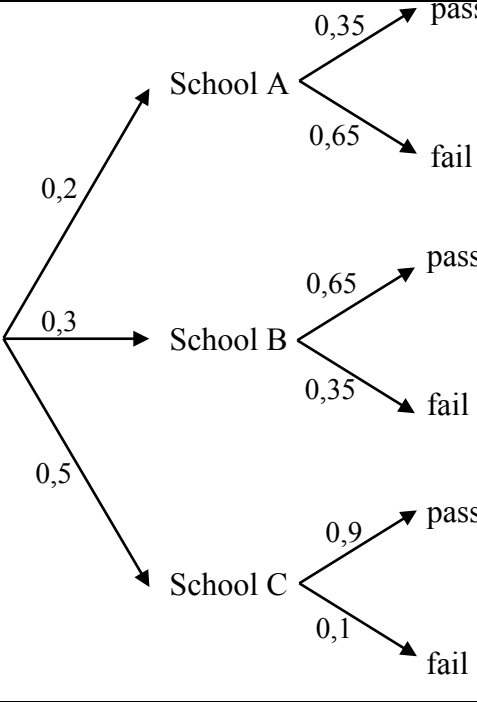
|  |  |                          |
|--|--|--------------------------|
| <p>9.1</p> <p>(0 ; 1)</p>  | <p>✓ answer</p>  | <p>(1)</p>               |
| <p>9.2</p> $f(x) = x^3 - x^2 - x + 1$ $f(x) = x^2(x - 1) - (x - 1)$ $f(x) = (x - 1)(x^2 - 1)$ $f(x) = (x - 1)(x - 1)(x + 1)$ $f(x) = 0$ $(x - 1)(x - 1)(x + 1) = 0$ <p>x-intercepts: (-1; 0); (1; 0)</p> <p><b>OR</b></p> $f(x) = x^3 - x^2 - x + 1$ $f(x) = (x - 1)(x^2 - 1)$ $f(x) = (x - 1)(x - 1)(x + 1)$ $f(x) = 0$ $(x - 1)(x - 1)(x + 1) = 0$ <p>x-intercepts: (-1; 0); (1; 0)</p> <p><b>OR</b></p> | <p>✓ (x - 1)</p> <p>✓ (x<sup>2</sup> - 1)</p> <p>✓ (x - 1)(x - 1)(x + 1)</p><br><p>✓ (-1; 0)</p> <p>✓ (1; 0)</p><br><p>✓ (x - 1)</p> <p>✓ (x<sup>2</sup> - 1)</p> <p>✓ (x - 1)(x - 1)(x + 1)</p><br><p>✓ (-1; 0)</p> <p>✓ (1; 0)</p> | <p>(5)</p><br><p>(5)</p> |

|            |   |  |
|------------|---|--|
|            | $f(x) = x^3 - x^2 - x + 1$ $f(x) = (x + 1)(x^2 - 2x + 1)$ $f(x) = (x + 1)(x - 1)(x - 1)$ $f(x) = 0$ $(x - 1)(x - 1)(x + 1) = 0$ <p>x-intercepts: <math>(-1; 0); (1; 0)</math></p>                           | <ul style="list-style-type: none"> <li>✓ <math>(x + 1)</math></li> <li>✓ <math>(x^2 - 2x + 1)</math></li> <li>✓ <math>(x - 1)(x - 1)(x + 1)</math></li> <li>✓ <math>(-1; 0)</math></li> <li>✓ <math>(1; 0)</math></li> </ul> <p style="text-align: right;">(5)</p>                                   |
| <p>9.3</p> | $f(x) = x^3 - x^2 - x + 1$ $f'(x) = 3x^2 - 2x - 1$ $f'(x) = 0$ $(3x + 1)(x - 1) = 0$ $x = -\frac{1}{3} \text{ or } x = 1$ $y = \frac{32}{27} \quad y = 0$ $\left(-\frac{1}{3}; \frac{32}{27}\right) (1; 0)$ | <ul style="list-style-type: none"> <li>✓ <math>f'(x) = 3x^2 - 2x - 1</math></li> <li>✓ <math>f'(x) = 0</math></li> <li>✓ factorisation</li> <li>✓ x value</li> <li>✓ x value</li> <li>✓ <math>y = \frac{32}{27}</math></li> </ul> <p style="text-align: right;">(6)</p>                              |
| <p>9.4</p> |    | <ul style="list-style-type: none"> <li>✓ y- and x-intercepts</li> <li>✓ shape</li> <li>✓ turning points</li> </ul> <p style="text-align: right;">(3)</p>   |
| <p>9.5</p> | $f'(x) < 0$ $-\frac{1}{3} < x < 1$ <p><b>OR/OF</b></p> $\left(-\frac{1}{3}; 1\right)$   | <ul style="list-style-type: none"> <li>✓ <math>x &gt; -\frac{1}{3}</math></li> <li>✓ <math>x &lt; 1</math></li> <li>✓ <math>\left(-\frac{1}{3}; 1\right)</math></li> </ul> <p style="text-align: right;">(2)</p> <p style="text-align: right;">(2)</p> <p style="text-align: right;"><b>[17]</b></p> |

