



# basic education

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

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12/GRAAD 12**

**MATHEMATICS P1/WISKUNDE VI**

**FEBRUARY/MARCH/FEBRUARIE/MAART 2016**

**MEMORANDUM**

**MARKS: 150**

**PUNTE: 150**

**This memorandum consists of 18 pages.  
*Hierdie memorandum bestaan uit 18 bladsye.***

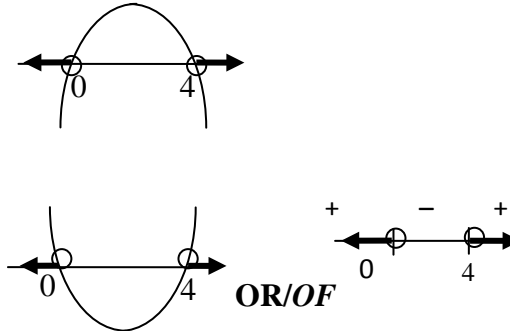
**NOTE:**

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

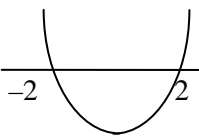
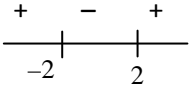
**LET WEL:**

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

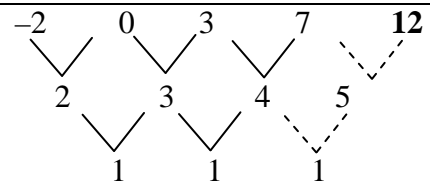
**QUESTION/VRAAG 1**

<p>1.1.1</p>	$x^2 - x - 12 = 0$ $(x - 4)(x + 3) = 0$ $x = 4 \text{ or } x = -3$ <p><b>OR/OF</b></p> $x^2 - x - 12 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-12)}}{2(1)}$ $= 4 \text{ or } -3$	<p>✓ factors</p> <p>✓✓ answers (3)</p> <p>✓ substitution into formula</p> <p>✓✓ answers (3)</p>
<p>1.1.2</p>	$x(x + 3) - 1 = 0$ $x^2 + 3x - 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-3 \pm \sqrt{3^2 - 4(1)(-1)}}{2(1)}$ $= \frac{-3 \pm \sqrt{13}}{2}$	<p>✓ standard form</p> <p>✓ substitution into correct formula</p> <p>✓ answer (3)</p>
<p>1.1.3</p>	$x(4 - x) < 0$ $x < 0 \text{ or } x > 4$ <p><b>OR/OF</b></p> $x(4 - x) < 0$ $x(x - 4) > 0$ $x < 0 \text{ or } x > 4$ 	<p>✓ <math>x &lt; 0</math></p> <p>✓ <math>x &gt; 4</math></p> <p>✓ or (3)</p> <p>✓ <math>x &lt; 0</math></p> <p>✓ <math>x &gt; 4</math></p> <p>✓ or (3)</p>

<p>1.1.4</p>	$x = \frac{a^2 + a - 2}{a - 1}$ $= \frac{(a + 2)(a - 1)}{a - 1}$ $= a + 2$ $= 88888888888890$	<p>✓ <math>(a + 2)(a - 1)</math></p> <p>✓ answer (check ten eights written)/tien agtstes geskryf (2)</p>
<p>1.2</p>	$y + 7 = 2x$ $y = 2x - 7 \dots\dots\dots(1)$ $x^2 - xy + 3y^2 = 15$ <p>substitute (1) in (2) :</p> $x^2 - x(2x - 7) + 3(2x - 7)^2 = 15$ $x^2 - 2x^2 + 7x + 3(4x^2 - 28x + 49) = 15$ $x^2 - 2x^2 + 7x + 12x^2 - 84x + 147 - 15 = 0$ $11x^2 - 77x + 132 = 0$ $x^2 - 7x + 12 = 0$ $(x - 3)(x - 4) = 0$ $x = 3 \quad \text{or} \quad x = 4$ $y = 2(3) - 7 \quad y = 2(4) - 7$ $y = -1 \quad \quad \quad y = 1$ <p><b>OR/OF</b></p> $y + 7 = 2x$ $x = \frac{y + 7}{2} \dots\dots\dots(1)$ $x^2 - xy + 3y^2 = 15 \quad \dots\dots\dots(2)$ <p>substitute (1) in (2) :</p> $\left(\frac{y + 7}{2}\right)^2 - \left(\frac{y + 7}{2}\right)y + 3y^2 = 15$ $\frac{y^2 + 14y + 49}{4} - \frac{y^2 + 7y}{2} + 3y^2 = 15$ $y^2 + 14y + 49 - 2y^2 - 14y + 12y^2 - 60 = 0$ $11y^2 - 11 = 0$ $y^2 - 1 = 0$ $(y - 1)(y + 1) = 0$ $y = -1 \quad \quad \quad y = 1$ $x = \frac{-1 + 7}{2} \quad \quad \quad x = \frac{1 + 7}{2}$ $x = 3 \quad \quad \quad x = 4$	<p>✓ <math>y = 2x - 7</math></p> <p>✓ substitution</p> <p>✓ standard form</p> <p>✓ factorisation</p> <p>✓ x-values</p> <p>✓ y-values</p> <p>(6)</p> <p>✓ <math>x = \frac{y + 7}{2}</math></p> <p>✓ substitution</p> <p>✓ standard form</p> <p>✓ factorisation</p> <p>✓ y-values</p> <p>✓ x-values (6)</p>

