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DEPARTMENT OF  
**EDUCATION**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**MATHEMATICS P1**

**MEMORANDUM**

**SEPTEMBER 2018**

**MARKS: 150**

**TIME: 3 hours**

**This memorandum consists of 16 pages.**

**NOTE:**

- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking memorandum.
- Assuming values/answers in order to solve a problem is unacceptable.

**QUESTION 1**

|       |                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.1.1 | $(x-3)(x+1) = 0$<br>$x-3 = 0$ or $x+1 = 0$<br>$x = 3$ or $x = -1$                                                                                                                                                                                                                                                                                                    | Values/waardes of/van $x$<br>$\checkmark x = 3$<br>$\checkmark x = -1$ (2)                                                                                                                                                                                                                                                                                                                                                                  |
| 1.1.2 | $x^2 - x - 4 = 0$<br>$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$<br>$= \frac{1 \pm \sqrt{(-1)^2 - 4(1)(-4)}}{2(1)}$<br>$x = \frac{1 \pm \sqrt{17}}{2}$<br>$x = 2,56$<br>or $x = -1,56$<br><br><b>ALTERNATIVE /ALTERNATIEF</b><br>$x^2 - x - 4 = 0$<br>$(x - \frac{1}{2})^2 = 4\frac{1}{4}$<br>$x = \frac{1}{2} \pm \frac{\sqrt{17}}{2}$<br>$x = 2,56$ or/of $x = -1,56$ | $\checkmark$ standard form<br><i>/standaardvorm</i><br><br>$\checkmark$ correct substitution into<br>correct formula<br><i>/korrekte vervanging in</i><br><i>korrekte formule</i><br><br>$\checkmark x = 2,56$<br>$\checkmark x = -1,56$ (5)<br><br><b>OR</b><br><br>$\checkmark$ standard form/std vorm<br>$\checkmark$ completing the square<br><i>/voltooing van vierkant</i><br><br>$\checkmark x = 2,56$<br>$\checkmark x = -1,56$ (4) |

|       |                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.1.3 | $x + \sqrt{x-2} = 4$ $(\sqrt{x-2})^2 = (4-x)^2$ $x-2 = 16-8x+x^2$ $x^2-9x+18=0$ $(x-3)(x-6)=0$ $x=3 \text{ or/of } x=6$ $\therefore x=3$ <p>ALTERNATIVE/ALTERNATIEF</p> $(\sqrt{x-2})^2 = (4-x)^2$ $x-2 = 16-8x+x^2$ $x^2-9x+18=0$ $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ $= \frac{1 \pm \sqrt{(-9)^2 - 4(1)(18)}}{2(1)}$ $x = \frac{1 \pm \sqrt{9}}{2}$ $x=3 \text{ or } x=6$ $\therefore x=3$ | <p>✓ squaring both sides<br/>/kwadrering beide kante</p> <p>✓ standard form/std vorm<br/>✓ factors/faktore</p> <p>✓ both values/beide waardes<br/>✓ select/selekteer <math>x=3</math><br/>(5)</p> <p><b>OR</b></p> <p>✓ squaring both sides<br/>/kwadrering beide kante</p> <p>✓ standard form/std vorm</p> <p>✓ formula/formule</p> <p>✓ both values/beide waardes</p> <p>✓ select/selekteer <math>x=3</math><br/>(5)</p> |
| 1.1.4 | $x \leq 0 \text{ or } x \geq \frac{1}{2}$                                                                                                                                                                                                                                                                                                                                                       | <p>✓ critical values<br/>/kritieke waardes</p> <p>✓ both answers and<br/>inequality signs correct (3)<br/>/beide antwoorde en<br/>ongelykheids tekens moet<br/>reg wees</p>                                                                                                                                                                                                                                                |

