



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT**

GRADE/GRAAD 11

NOVEMBER 2013

**MATHEMATICS P1/WISKUNDE V1
MEMORANDUM**

MARKS/PUNTE: 150

This memorandum consists of 9 pages.
Hierdie memorandum bestaan uit 9 bladsye.

QUESTION/VRAAG 1

| | | | | |
|-----|-------|--|-----|--|
| 1.1 | | $x = \frac{5}{3x-2}$ $\therefore 3x^2 - 2x - 5 = 0$ $\therefore (3x-5)(x+1) = 0$ $\therefore x = \frac{5}{3} \text{ or/of } x = -1$ | (3) | <ul style="list-style-type: none"> ✓ standard form standaard vorm ✓ factorisation faktorisering ✓ values of x waardes van x |
| 1.2 | 1.2.1 | $ax^2 + bx + c = 0$ $\therefore x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ | (1) | <ul style="list-style-type: none"> ✓ formula formule |
| | 1.2.2 | $x(3x+13) = 11$ $\therefore 3x^2 + 13x - 11 = 0$ $x = \frac{-13 \pm \sqrt{(13)^2 - 4(3)(-11)}}{2(3)}$ $= \frac{-13 \pm \sqrt{169 + 132}}{6}$ $= \frac{-13 \pm \sqrt{301}}{6}$ $\therefore x = 0,72 \text{ or/of } x = -5,06$ | (4) | <ul style="list-style-type: none"> ✓ standard form standaard vorm ✓ sub into formula vervanging in formule ✓✓ values of x waardes van x |
| 1.3 | 1.3.1 | $(81x^{-4})^{\frac{3}{4}} = \left(\frac{3^4}{x^4}\right)^{\frac{3}{4}} = \frac{27}{x^3} \text{ or/of } 27x^{-3}$ | (2) | <ul style="list-style-type: none"> ✓ simplification vereenvoudiging ✓ answer antwoord |
| | 1.3.2 | $4(3 - \sqrt{5})(3 + \sqrt{5})$ $= 4(9 - 5)$ $= 16$ | (2) | <ul style="list-style-type: none"> ✓ simplification vereenvoudiging ✓ answer antwoord |

[12]

QUESTION/VRAAG 2

| | | | | |
|-----|-------|---|-----|--|
| 2.1 | 2.1.1 | $\frac{4x^2 + 2x + 1}{4x^2 - 2x + 1} = k$ $\therefore 4x^2 + 2x + 1 = 4kx^2 - 2kx + k$ $\therefore 4x^2 - 4kx^2 + 2x + 2kx + 1 - k = 0$ $\therefore (4 - 4k)x^2 + (2 + 2k)x + (1 - k) = 0$ | (3) | <ul style="list-style-type: none"> ✓ cross-multiplication kruisvermenigvuldig ✓ simplification vereenvoudiging ✓ answer antwoord |
| | 2.1.2 | <p>If roots are real, then/ As wortels reëel is, dan is: $\Delta \geq 0$</p> $\therefore (2 + 2k)^2 - 4(4 - 4k)(1 - k) \geq 0$ $\therefore 4 + 8k + 4k^2 - 4(4 - 8k + 4k^2) \geq 0$ $\therefore 4 + 8k + 4k^2 - 16 + 32k - 16k^2 \geq 0$ $\therefore -12k^2 + 40k - 12 \geq 0$ $\therefore 3k^2 - 10k + 3 \leq 0$ $\therefore (3k - 1)(k - 3) \leq 0$ $\therefore \frac{1}{3} \leq k \leq 3$ | (5) | <ul style="list-style-type: none"> ✓ statement: $\Delta \geq 0$ ✓ substitute in Δ vervang in Δ ✓ simplification vereenvoudiging ✓ standard form standaard vorm ✓ factorisation faktorisering |
| 2.2 | | $\sqrt{108} - \sqrt{18} = \sqrt{36 \times 3} - \sqrt{9 \times 2}$ $= 6\sqrt{3} - 3\sqrt{2}$ $= 6b - 3a$ | (2) | <ul style="list-style-type: none"> ✓ simplification vereenvoudiging ✓ answer antwoord |