1.3	$y = x + \frac{1}{x}$ $xy = x^2 + 1$ $x^2 - xy + 1 = 0$ <p>Since <math>x</math> is real, this equation has real roots./Omdat <math>x</math> reëel is, het die vergelyking reële wortels.</p> $\Delta \geq 0$ $y^2 - 4 \geq 0$ $(y - 2)(y + 2) \geq 0$ <div style="display: flex; justify-content: space-around; align-items: center;">  <p><b>OR/ OF</b></p>  </div> $y \leq -2 \text{ or } y \geq 2$	$\checkmark x^2 - xy + 1 = 0$ $\checkmark \Delta \geq 0$ $\checkmark y^2 - 4$ $\checkmark \text{factors}$  $\checkmark y \leq -2$ $\checkmark y \geq 2$ <p style="text-align: right;">(6) <b>[23]</b></p>
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**QUESTION/VRAAG 2**

2.1.1	 <p>The next term of the sequence is 12./Die volgende term in die ry is 12.</p>	$\checkmark \text{answer}$ <p style="text-align: right;">(1)</p>
2.1.2	$2a = 1$ $a = \frac{1}{2}$ $3a + b = T_2 - T_1$ $3\left(\frac{1}{2}\right) + b = 2$ $b = \frac{1}{2}$ $a + b + c = T_1$ $\frac{1}{2} + \frac{1}{2} + c = -2$ $c = -3$ $\therefore T_n = \frac{1}{2}n^2 + \frac{1}{2}n - 3$ <p><b>OR/OF</b></p>	$\checkmark \text{value of } a$ $\checkmark 3\left(\frac{1}{2}\right) + b = 2$  $\checkmark \text{value of } b$ $\checkmark \frac{1}{2} + \frac{1}{2} + c = -2$  $\checkmark \text{value of } c$ <p style="text-align: right;">(5)</p>



	<p>Since <math>T_2 = 0</math>, <math>(n - 2)</math> is a factor of <math>T_n</math></p> $T_n = an^2 + bn + c$ $= a(n - 2)(n - k)$ $T_1 = -2 = a(1 - 2)(1 - k)$ $-2 = -a(1 - k)$ $a = \frac{2}{1 - k}$ $T_3 = 3 = a(3 - 2)(3 - k)$ $3 = a(3 - k)$ $a = \frac{3}{3 - k}$ $\frac{2}{1 - k} = \frac{3}{3 - k}$ $2(3 - k) = 3(1 - k)$ $6 - 2k = 3 - 3k$ $k = -3$ $a = \frac{1}{2}$ $T_n = \frac{1}{2}(n - 2)(n + 3)$ $= \frac{1}{2}n^2 + \frac{1}{2}n - 3$	<p>✓ <math>T_n = a(n - 2)(n - k)</math></p> <p>✓ <math>-2 = a(1 - 2)(1 - k)</math></p> <p>✓ <math>3 = a(3 - 2)(3 - k)</math></p> <p>✓ value of <math>k</math></p> <p>✓ value of <math>a</math></p> <p>(5)</p>
<p>2.1.3</p>	$\frac{1}{2}n^2 + \frac{1}{2}n - 3 = 322$ $n^2 + n - 6 = 644$ $n^2 + n - 650 = 0$ $n = \frac{-1 \pm \sqrt{1^2 - 4(1)(-650)}}{2}$ $n = 25 \text{ or } n = -26$ <p>The 25<sup>th</sup> term has a value of 322./Die 25<sup>ste</sup> term se waarde is 322.</p> <p><b>OR/OF</b></p> $\frac{1}{2}n^2 + \frac{1}{2}n - 3 = 322$ $n^2 + n - 6 = 644$ $n^2 + n - 650 = 0$ $(n - 25)(n + 26) = 0$ $n = 25 \text{ or } n = -26$ <p>The 25<sup>th</sup> term has a value of 322./Die 25<sup>ste</sup> term se waarde is 322.</p> <p><b>OR/OF</b></p>	<p>✓ <math>\frac{1}{2}n^2 + \frac{1}{2}n - 3 = 322</math></p> <p>✓ standard form</p> <p>✓ substitution into quadratic formula</p> <p>✓ answer</p> <p>(4)</p> <p>✓ <math>\frac{1}{2}n^2 + \frac{1}{2}n - 3 = 322</math></p> <p>✓ standard form</p> <p>✓ factors</p> <p>✓ answer</p> <p>(4)</p>