|       |                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.2.1 | $P = \frac{4^{x+3} + 4^x}{8^{x+2} + 8^x}$ $= \frac{2^{2x+6} + 2^{2x}}{2^{3x+6} + 2^{3x}}$ $= \frac{2^{2x}(2^6 + 1)}{2^{3x}(2^6 + 1)}$ $= 2^{-x} \text{ or/of } \left(\frac{1}{2}\right)^x$ <p><b>ALTERNATIVE/ALTERNATIEF</b></p> $P = \frac{4^x(4^3 + 1)}{8^x(8^2 + 1)}$ $= \frac{4^x(65)}{8^x(65)}$ $= \left(\frac{1}{2}\right)^x$ | <p>✓ prime numbers with exponents/<i>priemgetalle met eksponente</i></p> <p>✓ factorisation/<i>faktorisering</i></p> <p>✓ simplification/<i>vereenvoudiging</i></p> <p>✓ answer/<i>antwoord</i> (4)</p> <p><b>OR</b></p> <p>✓ factorisation/<i>faktorisering</i></p> <p>✓ factorisation/<i>faktorisering</i></p> <p>✓ simplification/<i>vereenvoudiging</i></p> <p>✓ answer/<i>antwoord</i> (4)</p> |
| 1.2.2 | $P = 8$ $2^{-x} = 8$ $2^{-x} = 2^3$ $\therefore -x = 3$ $\therefore x = -3$                                                                                                                                                                                                                                                         | <p>✓ equating/<i>stel gelyk</i></p> <p>✓ answer/<i>antwoord</i> (2)</p>                                                                                                                                                                                                                                                                                                                             |

|     |                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                 |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.3 | $3y = -3 + x + x^2$ $\sum_{k=3}^4 x(k-2)^2 = 5y$ $k=3 : x(3-2)^2 = x$ $k=4 : x(4-2)^2 = 4x$ $\therefore x + 4x = 5y$ $5x = 5y$ $\therefore x = y$ $(1) \dots 3x = -3 + x + x^2$ $0 = x^2 - 2x - 3$ $0 = (x+1)(x-3)$ $\therefore x = -1 \text{ or } x = 3$ $y = -1 \text{ or } y = 3$ | <p>✓<br/>both values in terms of <math>x</math><br/><i>/beide waardes in terme van</i></p> <p>✓ equating/<i>stel gelyk</i></p> <p>✓ standard<br/>form/<i>standaardvorm</i></p> <p>✓ <math>x = -1</math> or <math>x = 3</math></p> <p>✓ <math>y = -1</math> or <math>y = 3</math></p> <p>(5)</p> |
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[25]

## QUESTION 2/VRAAG 2

|     |                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                             |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.1 | $10 - 3y ; 7 ; 15 ; 8y + 1.$ $\begin{array}{ccccc} 10 - 3y & ; & 7 & ; & 15 & ; & 8y + 1 \\ & \swarrow & & \searrow & \swarrow & & \searrow \\ & -3 + 3y & & 8 & & 8y - 14 & \\ & \swarrow & & \searrow & \swarrow & & \searrow \\ & 11 - 3y & & 8y - 22 & & & \\ & 11 - 3y = 8y - 22 & & & & & \\ & \therefore y = 3 & & & & & \end{array}$ | <p>✓ First differences<br/><i>/eerste verskil</i></p> <p>✓ Second differences<br/><i>/tweede verskil</i></p> <p>✓ equating<br/><i>/gelykstelling</i></p> <p>✓ value of <math>y</math><br/><i>/waarde van</i></p> <p>(4)</p> |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|     |                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                        |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.2 | $1 ; 7 ; 15 ; 25$<br>$2a = 2$<br>$\therefore a = 1$<br>$6 = 3(1) + b$<br>$3 = b$<br>$1 + 3 + c = 1$<br>$c = -3$<br>$T_n = n^2 + 3n - 3$                                                                                                                                                                                                             | ✓ The quadratic row<br><i>/kwadratiese ry</i><br><br>✓ value of $a$<br><i>/waarde van</i><br><br>✓ value of $b$<br><i>/waarde van</i><br><br>✓ value of $c$<br><i>/waarde van</i><br><br>(4)                                                                                                                                           |
| 2.3 | $n^2 + 3n - 3 > 2157$<br>$n^2 + 3n - 2160 > 0$<br>$(n + 48)(n - 45) > 0$<br><br>$n < -48$ or $n > 45$<br><br>$\therefore T_{46}$<br><br>ALTERNATIVE:<br>$n^2 + 3n - 3 > 2157$<br>$n^2 + 3n - 2160 > 0$<br><br>$n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$<br>$n = \frac{-3 \pm \sqrt{8649}}{2}$<br>$n = -48$ or/of $n = 45$<br><br>$\therefore T_{46}$ | ✓ inequality<br><i>/ongelykheid</i><br>✓ factorization<br><i>faktorisering</i><br><br>✓ select correct value of $n$<br><i>/selekteer korrekte waarde</i><br>(3)<br><br><b>OR</b><br>✓ inequality<br><i>/ongelykheid</i><br><br>✓ formula<br><i>/formule</i><br><br>✓ select correct value of $n$<br><i>/selekteer regte waarde</i> (3) |