| | | | |
|-----|---|-----|---|
| 2.3 | $\frac{3^{x+3} \cdot 12^{x-3}}{2^{2x-6} \cdot 9^x} = \frac{3^{x+3} \cdot 3^{x-3} \cdot 2^{2x-6}}{2^{2x-6} \cdot 3^{2x}}$ $= \frac{3^{x+3+x-3} \cdot 2^{2x-6}}{2^{2x-6} \cdot 3^{2x}}$ $= 3^0 \cdot 2^0$ $= 1$ | (3) | <ul style="list-style-type: none"> ✓ express in exponential form ✓ druk uit in eksponent-vorm ✓ simplification ✓ vereenvoudiging ✓ answer/ antwoord |
| 2.4 | $(x + 1)(2x - 3) > 3$ $2x^2 - x - 3 - 3 > 0$ $2x^2 - x - 6 > 0$ $(2x + 3)(x - 2) > 0$ $\therefore x < -\frac{3}{2} \text{ or/of } x > 2$ | (4) | <ul style="list-style-type: none"> ✓ simplification ✓ vereenvoudiging ✓ factorisation ✓ faktorisering ✓ $x < -\frac{3}{2}$ ✓ $x > 2$ |
| 2.5 | $2x - y = 3$ $\therefore -y = -2x + 3$ $\therefore y = 2x - 3$ <p>Substitute into/Stel in $27^{\frac{x}{3}} = 3^{y-1}$</p> $\therefore (3^3)^{\frac{x}{3}} = 3^{(2x-3)-1}$ $\therefore 3^x = 3^{2x-4}$ $\therefore x = 2x - 4$ $-x = -4$ $\therefore x = 4$ <p>and/en $y = 2(4) - 3 = 5$</p> $\therefore x = 4 \text{ and/en } y = 5$ | (6) | <ul style="list-style-type: none"> ✓ y the subject ✓ y die onderwerp ✓ substituting ✓ vervanging ✓ simplification of exponents ✓ vereenvoudiging van eksponente ✓ value of x ✓ waarde van x ✓ value of y ✓ waarde van y |

[23]

QUESTION/VRAAG 3

| | | | | |
|-----|-------|---|-----|---|
| 3.1 | 3.1.1 | $x = 3$ | (2) | ✓✓ answer antwoord |
| | 3.1.2 | When/Wanneer $x \geq 0, x \neq 3$ | (2) | ✓✓ answer antwoord |
| 3.2 | 3.2.1 | $\sqrt{5 - 2x} = \frac{x}{2} + 4$ $5 - 2x \geq 0$ $\therefore -2x \geq -5$ $\therefore x \leq \frac{5}{2}$ <p style="text-align: center;">and/en</p> $\frac{x}{2} + 4 \geq 0$ $\therefore \frac{x}{2} \geq -4$ $\therefore x \geq -8$ $\therefore -8 \leq x \leq \frac{5}{2}$ | (5) | <ul style="list-style-type: none"> ✓ $5 - 2x \geq 0$ ✓ $x \leq \frac{5}{2}$ ✓ $\frac{x}{2} + 4 \geq 0$ ✓ $x \geq -8$ ✓ $-8 \leq x \leq \frac{5}{2}$ |
| | 3.2.2 | $\sqrt{5 - 2x} = \frac{x}{2} + 4$ $5 - 2x = \left(\frac{x}{2} + 4\right)^2$ $5 - 2x = \frac{x^2}{4} + 4x + 16$ $\therefore 20 - 8x = x^2 + 16x + 64$ $\therefore x^2 + 24x + 44 = 0$ $\therefore (x + 22)(x + 2) = 0$ $\therefore x \neq -22 \text{ not valid/n.v.t. or/of } x = -2$ <p>Since/Aangesien $-8 \leq x \leq \frac{5}{2}$</p> <p>Solution/Oplossing $x = -2$</p> | (5) | <ul style="list-style-type: none"> ✓ square both sides ✓ kwadreer beide kante ✓ simplification ✓ vereenvoudiging ✓ standard form ✓ standaard vorm ✓ exclusion of -22 ✓ uitlating van -22 ✓ solution ✓ oplossing |