	$\frac{1}{2}n^2 + \frac{1}{2}n - 3 = 322$ $n^2 + n - 6 = 644$ $(n+3)(n-2) = 23 \times 28$ $n-2 = 23$ $n = 25$	$\checkmark \frac{1}{2}n^2 + \frac{1}{2}n - 3 = 322$ $\checkmark (n+3)(n-2)$ $\checkmark 23 \times 28$ $\checkmark \text{answer}$ <p style="text-align: right;">(4)</p>
2.2.1	$T_2 : a + d = 8$ $T_5 : a + 4d = 10$ $T_5 - T_2 : 3d = 2$ $d = \frac{2}{3}$	$\checkmark a + d = 8$ $\checkmark a + 4d = 10$ $\checkmark \text{answer}$ <p style="text-align: right;">(3)</p>
2.2.2	$T_1 = T_2 - d$ $= 8 - \frac{2}{3}$ $= \frac{22}{3}$ $T_n = a + (n-1)d$ $= \frac{22}{3} + (n-1)\frac{2}{3}$ $= \frac{2n+20}{3}$ $S_{50} = \sum_{n=1}^{50} \left( \frac{22}{3} + (n-1)\frac{2}{3} \right)$ <p><b>OR/OF</b></p> $S_{50} = \sum_{n=1}^{50} \left( \frac{2n+20}{3} \right)$	$\checkmark T_1 = \frac{22}{3}$ $\checkmark \text{answer}$ <p style="text-align: right;">(2)</p> <p style="text-align: right;">(2)</p>
2.2.3	$S_n = \frac{n}{2}[2a + (n-1)d]$ $S_{50} = \frac{50}{2} \left[ 2 \left( \frac{22}{3} \right) + (50-1) \left( \frac{2}{3} \right) \right]$ $= \frac{3550}{3}$	$\checkmark \text{correct substitution into correct formula}$ $\checkmark \checkmark \text{answer}$ <p style="text-align: right;">(3)</p> <p style="text-align: right;"><b>[18]</b></p>