[11]

**QUESTION 3/VRAAG 3**

|       |                                                                                                            |                                                   |
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| 3.1.1 | The first term $a = p$ and<br>the constant difference $d = q - p$<br><br>$T_{10} = p + 9(q - p) = 9q - 8p$ | ✓ $p$ and $(q - p)$<br><br>✓ $9q - 8p$<br><br>(2) |
|-------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------|

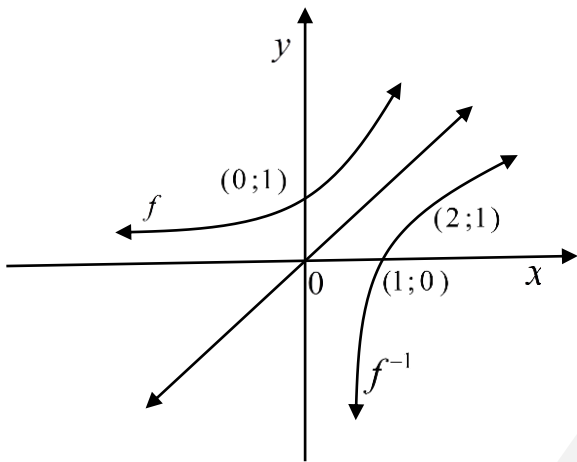
|       |                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                             |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.1.2 | $S_n = \frac{n}{2}[2a + (n-1)d]$ $\therefore S_{20} = 10(2a - 19d)$ $S_{20} = 20p + 190(q - p)$ $= 190q - 170p$                                                                                                                                   | <p>✓ correct substitution into correct formula<br/>/korrekte vervanging in korrekte waarde</p> <p>✓ answer /antwoord (2)</p>                                                                                                                                                                                                                                |
| 3.2.1 | $T_3 + T_4 = 167$ $a + 2d + a + 3d = 167$ $2a + 5d = 167 \dots\dots\dots(1)$ $T_{21} = -4$ $a + 20d = -4$ $a = -20d - 4 \dots\dots\dots(2)$ $\text{Substitute (1) into (2): } 2(-20d - 4) + 5d = 167$ $-40d - 8 + 5d = 167$ $-35d = 175$ $d = -5$ | <p>✓ equation/vergelyking 1</p> <p>✓ equation/vergelyking 2</p> <p>✓ equating :<br/>Equation 1 = equation 2</p> <p>✓ value of <math>d</math> (4)<br/>/waarde van</p>                                                                                                                                                                                        |
| 3.2.2 | $a + 20d = -4$ $a = -20(-5) - 4 = 96$ $S_{21} = \frac{21}{2}[2a + 20d]$ $= \frac{21}{2}[2(96) + 20(-5)]$ $= 966$ <p>OR</p> $a + 20d = -4$ $a = -20(-5) - 4 = 96$ $S_{21} = \frac{21}{2}(a + l)$ $= \frac{21}{2}(96 - 4)$ $= 966$                  | <p>✓ value of <math>a</math><br/>/waarde van</p> <p>✓ correct substitution in correct formula<br/>/korrekte vervanging in korrekte waarde</p> <p>✓ answer/antwoord</p> <p>OR</p> <p>✓ value of <math>a</math><br/>/waarde van</p> <p>✓ correct substitution in correct formula<br/>/korrekte vervanging in korrekte waarde</p> <p>✓ answer/antwoord (3)</p> |