[14]

QUESTION/VRAAG 4

| | | | | |
|-----|--|---|-----|---|
| 4.1 | $A = P(1 - in)$ $\therefore A = R15\ 000 \left(1 - \frac{12}{100} \times 6\right)$ $= R4\ 200$ | | (3) | ✓ formula ✓ formule ✓ substituting ✓ vervanging ✓ answer ✓ antwoord |
| 4.2 | 4.2.1 | $\frac{15\%}{12} = 1,25\% \text{ per month/per maand}/0,0125$ | (1) | ✓ answer/antwoord |
| | 4.2.2 | $i_{eff} = \left(1 + \frac{i^m}{m}\right)^m - 1$ $(1 + 0,0125)^{12} - 1 = 0,1607545 \dots$ $= 16,1\% \text{ p. a./p. j.}$ | (4) | ✓ correct formula ✓ korrekte formule ✓ substituting ✓ vervanging ✓ simplification ✓ vereenvoudiging ✓ answer/antwoord |
| | 4.2.3 | $A = P(1 + i)^n = R2\ 500(1 + 0,0125)^{7 \times 12}$ $= R2\ 500(1 + 0,0125)^{84}$ $= R7\ 097,78$ | (3) | ✓ substituting into ✓ correct formula ✓ vervanging in ✓ korrekte formule ✓ values of i and n ✓ waardes van i en n ✓ answer/antwoord |
| 4.3 | $A = P_1(1 + i)^n + P_2(1 + i)^n$ $= R550\ 000 \left(1 + \frac{0,18}{4}\right)^{7 \times 4} + R560\ 000 \left(1 + \frac{0,18}{4}\right)^{3 \times 4}$ $= R2\ 836\ 028,60$ <p style="text-align: center;">Or/Of</p> $T_0 \text{-----} T_4 \text{-----} T_7$ $A = R550\ 000 \left(1 + \frac{0,18}{4}\right)^{4 \times 4} + R1\ 672\ 303,584 \left(1 + \frac{0,18}{4}\right)^{3 \times 4}$ $= R1\ 112\ 303,584 + R560\ 000$ $= R1\ 672\ 303,584$ $= R2\ 836\ 028,60$ | | (5) | ✓ formula ✓ formule ✓ sub/verv $P_1(1 + i)^n$ ✓ sub/verv $P_2(1 + i)^n$ ✓✓ answer/antwoord |

[16]

QUESTION/VRAAG 5

| | | | |
|-----|---|-----|--|
| 5.1 | R4 000 | (1) | ✓ answer/antwoord |
| 5.2 | $A = P(1 - in)$ $R4\ 000 = 15\ 000(1 - 8,5i)$ $i = 0,08627$ \therefore the rate of straight-line depreciation is/die reguitlynwaardeverminderingkoers is 8,6% | (2) | ✓ value of i ✓ waarde van i ✓ depreciation interest rate/waardevermin- dering rentekoers |
| | $A = P(1 - i)^n$ $4\ 000 = 15\ 000(1 - i)^{8,5}$ $i = 0,144$ \therefore the rate of reducing-balance depreciation is/die balansverminderingkoers 14,4% | (2) | ✓ value of i ✓ waarde van i ✓ depreciation interest rate/waardevermin- dering |

[5]