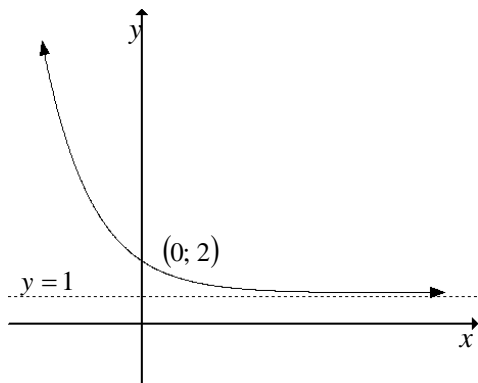
**QUESTION/VRAAG 3**

<p>3.1</p>	$r = \frac{70}{100}$ $= \frac{7}{10}$ $T_n = ar^{n-1}$ $11,76 = 100\left(\frac{7}{10}\right)^{n-1}$ $\left(\frac{7}{10}\right)^{n-1} = \frac{11,76}{100}$ $n-1 = \log_{\frac{7}{10}}\left(\frac{11,76}{100}\right)$ $n-1 = 6$ $n = 7$ <p>During the 7<sup>th</sup> year/<i>In die 7<sup>de</sup> jaar</i></p> <p><b>OR/OF</b></p> $r = \frac{70}{100}$ $= \frac{7}{10}$ $T_n = ar^{n-1}$ $11,76 = 100(0,7)^{n-1}$ $0,7^{n-1} = \frac{11,76}{100}$ $= 0,1176$ $(n-1)\log 0,7 = \log 0,1176$ $n-1 = \frac{\log 0,1176}{\log 0,7}$ $n-1 = 6$ $n = 7$ <p>During the 7<sup>th</sup> year/<i>In die 7<sup>de</sup> jaar</i></p>	<p>✓ value of <math>r</math></p> <p>✓ substitution in formula for <math>T_n</math></p> <p>✓ use of logarithms</p> <p>✓ answer (4)</p> <p>✓ value of <math>r</math></p> <p>✓ substitution in formula for <math>T_n</math></p> <p>✓ use of logarithms</p> <p>✓ answer (4)</p>
<p>3.2</p>	$h(n) = 130 + (100 + 70 + 49 + \dots \text{to } n \text{ terms})$ $= 130 + \frac{100(1 - (0,7)^n)}{1 - 0,7}$ $= 130 + \frac{100(1 - (0,7)^n)}{0,3}$	<p>✓ 130</p> <p>✓ 100 + 70 + 49 + ...to <math>n</math> terms</p> <p>✓ answer (3)</p>



3.3	Eventual height of the tree/ <i>Uiteindelijke hoogte van die boom</i> $= 130 + \frac{100}{1 - 0,7}$ $= 463,33 \text{ mm} \quad \text{OR} \quad \frac{1390}{3} \text{ mm}$	$\checkmark \checkmark 130 + \frac{100}{1 - 0,7}$  $\checkmark$ answer  (3) <b>[10]</b>
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**QUESTION/VRAAG 4**

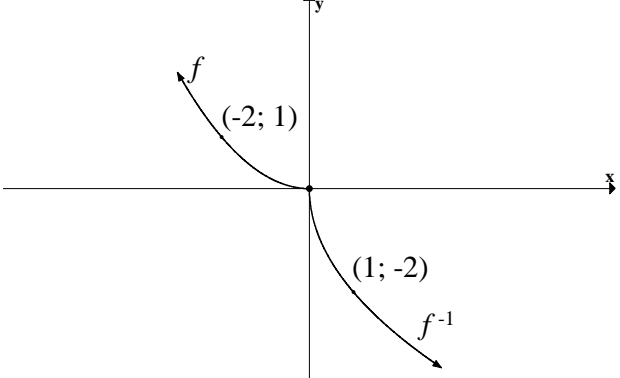
4.1	(0 ; 2)	$\checkmark$ answer  (1)
4.2		$\checkmark$ shape  $\checkmark$ (0; 2)  $\checkmark$ asymptote  (3)
4.3	$f(-2) = 5$ $f(1) = 2^{-1} + 1 = \frac{3}{2}$ Average gradient = $\frac{f(1) - f(-2)}{1 - (-2)}$ $= \frac{\frac{3}{2} - 5}{3}$ $= -\frac{7}{6}$	$\checkmark f(-2) = 5$ $\checkmark f(1) = \frac{3}{2}$  $\checkmark$ answer  (3)
4.4	Since the asymptote of $f$ is $y = 1$ , the asymptote of $h(x) = 3f(x)$ will be $y = 3$ .  <i>Omdat die asimptoot van <math>f</math> <math>y = 1</math> is,                  sal die asimptoot van <math>h(x) = 3f(x)</math> <math>y = 3</math> wees.</i>	$\checkmark$ answer  (1) <b>[8]</b>