**QUESTION/VRAAG 10**

|      |  |   |
|------|--|---|
| 10.1 | $60 = 2b + 2r + \frac{1}{2}(2\pi r)$ $2b = 60 - 2r - \pi r$ $b = 30 - r - \frac{1}{2}\pi r$  | $\checkmark 60 = 2b + 2r + \frac{1}{2}(2\pi r)$ $\checkmark b = 30 - r - \frac{1}{2}\pi r$ <p style="text-align: right;">(2)</p>  |
| 10.2 | <p>Area = area of rectangle + area of semicircle</p> $A(r) = \text{length} \times \text{breadth} + \frac{1}{2}(\text{area of circle})$ $= (2r)\left(30 - r - \frac{1}{2}\pi r\right) + \frac{1}{2}(\pi r^2)$ $= 60r - 2r^2 - \pi r^2 + \frac{1}{2}\pi r^2$ $= 60r - 2r^2 - \frac{1}{2}\pi r^2$ $= 60r - \left(2 + \frac{1}{2}\pi\right)r^2$ <p>For a maximum,</p> $A'(r) = 0$ $60 - 2\left(2 + \frac{1}{2}\pi\right)r = 0$ $60 - (4 + \pi)r = 0$ $r = \frac{60}{4 + \pi}$ $= 8,40 \text{ m}$ | $\checkmark (2r)\left(30 - r - \frac{1}{2}\pi r\right)$ $\checkmark \frac{1}{2}(\pi r^2)$ $\checkmark 60r - 2r^2 - \frac{1}{2}\pi r^2$ $\checkmark A'(r) = 0$ $\checkmark 60 - 2\left(2 + \frac{1}{2}\pi\right)r$ $\checkmark \text{answer}$ <p style="text-align: right;">(6)<br/><b>[8]</b></p> |

**QUESTION/VRAAG 11**

|        |  |  |
|--------|--|--|
| 11.1   | $8 \times 7 \times 6 \times 5 \times 4$ or $\frac{8!}{3!}$<br>$= 6720$   | $\checkmark 8 \times 7 \times 6 \times 5 \times 4 / \frac{8!}{3!}$<br>$\checkmark 6720$<br>(2)   |
| 11.2   | $P(A \text{ and } B) = P(A) \times P(B)$<br>$= 0,4 \times 0,35$<br>$= 0,14$<br>$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$<br>$= 0,4 + 0,35 - 0,14$<br>$= 0,61$ | $\checkmark 0,4 \times 0,35$<br>$\checkmark 0,14$<br>$\checkmark$ substitution<br>$\checkmark$ answer<br>(4)   |
|        |    |  |
| 11.3.1 | $100\% - 20\%$ or/of $1 - 0,2$<br>$= 80\%$ or/of $= 0,8$<br><b>OR/OF</b><br>$30\% + 50\% = 80\%$ or/of $0,3 + 0,5 = 0,8$   | $\checkmark 100\% - 20\%$ or $1 - 0,2$<br>$\checkmark 80\%$ or $0,8$<br>$\checkmark 30\% + 50\%$ or $0,3 + 0,5$<br>$\checkmark 80\%$ or $0,8$<br>(2) |
| 11.3.2 | $0,3 \times 0,35 = 0,105$<br>$= 10,5\%$  | $\checkmark 0,3$<br>$\checkmark 0,35$<br>$\checkmark 0,105 = 10,5\%$<br>(3)  |
| 11.3.3 | $(0,2 \times 0,35) + (0,3 \times 0,65) + (0,5 \times 0,9)$<br>$= 0,715$<br>$= 71,5\%$  | $\checkmark 0,2 \times 0,35$<br>$\checkmark 0,3 \times 0,65$<br>$\checkmark 0,5 \times 0,9$<br>$\checkmark$ answer<br>(4)<br><b>[15]</b>             |