|     |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                        |
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| 3.3 | $a = -3; r = -\frac{1}{3}$<br>Sequence is: $-3; 1; -\frac{1}{3}; \frac{1}{9}; -\frac{1}{27}$<br>Sequence of negative numbers:<br>$-3; -\frac{1}{3}; -\frac{1}{27}; \dots$<br>$a = -3; r = \frac{1}{9}$<br>$S_{\infty} = \frac{a}{1-r}$ $= \frac{-3}{1-\frac{1}{9}}$ $= \frac{-3}{\frac{8}{9}}$ $= -3 \frac{3}{8}$ | ✓ geometric sequence<br>/meetkundige ry<br><br>✓ sequence of negative numbers<br>/ry met negatiewe getalle<br><br>✓ value of $r$ and $a$<br>/waarde van<br><br>✓ correct substitution in correct formula<br>/korrekte vervanging in korrekte formule<br><br>✓ correct answer<br>/korrekte antwoord (5) |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

[16]

## QUESTION 4/VRAAG4

|     |                                                                                                                                                                                            |                                                           |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| 4.1 | $y = 2^x$<br>$x = 0$<br>$\therefore f(0) = 2^0 = 1$<br>$\therefore C(0;1)$<br>y - intercept: $g(x) = -(x-1)^2 + q$<br>$C(0;1)$<br>$1 = -(0-1)^2 + q$<br>$1 = -1 + q$<br>$\therefore q = 2$ | ✓ substitute $C(0;1)$<br>/vervang<br><br>✓ $q = 2$<br>(2) |
| 4.2 | $g(x) = -(x-1)^2 + 2$<br>$D(1; 2)$                                                                                                                                                         | ✓✓ answer /antwoord (2)                                   |
| 4.3 | $t = 2$                                                                                                                                                                                    | ✓ answer/antwoord (1)                                     |

|     |                                                                                        |                                                                                                                                                                           |
|-----|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.4 | $f^{-1} : x = 2^y$<br>$\therefore y = \log_2 x$                                        | ✓✓ answer/antwoord (2)                                                                                                                                                    |
| 4.5 |       | ✓ form of the graph<br><i>lvorm van die grafiek</i><br>✓ x – intercept/afsnit<br>✓ any other coordinate on the graph<br><i>lenige ander koördinaat op die grafiek</i> (3) |
| 4.6 | $g(x) = -(x-1)^2 + 2$<br>$g(x+1) - 2 = -(x-1+1)^2 + 2 - 2$<br>$\therefore h(x) = -x^2$ | ✓ +1 and -2<br>✓ answer/antwoord (2)                                                                                                                                      |
| 4.7 | Domain: $x \geq 0$ or $x \leq 0$                                                       | ✓ answer /antwoord (1)                                                                                                                                                    |

[13]