**QUESTION/VRAAG 5**

5.1	$y = a(x + p)^2 + q$ <p>Turning point (1 ; -8): <math>y = a(x - 1)^2 - 8</math></p> <p>Substitute (0 ; -4): <math>-4 = a(0 - 1)^2 - 8</math></p> $-4 = a - 8$ $a = 4 \quad p = -1 \quad q = -8$ $y = 4(x - 1)^2 - 8$	<p>✓ <math>y = a(x - 1)^2 - 8</math></p> <p>✓ substitute (0;-4)</p> <p>✓ <math>a = 4</math></p> <p>✓ <math>p</math> and <math>q</math> values</p> <p>(4)</p>
5.2	<p>Asymptote is <math>y = -2 \Rightarrow d = -2</math></p> <p>Substitute (1; -8):</p> $-8 = \frac{k}{1+r} - 2$ $k = -6(1+r)$ $k = -6 - 6r \dots\dots\dots \text{line 1}$ <p>Substitute (0; -4):</p> $-4 = \frac{k}{r} - 2$ $\frac{k}{r} = -2$ $k = -2r \dots\dots\dots \text{line 2}$ <p>Equating lines 1 and 2:</p> $-6 - 6r = -2r$ $-4r = 6$ $r = -\frac{3}{2}$ <p>Substituting into line 2                      or    line 1:</p> $k = (-2)\left(-\frac{3}{2}\right) = 3$ $k = -6 - 6\left(-\frac{3}{2}\right) = 3$	<p>✓ <math>d = -2</math></p> <p>✓ <math>k = -6 - 6r</math></p> <p>✓ <math>k = -2r</math></p> <p>✓ <math>-6 - 6r = -2r</math></p> <p>✓ value of <math>r</math></p> <p>✓ value of <math>k</math></p> <p>(6)</p>
5.3	$g(x) \geq f(x)$ $\therefore 0 \leq x \leq 1$	<p>✓ <math>0 \leq x</math></p> <p>✓ <math>x \leq 1</math></p> <p>(2)</p>
5.4	<p>The line <math>y = k</math> must pass through <math>f</math> twice on the positive side of the <math>x</math>-axis./Die lyn <math>y = k</math> moet twee keer deur <math>f</math> aan die positiewe kant van die <math>x</math>-as sny.</p> $-8 < k < -4$	<p>✓ <math>-8 &lt; k</math></p> <p>✓ <math>k &lt; -4</math></p> <p>(2)</p>

<p>5.5</p>	<p><math>y = -x + c</math></p> <p>Substitute the intersection point of the asymptotes, i.e. <math>\left(\frac{3}{2}; -2\right)</math>:</p> <p><i>Vervang die snypunt van die asimptote, m.a.w. <math>\left(\frac{3}{2}; -2\right)</math>:</i></p> $-2 = -\frac{3}{2} + c$ $c = -\frac{1}{2}$ $y = -x - \frac{1}{2}$ <p><b>OR/OF</b></p> <p><math>y = -x</math> is translated <math>\frac{3}{2}</math> units right and 2 units down/</p> <p><math>y = -x</math> <i>transleer</i> <math>\frac{3}{2}</math> <i>eenhede na regs en 2 eenhede na onder</i> <math>\Rightarrow</math></p> $y = -\left(x - \frac{3}{2}\right) - 2$ $y = -x - \frac{1}{2}$	<p>✓ <math>y = -x + c</math></p> <p>✓ <math>-2 = -\frac{3}{2} + c</math></p> <p>✓ answer (3)</p> <p>✓ <math>y = -x</math></p> <p>✓ <math>y = -\left(x - \frac{3}{2}\right) - 2</math></p> <p>✓ answer (3)</p>
<p>5.6</p>	<p>By symmetry,</p> $Q = \left(\frac{3}{2} + 8 - 2; -2 + \frac{3}{2} - 1\right)$ $= \left(\frac{15}{2}; -\frac{3}{2}\right)$	<p>✓ <math>x = \frac{15}{2}</math></p> <p>✓ <math>y = -\frac{3}{2}</math></p> <p>(2) <b>[19]</b></p>

**QUESTION/VRAAG 6**

<p>6.1</p>	$f: y = \frac{1}{4}x^2$ $f^{-1}: x = \frac{1}{4}y^2$ $y^2 = 4x$ $y = \pm\sqrt{4x}$ $f^{-1}(x) = -\sqrt{4x} \quad \text{OR/OF} \quad f^{-1}(x) = 2\sqrt{x}$	<p>✓ interchanging <math>x</math> and <math>y</math>                  ✓ <math>y^2 = 4x</math>                  ✓ answer                  (3)</p>
<p>6.2</p>		<p>✓ both graphs pass through (0 ; 0)                  ✓ shape for both                  ✓ one additional point on both graphs                  (3)</p>
<p>6.3</p>	<p>Yes. No value of <math>x</math> in the domain of <math>f^{-1}</math> maps onto more than one <math>y</math>-value.  <i>Ja. Geen waarde van <math>x</math> in die definisieversameling van <math>f^{-1}</math> assosieer met meer as een <math>y</math>-waarde nie.</i></p> <p><b>OR/OF</b></p> <p>Yes. One to one function./<i>Ja. Een-tot-een-funksie.</i></p> <p><b>OR/OF</b></p> <p>Yes. Vertical line test holds./<i>Ja. Die vertikale lyntoets werk.</i></p>	<p>✓ yes                  ✓ reason                  (2)</p> <p>✓ yes                  ✓ reason                  (2)</p> <p>✓ yes                  ✓ reason                  (2)</p> <p><b>[8]</b></p>