**TOTAL/TOTAAL: 150**





# basic education

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

## **SENIOR CERTIFICATE EXAMINATIONS/ SENIORSERTIFIKAAT-EKSAMEN**

**MATHEMATICS P1/WISKUNDE VI**

**2016**

**MARKING GUIDELINE (ADDENDUM)**

**MARKS/PUNTE: 150**

**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, sien slegs die EERSTE poging na.
- Volgehoue akkuraatheid is op ALLE aspekte van die memorandum van toepassing.

Once a candidate has reached 2 errors related to marks: stop marking.

**QUESTION/VRAAG 1**

|       |   |
|-------|---|
| 1.1.1 | <ul style="list-style-type: none"> <li>• incorrect rounding 2/3 – only rounding penalization</li> <li>• use of calculator 2/3 – this is where use of calculator for factors get used</li> <li>• answer in surd form 2/3 ( at least simplified under square root)</li> </ul>   |
| 1.1.2 | <ul style="list-style-type: none"> <li>• CA mark only if quadratic equation</li> <li>• check answers</li> <li>• if <math>6x^2 - 15 = x + 1</math> breakdown 0/3</li> <li>• both answer must be seen before selection if no factors are shown</li> <li>• if in the context of their incorrect sum, both of the answers are NA, both need to be shown as NA</li> </ul>  |
| 1.1.3 | $(x + 6)(x - 4) \geq 0$ <ul style="list-style-type: none"> <li>• <math>x \geq 4</math> or / and <math>x \geq -6</math>, award 1/3 marks (factors)</li> <li>• <math>x \leq 4</math> or / and <math>x \leq -6</math>, award 1/3 marks (factors)</li> <li>• <math>-6 \leq x \leq 4</math>, award 1/3 marks (factors)</li> <li>• <math>x \leq -6</math> and <math>x \geq 4</math>, award 2/3 marks</li> <li>• equal is left out: -1</li> </ul> <p>Answer only 3/3</p> |
| 1.2   | <p><b>NB:</b> At the second error related to a mark (two skills) – no further marking.<br/>If incorrect algebra leads to the equation being linear: max 2/6 These marks will be the changing of the formula and the substitution mark.</p>  |
| 1.3.2 | <p>CA from 1.3.1</p> <ul style="list-style-type: none"> <li>• If <math>7^x = p</math> can award 1 mark for the concept</li> <li>• If answer <math>x = 2</math> only 2/3</li> </ul>  |

**QUESTION/VRAAG 2**

|       |   |
|-------|---|
| 2.1.2 | <p>CA from 2.1.1<br/>Answer only 2/2</p>  |
| 2.1.3 | <p>Answer only 1/4</p> <ul style="list-style-type: none"> <li>• If <math>n = 7</math> 2/4</li> <li>• Incorrect working that leads to use of logs and an not a natural number max 2/4</li> </ul> |
| 2.2.1 | <p>Answer only 2/2</p>  |
| 2.2.2 | <ul style="list-style-type: none"> <li>• Answer only 1/6</li> </ul>   |

|  |   |
|--|---|
|  | <ul style="list-style-type: none"> <li><math>S_n</math> has to equal 30 500 otherwise a BD</li> </ul> |
|--|---|