## QUESTION 5/VRAAG 5

|        |                                                                                    |                                            |
|--------|------------------------------------------------------------------------------------|--------------------------------------------|
| 5.1    | $x = -2$<br>$y = 1$                                                                | ✓ answer/antwoord<br>✓ answer/antwoord (2) |
| 5.2 .1 | $A : x = 0$<br>$y = \frac{4}{0+2} + 1$<br>$y = 2 + 1$<br>$y = 3$<br><br>$A(0 ; 3)$ | ✓ answer /antwoord (1)                     |

|       |                                                                                                                                                                                                                          |                                                                                                                                                                  |
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| 5.2.2 | $y = 0$<br>$0 = \frac{4}{x+2} + 1$<br>$-1(x+2) = 4$<br>$-x-2 = 4$<br>$x = -6$<br><br>D(-6 ; 0)                                                                                                                           | ✓ equating to 0<br><i>/gelykstel aan</i><br><br>✓ simplification<br><i>/vereenvoudiging</i><br><br>✓ answer/antwoord (3)                                         |
| 5.2.3 | $\frac{4}{x+2} + 1 = 2x + 3$<br>$4 + 1(x+2) = (2x+3)(x+2)$<br>$4 = 2x^2 + 6x + 4$<br>B : $0 = 2x^2 + 6x$<br>$0 = 2x(x+3)$<br>$\therefore x = 0 \text{ or } x = -3$<br>$g(-3) = 2(-3) + 3 = -3$<br>$\therefore B(-3; -3)$ | ✓ equating <i>/gelykstelling</i><br><br>✓ standard form <i>/std vorm</i><br><br>✓ value of $x$<br><i>/waarde van</i><br>✓ value of $y$<br><i>/waarde van</i> (4) |
| 5.3   | Average gradient: $m = \frac{y_2 - y_1}{x_2 - x_1}$<br>$= \frac{0 - 3}{-6 - 0} = \frac{1}{2}$                                                                                                                            | ✓ applying $\frac{y_2 - y_1}{x_2 - x_1}$<br><i>/toepassing</i><br><br>✓ answer /antwoord (2)                                                                     |
| 5.4   | $g(x) = 2x + 3$<br>$g'(x) = 2$<br>$\therefore f(x), g'(x) \leq 0$<br>$g'(x) > 0, \forall x \in R$<br>$f(x) \leq 0 \text{ for}$<br>$-6 \leq x < -2$                                                                       | ✓ $g'(x)$<br>✓ explaining $g'(x) \leq 0$<br><i>/verduidelik</i><br><br>✓ answer of $f(x) \leq 0$<br><i>/antwoord</i> (3)                                         |

[15]

**QUESTION 6/VRAAG 6**

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                            |
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| 6.1   | $12\,500(1-i)^5 = 5\,546,32$ $(1-i)^5 = 0,4437056$ $\sqrt[5]{(1-i)^5} = \sqrt[5]{0,4437056}$ $1-i = 0,8500001102$ $i = 0,1499998898$ $i \approx 15\%$                                                                                                                                                                                                                                                                                                                                                                                    | <p>✓ correct substitution in correct formula<br/><i>/korrekte vervanging in korrekte formule</i></p> <p>✓ applying <math>\sqrt[5]{\phantom{x}}</math><br/><i>/toepassing</i></p> <p>✓ value of i (3)<br/><i>/waarde van</i></p>                                                            |
| 6.2.1 | $i_{eff} = \left(1 + \frac{i_m}{m}\right)^m$ $1 + i_{eff} = \left(1 + \frac{0,08}{12}\right)^{12}$ $i_{eff} = 0,082999 \times 100$ $i_{eff} = 8,299 \approx 8,3$                                                                                                                                                                                                                                                                                                                                                                         | <p>✓ <math>m = 12</math></p> <p>✓ correct substitution in correct formula<br/><i>/korrekte vervanging in korrekte formule</i></p> <p>✓ simplification/vereenvoudig<br/>✓ answer/antwoord (4)</p>                                                                                           |
| 6.2.2 | <p>Deposit paid = <math>1\,800\,000 \times \frac{60}{100} = R1\,080\,000</math></p> <p><i>Deposito betaal</i></p> <p>Balance owed = <math>OR\ 180\,000 \times \frac{40}{100} = R720\,000</math></p> <p>Therefore/<i>dus</i> : R720 000 was financed by the bank was paid by the bank.<br/><i>Was gefinansier deur die bank /betaal deur die bank.</i></p> $720\,000 \left(1 + \frac{0,08}{12}\right) = x \left[ \frac{1 - \left(1 + \frac{8}{1\,200}\right)^{(-119)}}{\frac{8}{1\,200}} \right]$ $4832 = (0,5464730496) x$ $8842,16 = x$ | <p>✓ deposit paid/<i>deposito betaal</i></p> <p>✓ balance owed<br/><i>/balans verskuldig</i></p> <p>✓ correct substitution in correct formula<br/><i>/korrekte vervanging in korrekte formule</i></p> <p>✓ <math>n = -119</math></p> <p>✓ answer of R8 842,16 (5)<br/><i>/antwoord</i></p> |