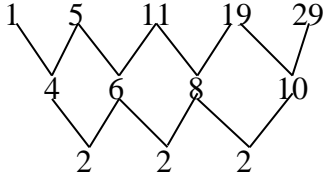
QUESTION/VRAAG 6

| | | | | | | | | | |
|-----|---|---|----|----|-----|-----|-----|-----|---|
| 6.1 | Figure number | 1 | 2 | 3 | 4 | 6 | 11 | (5) | ✓ ✓ ✓ ✓ ✓ 1 mark for each column completed |
| | Number of shaded tiles | 4 | 16 | 36 | 64 | 144 | 484 | | |
| | No of white tiles | 1 | 9 | 25 | 49 | 121 | 441 | | |
| | Total number of tiles | 5 | 25 | 61 | 113 | 265 | 925 | | |
| 6.2 | <p> $2a = 16$ $3a + b = 20$ $a + b + c = 5$ $a = 8$ $b = 20 - 24$ $c = 5 - 4$ $b = -4$ $c = 1$ $T_n = 8n^2 - 4n + 1$ </p> <p style="text-align: center;">Or/Of</p> <p> $T_n = (2n)^2 + (2n - 1)^2$ $= 4n^2 + 4n^2 - 4n + 1$ $= 8n^2 - 4n + 1$ </p> | | | | | | | (3) | ✓ set up of equation opstel van verg. ✓ simplification vereenvoudiging ✓ formula formule ✓ second constant difference tweede konstante verskil ✓ values of a, b and c waardes van a, b en c ✓ formula formule |

[8]

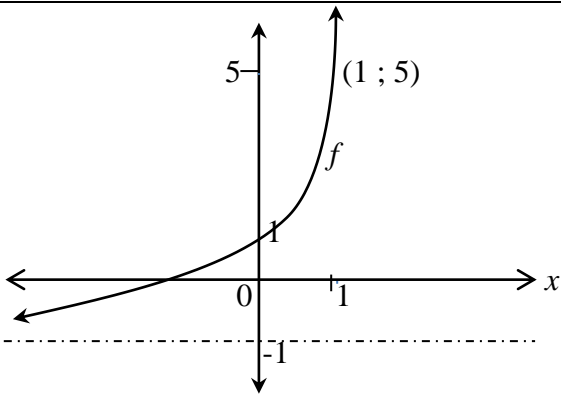
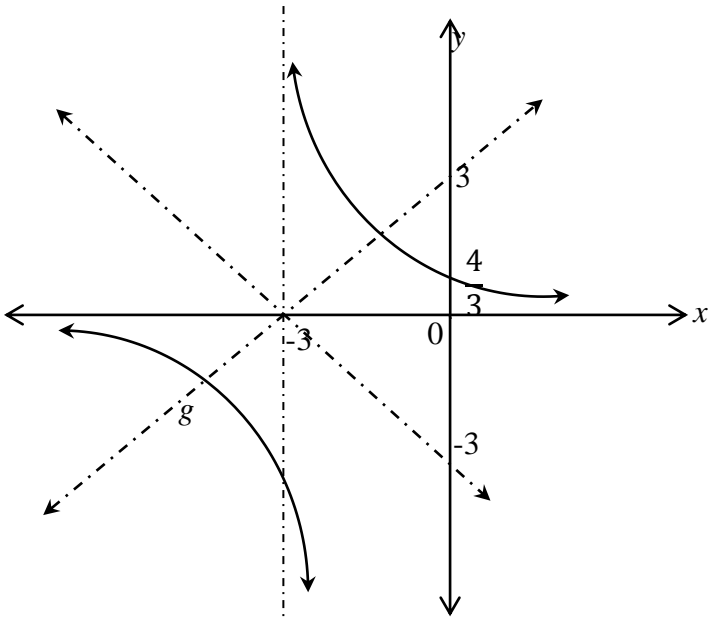
QUESTION/VRAAG 7