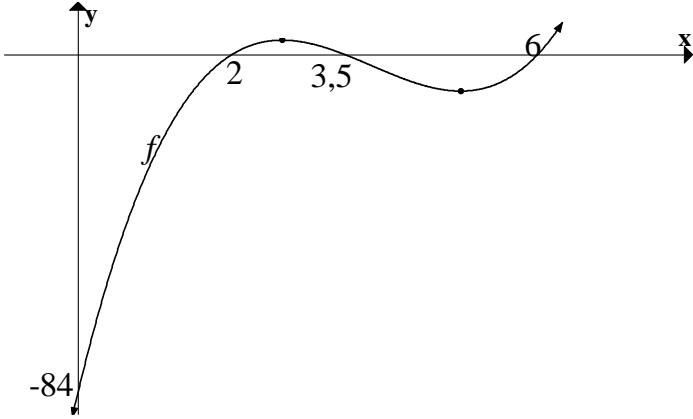
**QUESTION/VRAAG 7**

7.1.1	<p>Quarterly interest rate/<i>Kwartaallikse rentekoers</i></p> $= \frac{10\%}{4}$ $= 2,5\%$	<p>✓ answer (1)</p>
7.1.2	$A = P(1+i)^n$ $= 5000 \left(1 + \frac{2,5}{100}\right)^{2 \times 4}$ $= R6092,01$	<p>✓ <math>n = 8</math> ✓ <math>5000 \left(1 + \frac{2,5}{100}\right)^{2 \times 4}</math> ✓ answer (3)</p>
7.2.1	$P_v = \frac{x[1 - (1+i)^{-n}]}{i}$ $800\,000 = \frac{10\,000 \left[1 - \left(1 + \frac{0,14}{12}\right)^{-n}\right]}{\frac{0,14}{12}}$ $\frac{800\,000}{10\,000} \times \frac{0,14}{12} = 1 - \left(1 + \frac{0,14}{12}\right)^{-n}$ $\left(1 + \frac{0,14}{12}\right)^{-n} = 1 - \frac{800\,000}{10\,000} \times \frac{0,14}{12}$ $-n = \frac{\log \left[1 - \frac{800\,000 \times \frac{0,14}{12}}{10\,000}\right]}{\log \left(1 + \frac{0,14}{12}\right)}$ $n = 233,4699962$ <p>Motloi can make 233 withdrawals of R10 000./<i>Motloi kan 233 onttrekkings van R10 000 maak.</i></p>	<p>✓ <math>i = \frac{0,14}{12}</math> ✓ substitute into present value formula  ✓ <math>\left(1 + \frac{0,14}{12}\right)^{-n} = 1 - \frac{800\,000}{10\,000} \times \frac{0,14}{12}</math>  ✓ use of logs  ✓ 233 (5)</p>
7.2.2 (a)	$A - F_v = 800\,000 \left(1 + \frac{0,14}{12}\right)^{48} - \frac{10\,000 \left[\left(1 + \frac{0,14}{12}\right)^{48} - 1\right]}{\frac{0,14}{12}}$ $= 1\,396\,005,54 - 638\,577,36$ $= R757\,428$ <p><b>OR/OF</b></p>	<p>✓ <math>n = 48</math> in both formulae ✓ <math>i = \frac{0,14}{12}</math> in both formulae ✓ substitution into both formulae ✓ answer (4)</p>