|       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| 6.2.3 | $A = 724800 \left( 1 + \frac{8}{1\,200} \right)^{(3 \times 12)}$ $A = R920\,667,815$<br>$F = 8\,842,16 \left[ \frac{\left( 1 + \frac{8}{1\,200} \right)^{36} - 1}{\frac{8}{1\,200}} \right]$ $F = R358\,421,8873$ <p>Balance of the loan =<br/> <math>R\,920\,667,815 - R358\,421,88734\,119</math><br/> <math>= R562\,246</math></p> <p><b>ALTERNATIVE/ALTERNATIEF</b></p> $P = \frac{x[1 - (1+i)^{-n}]}{i}$<br>$P = 8\,842,16 \left[ \frac{1 - \left( 1 + \frac{8}{1\,200} \right)^{(-83)}}{\frac{8}{1\,200}} \right]$ <p>Balance of the loan: P = R562 246</p> | <p>✓ correct substitution in correct formula<br/> <i>/korrekte vervanging in korrekte formule</i></p> <p>✓ A = R920 667,815</p> <p>✓ correct substitution in correct formula<br/> <i>/korrekte vervanging in korrekte formule</i></p> <p>✓ difference/verskil</p> <p>✓ balance/balans (5)</p> <p style="text-align: center;"><b>OR</b></p> <p>✓ correct formula<br/> <i>/korrekte formule</i></p> <p>✓ <math>n = -83</math></p> <p>✓ 8 842,16</p> <p>✓ correct substitution</p> <p>✓ balance/balans (5)</p> |
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[17]

**QUESTION 7/VRAAG 7****Penalty for notation in 7.1 or 7.2- only once.**

|     |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                           |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7.1 | $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{3(x+h)^2 + 2 - 3x^2 - 2}{h}$ $= \lim_{h \rightarrow 0} \frac{3(x^2 + 2hx + h^2) + 2 - 3x^2 - 2}{h}$ $= \lim_{h \rightarrow 0} \frac{3x^2 + 6hx + 3h^2 - 3x^2 - 2}{h}$ $= \lim_{h \rightarrow 0} \frac{6hx + 3h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(6x + 3h)}{h}$ $= \lim_{h \rightarrow 0} (6x + 3h)$ $= 6x$ | <p>✓ correct formula</p> <p>✓ subst. in formula</p> <p>✓ simplifying</p> <p>✓ factorising</p> <p>✓ 6x (5)</p>                                                             |
| 7.2 | $y = -(4x^2 - 12x + 9)$ $y = -4x^2 + 12x - 9$ $\frac{dy}{dx} = -8x + 12$                                                                                                                                                                                                                                                                                                                           | <p>✓ simplifying</p> <p>✓ -8x</p> <p>✓ 12 (3)</p>                                                                                                                         |
| 7.3 | $f(x) = \sqrt{x}(x+2)$ $f(x) = x\sqrt{x} + 2\sqrt{x}$ $= x^{\frac{3}{2}} + 2x^{\frac{1}{2}}$ $f'(x) = \frac{3}{2}x^{\frac{1}{2}} + x^{\frac{-1}{2}}$ $f'(4) = \frac{3}{2}(4)^{\frac{1}{2}} + (4)^{\frac{-1}{2}}$ $= 3 + 2^{-1}$ $= 3\frac{1}{2}$                                                                                                                                                   | <p>✓ simplifying</p> <p>✓ determining derivative of each fraction</p> <p><i>Ibepaal eerste afgeleide van elke term</i></p> <p>✓ substitution of 4</p> <p>✓ answer (4)</p> |