| | | | |
|-----|--|-----|--|
| 7.1 | 29 | (1) | ✓ answer/antwoord |
| 7.2 | $T_n = an^2 + bn + c$ $1 = a + b + c$ $\therefore c = 1 - a - b$ $5 = 4a + 2b + c$ $5 = 4a + 2b + 1 - a - b$ $4 = 3a + b \tag{1}$ $11 = 9a + 3b + c$ $11 = 9a + 3b + 1 - a - b$ $\therefore 10 = 8a + 2b \tag{2}$ <p>Solving (1) and (2) simultaneously. Los (1) en (2) gelyktydig op.</p> $8 = 6a + 2b \quad (1) \times 2$ $\underline{10 = 8a + 2b} \quad (2)$ $\therefore 2 = 2a$ $\therefore a = 1$ $\therefore b = 1$ $\therefore c = -1$ $T_n = n^2 + n - 1$ <p style="text-align: center;">Or/Of</p> | (7) | ✓ $c = 1 - a - b$ ✓ $4 = 3a + b$ ✓ $10 = 8a + 2b$ ✓ $a = 1$ ✓ $b = 1$ ✓ $c = -1$ ✓ $T_n = n^2 + n - 1$ |

| | | |
|-----|---|--|
| | $T_n = an^2 + bn + c$ $1 = a + b + c \quad (1)$ $5 = 4a + 2b + c \quad (2)$ $11 = 9a + 3b + c \quad (3)$ $(2) - (1) \quad 3a + b = 4 \quad (4)$ $(3) - (2) \quad 5a + b = 6 \quad (5)$ $(5) - (4) \quad 2a = 2$ $\therefore a = 1$ $\therefore b = 1$ $\therefore c = -1$ $T_n = n^2 + n - 1$ <p style="text-align: center;">Or/Of</p>  $2a = 2 \quad 3a + b = 4 \quad a + b + c = 1$ $a = 1 \quad 3 + b = 4 \quad 1 + 1 + c = 1$ $\quad \quad b = 1 \quad c = -1$ $T_n = n^2 + n - 1$ | <p>(7)</p> <ul style="list-style-type: none"> ✓ Substitution into T_1 ✓ vervanging in T_1 ✓ Substitution into T_2 ✓ vervanging in T_2 ✓ Substitution into T_3 ✓ vervanging in T_3 ✓ value of a ✓✓ value of b ✓ waarde van b ✓✓ value of c ✓ waarde van c ✓ T_n ✓ Constant second difference/Konstante tweede verskil ✓ value of a ✓ waarde van a ✓✓ value of b ✓ waarde van b ✓✓ value of c ✓ waarde van c ✓ T_n |
| 7.3 | $T_n = n^2 + n - 1 \quad \text{or/of} \quad T_n = 100(101) - 1$ $\therefore T_{100} = 100^2 + 100 - 1 = 10\,099$ | <p>(3)</p> <ul style="list-style-type: none"> ✓✓ substitution into T_n ✓ vervanging in T_n ✓ answer ✓ antwoord |

[11]**QUESTION/VRAAG 8**

| | | | |
|-----|--|-----|--|
| 8.1 | $y = -1$ | (1) | ✓ $y = -1$ |
| 8.2 | $y\text{-intercept: } x = 0$ $y = 2 \cdot 3^0 - 1$ $= 2 \cdot 1 - 1$ $= 1$ $\therefore (0; 1)$ | (2) | <ul style="list-style-type: none"> ✓ value of y ✓ waarde van y ✓ coordinate ✓ koördinaat |
| 8.3 | $x = 1: y = 2 \cdot 3^1 - 1 = 5$ $\therefore (1; 5)$ | (2) | <ul style="list-style-type: none"> ✓ x-coordinate ✓ x-koördinaat ✓ y-coordinate ✓ y-koördinaat |