	$P_v = \frac{x[1-(1+i)^{-n}]}{i}$ $= \frac{10000 \left[ 1 - \left( 1 + \frac{0,14}{12} \right)^{-185,4699962\dots} \right]}{\frac{0,14}{12}}$ $= \text{R}757\,428$	<p>✓ <math>n = -185,46996\dots</math>                  ✓ <math>i = \frac{0,14}{12}</math>                  ✓  <math display="block">\frac{10000 \left[ 1 - \left( 1 + \frac{0,14}{12} \right)^{-185,4699962\dots} \right]}{\frac{0,14}{12}}</math>                  ✓ answer                  (4)</p>
<p>7.2.2 (b)</p>	<p>Let the purchase price of the house be <math>y</math>. / <i>Laat die koopprys van die huis <math>y</math> wees.</i></p> $\frac{757\,428}{y} = 30\%$ $757\,428 = 0,3y$ $y = \frac{757\,428}{0,3}$ $= \text{R}2\,524\,760$ <p><b>OR/OF</b></p> <p>Let the purchase price of the house be <math>y</math>. / <i>Laat die koopprys van die huis <math>y</math> wees.</i></p> $y = \frac{757\,428}{30} \times 100$ $= \text{R}2\,524\,760$	<p>✓ answer (1)</p> <p>✓ answer (1)</p> <p>[14]</p>

**QUESTION/VRAAG 8**

<p>8.1</p>	$f(x+h) = -(x+h)^2 + 4 = -(x^2 + 2xh + h^2) + 4$ $= -x^2 - 2xh - h^2 + 4$ $f(x+h) - f(x) = -2xh - h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{-2xh - h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-2x - h)}{h}$ $= \lim_{h \rightarrow 0} (-2x - h)$ $= -2x$ <p><b>OR/OF</b></p> $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{-(x+h)^2 + 4 - (-x^2 + 4)}{h}$ $= \lim_{h \rightarrow 0} \frac{-x^2 - 2xh - h^2 + 4 + x^2 - 4}{h}$ $= \lim_{h \rightarrow 0} \frac{-2xh - h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-2x - h)}{h}$ $= \lim_{h \rightarrow 0} (-2x - h)$ $= -2x$	<p>✓ finding <math>f(x+h)</math> ✓ <math>-2xh - h^2</math></p> <p>✓ formula</p> <p>✓ factorisation</p> <p>✓ answer (5)</p> <p>✓ formula</p> <p>✓ finding <math>f(x+h)</math> ✓ <math>-2xh - h^2</math></p> <p>✓ factorisation</p> <p>✓ answer (5)</p>
<p>8.2.1</p>	$y = 3x^2 + 10x$ $\frac{dy}{dx} = 6x + 10$	<p>✓ <math>6x</math> ✓ <math>10</math></p> <p>(2)</p>
<p>8.2.2</p>	$f(x) = \left(x - \frac{3}{x}\right)^2$ $= x^2 - 6 + \frac{9}{x^2}$ $= x^2 - 6 + 9x^{-2}$ $f'(x) = 2x - 18x^{-3}$	<p>✓ <math>x^2 - 6 + \frac{9}{x^2}</math></p> <p>✓ <math>9x^{-2}</math> ✓ <math>2x - 18x^{-3}</math></p> <p>(3)</p>

8.3.1	$f(2) = 2(2)^3 - 23(2)^2 + 80(2) - 84$ $= 0$ $\therefore (x - 2) \text{ is a factor}$	✓ substitution of 2 into $f$ ✓ value of 0 (2)
8.3.2	$f(x) = 2x^3 - 23x^2 + 80x - 84$ $= (x - 2)(2x^2 - 19x + 42)$ $= (x - 2)(2x - 7)(x - 6)$	✓ $2x^2 - 19x + 42$ ✓ $(x - 2)(2x - 7)(x - 6)$ (2)
8.3.3	$f'(x) = 6x^2 - 46x + 80$ $6x^2 - 46x + 80 = 0$ $3x^2 - 23x + 40 = 0$ $(3x - 8)(x - 5) = 0$ $x = \frac{8}{3} \text{ or } x = 5$	✓ $f'(x) = 6x^2 - 46x + 80$ ✓ $f'(x) = 0$ ✓ factors ✓ $x$ -values (4)
8.3.4		✓ $x$ -intercepts ✓ $y$ -intercept ✓ shape (3)
8.3.5	$6x^2 - 46x + 80 = 40$ $6x^2 - 46x + 40 = 0$ $3x^2 - 23x + 20 = 0$ $(3x - 20)(x - 1) = 0$ $x = \frac{20}{3} \text{ or } x = 1$ <p>But <math>x</math> must be an integer, so <math>x = 1</math> at the point where tangent touches <math>f/x</math> moet heelgetal wees so <math>x = 1</math> by punt waar die raaklyn <math>f</math> raak:</p> $y = f(1) = 2(1)^3 - 23(1)^2 + 80(1) - 84 = -25$ $y = mx + c$ $-25 = 40(1) + c$ $-65 = c$ $(0; -65)$	✓ $6x^2 - 46x + 80 = 40$ ✓ factors ✓ $x = 1$ ✓ $y$ -value ✓ $-25 = 40(1) + c$ ✓ answer (6) <b>[27]</b>