**[12]**

**QUESTION 8/VRAAG 8**

|       |                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                       |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.1   | $g(x) = (x+1)(x+1)(x-5) = 0$<br>$\therefore x = -1$ or $x = 5$<br>$A(-1; 0)$ and $D(5; 0)$                                                                                                                                                                                                                                              | ✓ $A(-1; 0)$<br>✓ $D(5; 0)$<br>(2)                                                                                                                                                                    |
| 8.2   | $g'(x) = 3x^2 - 6x - 9 = 0$<br>$\div 3: x^2 - 2x - 3 = 0$<br>$(x-3)(x+1) = 0$<br>$x = 3$ or $x = -1$<br>$g(3) = -32$<br>$\therefore C(3; -32)$ and $A(-1; 0)$                                                                                                                                                                           | ✓ first derivative = 0<br><i>leerste afgeleide</i><br><br>✓ $C(3; -32)$<br>✓ $A(-1; 0)$<br>(3)                                                                                                        |
| 8.3   | EC: $y = -32$<br>$\therefore -32 = x^3 - 3x^2 - 9x - 5$<br>$0 = x^3 - 3x^2 - 9x - 5 + 32$<br>$0 = x^3 - 3x^2 - 9x + 27$<br>$0 = (x-3)(x-3)(x+3)$<br>$\therefore x = 3$ or $x = -3$<br>$\therefore x$ - coordinate at E : $x = -3$                                                                                                       | ✓ equation of tangent<br><i>lvergelyking van raaklyn</i><br><br>✓ equating / gelykstelling<br><br><br>✓ value of $x$<br><i>lwaarde van</i><br>(3)                                                     |
| 8.4.1 | $g'(x) = 3x^2 - 6x - 9$<br>$g''(x) = 6x - 6 = 0$<br>$x = 1$<br>$g(1) = (1)^3 - 3(1)^2 - 9(1) - 5 = -16$<br>$\therefore$ point of inflection: $(1; -16)$<br>OR<br>$x = \frac{x_A + x_C}{2}$ and $y = \frac{y_A + y_C}{2}$<br>$x = \frac{-1 + 3}{2} = 1$ and $y = \frac{0 - 32}{2} = -16$<br>$\therefore$ point of inflection: $(1; -16)$ | ✓ second derivative = 0<br><i>ltweede afgeleide</i><br>✓ value of $x$<br><i>lwaarde van</i><br>✓ value of $y$<br><i>lwaarde van</i><br>OR<br>✓ average<br><br>✓ value of $x$<br>✓ value of $y$<br>(3) |
| 8.4.2 | Gradient of tangent: $g'(1) = 3(1)^2 - 6(1) - 9 = -12$<br>Point of inflection $(1; -16)$<br>$y = -12x + c$<br>$-16 = -12(1) + c$<br>Equation of tangent:<br>$-4 = c$<br>$\therefore y = -12x - 4$                                                                                                                                       | ✓ first derivative<br><i>leerste afgeleide</i><br>✓ value of gradient<br><i>lwaarde van gradient</i><br>✓ substitution of<br>coordinates of the point of<br>inflection<br>✓ equation of tangent (4)   |