**QUESTION/VRAAG 3**

|     |                  |
|-----|------------------|
| 3.2 | $n = 5$ only 1/3 |
| 3.3 | Answer only 1/4  |

**QUESTION/VRAAG 4**

|     |                        |
|-----|------------------------|
| 4.1 | $x = 4$ ; $y = 3$ 1/1  |
| 4.3 | $y = 0$ can be implied |
| 4.4 | CA from 4.2 and 4.3    |

**QUESTION/VRAAG 5**

|     |   |
|-----|---|
| 5.1 | Only working out, but no sketch max 4/6 – loose shape mark per graph not sketched |
| 5.2 | CA from turning point in 5.1  |
| 5.3 | CA from sketch (TP to $y$ -intercept)   |
| 5.4 | Answer only 2/2   |

**QUESTION/VRAAG 6**

|     |  |
|-----|--|
| 6.1 | Answer only 2/2<br>If answer not in terms of $b$ max 1/2 |
| 6.3 | Coordinate from not needed                               |

**QUESTION/VRAAG 7**

**Penalise candidates a maximum of one mark (overall) for notation error in 7.1 and 7.2**

|     |  |
|-----|--|
| 7.1 | <ul style="list-style-type: none"> <li>Interchange A and P – breakdown 0/3</li> <li>Wrong formula 0/3</li> <li>Early rounding: answer is 12,93% – 2/3</li> </ul>   |
| 7.3 | <ul style="list-style-type: none"> <li><math>i</math> and <math>n</math> incorrect – learner can still get the substitution mark 1/6</li> <li>If quarterly is taken as monthly consistently in both parts 5/6</li> </ul> $A = P(1 + i)^n$ <ul style="list-style-type: none"> <li>If 10 years is used: <math>= 115\,902,69 \left(1 + \frac{0,075}{4}\right)^{4 \times 10}</math> 5/6<br/><math>= R\,243\,667,94</math></li> </ul> |

**QUESTION/VRAAG 8****Penalise candidates a maximum of one mark (overall) for notation error in 8.1 and 8.2**

|     |   |                        |
|-----|---|------------------------|
| 8.1 | $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ <p style="text-align: center;"> <span style="margin-right: 100px;"><u>Notation</u></span> <span><u>formula</u></span> </p>               | Formula can be implied |
| 8.2 | <ul style="list-style-type: none"> <li>• If function and derivative is mixed but splitting of fractions is evident max ¾</li> <li>• If they start with differentiation – breakdown 0/4</li> </ul> |                        |
| 8.3 | $y'' = 0$ can be implied  |                        |

**QUESTION/VRAAG 9**

|     |  |  |
|-----|--|--|
| 9.2 | No working is shown(calculator used) <ul style="list-style-type: none"> <li>• If the cubic becomes a quadratic 2/5</li> <li>• If three brackets 5/5</li> </ul> |  |
| 9.3 | $f'(x) = 0$ cannot be implied<br>$f'(x) = 3x^2 - 2x - 1$<br>$x = -\left(\frac{-2}{2(3)}\right)$ <b>BE CAREFUL</b> 1/6 for derivative<br>$= \frac{1}{3}$        |  |
| 9.4 | If dots only indicated on the graph 1/3 – x and y-intercepts   |  |
| 9.5 | Only CA from a cubic graph<br>Each answer gets evaluated independently   |  |

**QUESTION/VRAAG 10**

|      |   |
|------|---|
| 10.2 | Derivative equal to zero is an independent mark<br>$A'(r) = 0$ can be implied if working is correct |
|------|---|

**QUESTION/VRAAG 11****If percentages are used – penalize once per question**

|        |                                 |
|--------|---------------------------------|
| 11.1   | Answer only 2/2<br>2 or 0 marks |
| 11.3.2 | Do not penalize rounding        |
| 11.3.3 | Do not penalize rounding        |