**QUESTION/VRAAG 9**

9.1	$340 = \pi r^2 h$ $\therefore h = \frac{340}{\pi r^2}$	✓ substitution into volume formula ✓ answer (2)
9.2	$A = 2\pi r^2 + 2\pi rh$ $= 2\pi r^2 + 2\pi r \left( \frac{340}{\pi r^2} \right)$ $= 2\pi r^2 + 680r^{-1}$	✓ formula ✓ substitution of $h$ (2)
9.3	$A(r) = 2\pi r^2 + 680r^{-1}$ $A'(r) = 4\pi r - 680r^{-2}$ $4\pi r - 680r^{-2} = 0$ $4\pi r = \frac{680}{r^2}$ $r^3 = \frac{680}{4\pi}$ $r = \sqrt[3]{\frac{680}{4\pi}} \text{ cm or } 3,78 \text{ cm}$	✓ $4\pi r$ ✓ $-680r^{-2}$  ✓ $r^3 = \frac{680}{4\pi}$ ✓ answer (4) <b>[8]</b>

**QUESTION/VRAAG 10**

10.1.1	160	✓ answer (1)
10.1.2	$P(M) = \frac{60}{160}$ $= \frac{3}{8}$ $= 0,375$	✓ 60  ✓ answer (2)
10.1.3	$P(\text{Male}) \times P(\text{Coffee}) = P(\text{Male and Coffee})$ $P(\text{Manlik}) \times P(\text{Koffie}) = P(\text{Manlik en Koffie})$ $\frac{3}{8} \times \frac{80}{160} = \frac{b}{160}$ $\frac{3}{16} = \frac{b}{160}$ $16b = 480$ $b = 30$	✓ formula  ✓ $\frac{80}{160}$ ✓ $\frac{b}{160}$  ✓ answer (4)

10.2.1	$6!$ $= 6 \times 5 \times 4 \times 3 \times 2 \times 1$ $= 720$	$\checkmark 6!$  $\checkmark$ answer (2)
10.2.2	number of ways Xoliswa sits next to Anees/ <i>getal maniere waarop Xoliswa langs Anees sit</i> $= 5! \times 2$ $= 240$  <b>OR/OF</b>  Regard Xoliswa and Anees as a single entity/ <i>Beskou Xoliswa en Anees as een</i> Number of ways in which 5 passengers can be arranged = $5!$ <i>Getal maniere waarop 5 passasiers gerangskik kan word = <math>5!</math></i> So $5!$ different arrangements for XA and $5!$ different arrangements for AX <i>So <math>5!</math> verskillende rangskikkings vir XA en <math>5!</math> verskillende rangskikkings vir AX</i>  number of ways Xoliswa sits next to Anees <i>getal maniere waarop Xoliswa langs Anees sit</i> $= 5! \times 2$ $= 240$	$\checkmark 5! \times 2$ $\checkmark$ answer (2)  $\checkmark 5! + 5!$  $\checkmark$ answer  (2)
10.2.3	number of ways Mary is at an end of the row on the left = $1 \times 5!$ number of ways Mary is at an end of the row on the right = $5! \times 1$ total number of arrangements = $6!$ $P(\text{Mary is at an end of the row}) = \frac{5! \times 1 + 1 \times 5!}{6!}$ $= \frac{1}{3}$  <i>getal maniere waarop Mary aan die einde van die ry links is = <math>1 \times 5!</math></i> <i>getal maniere waarop Mary aan die einde van die ry regs is = <math>5! \times 1</math></i> totale getal rangskikkings = $6!$ $P(\text{Mary is aan einde van die ry}) = \frac{5! \times 1 + 1 \times 5!}{6!}$ $= \frac{1}{3}$	$\checkmark$ both LHS and RHS ways $\checkmark 6!$ $\checkmark$ setting up probability  $\checkmark$ answer  (4)  <b>[15]</b>
<b>TOTAL/TOTAAL:</b>		<b>150</b>