**QUESTION 9 /VRAAG 9**

|     |                                                                                                                                                                              |                                                                                                                                 |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 9.1 | $\text{Area shaded} = 8x - (2x)^2 - \pi \left( \frac{2}{3} \times 2x \right)^2$ $= 8x - \pi \left( 4 + \frac{16}{9} \right) x^2$ $= 8x - \frac{52}{9} \pi x^2$               | <p>✓✓ ✓ formula /formule</p> <p>✓ factorization /faktorisering (4)</p>                                                          |
| 9.2 | $A = 8x - \frac{52}{9} \pi x^2$ <p>Maximum area: <math>D_x(A) = 8 - \frac{104}{9} \pi x = 0</math></p> $\therefore 104 \pi x = 72$ $x = \frac{72}{104 \pi} = 0,22 \text{ m}$ | <p>✓ first derivative = 0 /eerste afgeleide</p> <p>✓ simplifying /vereenvoudiging</p> <p>✓ <math>x</math> value /waarde (4)</p> |
| 9.3 | <p>maximum area = <math>8(0,22) - \frac{52}{9} \pi (0,22)^2 = 0,88 \text{ m}^2</math></p>                                                                                    | <p>✓ answer /antwoord (1)</p>                                                                                                   |

**[9]****QUESTION 10/VRAAG 10**

|      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                  |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| 10.1 | <p>For an odd product, the two numbers must be odd.<br/> <i>Vir 'n onewe produk moet albei getalle onewe wees</i><br/> First draw: 4 odd out of 7 cards<br/> <i>Eerste trekking: 4 onewe van 7 kaarte</i><br/> Second draw: 3 odd out of 6<br/> <i>Tweede trekking: 3 onewe van 6</i><br/> <math>P(\text{odd product}) = \frac{4}{7} \times \frac{3}{6} = \frac{2}{7} \approx 0,3</math><br/> <math>P(\text{onewe produk}) = \frac{4}{7} \times \frac{3}{6} = \frac{2}{7} \approx 0,3</math></p> | <p>✓ <math>\frac{4}{7}</math></p> <p>✓ <math>\frac{3}{6}</math></p> <p>✓ <math>\frac{2}{7}</math> Or 0,3 (3)</p> |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|

|        |                                             |                                          |
|--------|---------------------------------------------|------------------------------------------|
| 10.3   |                                             | ✓ 0,3 and 0,35<br>✓ 0,25<br>✓ 0,1<br>(3) |
| 10.4.1 | $P(A \text{ and } B^c) = 0,55 - 0,25 = 0,3$ | ✓ $0,55 - 0,25$<br>✓ 0,3<br>(2)          |
| 10.4.2 | $P(A \text{ or } B^c) = 1 - 0,35 = 0,65$    | ✓ answer /antwoord<br>(1)                |

[9]

**QUESTION 11/VRAAG 11**

|      |                                                                                                                                                                                                                                                                                          |                                                                               |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| 11.1 | $6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$                                                                                                                                                                                                                              | ✓✓ answer /antwoord<br>(2)                                                    |
| 11.2 | $2! \times 5! = 2 \times 120 = 240$                                                                                                                                                                                                                                                      | ✓ $2! \times 5!$<br>✓ 240<br>(2)                                              |
| 11.3 | Left/links : $1 \times 5!$<br>Right /regs: $5 \times 1$<br>$\frac{1 \times 5! + 5 \times 1}{6!}$ $\frac{120 + 120}{720}$ $= \frac{240}{720}$ $= \frac{1}{3}$ OR<br>Left/links : $\frac{1}{6}$<br>Right /regs: $\frac{1}{6}$<br>$\frac{1}{6} + \frac{1}{6}$ $= \frac{2}{6} = \frac{1}{3}$ | ✓ $1 \times 5!$<br>✓ $1 \times 5!$<br>✓ $6!$<br>✓ answer /answer<br>OR<br>(4) |

[8]

**TOTAL 150**