| | | | |
|------|--|-----|--|
| 8.4 |  | (3) | <ul style="list-style-type: none"> ✓ shape vorm ✓ y-intercept y-afsnit ✓ y-asymptote y-asimptote |
| 8.5 | $y > -1$ | (1) | ✓ $y > -1$ |
| 8.6 | $x = 3$ $y = 0$ | (2) | <ul style="list-style-type: none"> ✓ x-asymptote/ x-asimptote ✓ y-asymptote/ y-asimptote |
| 8.7 | $g(0) = \frac{4}{0+3} = \frac{4}{3}$ $\therefore (0; \frac{4}{3})$ | (2) | <ul style="list-style-type: none"> ✓ $g(0)$ ✓ coordinate koördinaat |
| 8.8 | $y = x + 3$ $y = -x - 3$ | (2) | <ul style="list-style-type: none"> ✓ $y = x + 3$ ✓ $y = -x - 3$ |
| 8.9 |  | (4) | <ul style="list-style-type: none"> ✓ asymptote asymptote ✓ y-intercept y-afsnit ✓✓ one mark for each branch een punt vir elke tak |
| 8.10 | $AG = \frac{g(x_2) - g(x_1)}{x_2 - x_1}$ $= \frac{1-4}{1+2}$ $= -1$ | (3) | <ul style="list-style-type: none"> ✓ formula formule ✓ substitution vervanging ✓ answer antwoord |

QUESTION/VRAAG 9

| | | | | |
|-----|-------|---|-----|--|
| 9.1 | 9.1.1 | $y = a(x - x_1)(x - x_2)$ $y = a(x + 2)(x - 3) = a(x^2 - x - 6)$ At (0 ; -12): $-12 = a(-6)$ $\therefore a = 2$ $a = 2$ $\therefore y = 2x^2 - 2x - 12$ | (4) | ✓ factors faktore ✓ simplification vereenvoudiging ✓ value of a waarde van a ✓ equation vergelyking |
| | 9.1.2 | $y = 2(2x^2 - 2x - 12)$ $= 2(x^2 - x - 6)$ $= 2(x^2 - x + \frac{1}{4} - 6 - \frac{1}{4})$ $= 2\left[\left(x - \frac{1}{2}\right)^2 - 6\frac{1}{4}\right]$ $= 2\left(x - \frac{1}{2}\right)^2 - 6\frac{1}{4}$ | (3) | ✓ factorisation faktorisering ✓ completion of the square voltooiing van die kwadraat ✓ simplification vereenvoudiging |
| 9.2 | 9.2.1 | $f(x) = -(x^2 - x - 12)$ $= -(x - 4)(x + 3)$ C(0 ; 12) and/en D(4 ; 0) | (3) | ✓ factorisation faktorisering ✓ C-coordinate C-koördinaat ✓ D-coordinate D-koördinaat |
| | 9.2.2 | $m = -3$ and/en $c = 12$ $\therefore g(x) = -3x + 12$ | (2) | ✓ m and/en C ✓ $g(x) = -3x + 12$ |
| | 9.2.3 | $OB = \frac{1}{2}$ or/of $\therefore g\left(\frac{1}{2}\right) = -3\left(\frac{1}{2}\right) + 12 = 10\frac{1}{2}$ $f(x) = -x^2 + x + 12$ $= -\left(\frac{1}{2}\right)^2 + \frac{1}{2} + 12$ $= -\frac{1}{4} + \frac{2}{4} + 12$ $AE = AB - EB$ $= \frac{1}{4} + 12$ $\therefore AE = 12\frac{1}{4} - 10\frac{1}{2}$ $f(x) = 12\frac{1}{4}$ $= 1\frac{3}{4}$ | (3) | ✓ $g\left(\frac{1}{2}\right)$ ✓ $10\frac{1}{2}$ ✓ length of AE lengte van AE |
| | 9.2.4 | $x > \frac{1}{2}$ | (1) | ✓ $x > \frac{1}{2}$ |
| | 9.2.5 | $y \leq 12\frac{1}{4}$ | (1) | ✓ $y \leq 12\frac{1}{4}$ |

[17]

QUESTION/VRAAG 10

| | | | |
|------|--|-----|------------------------------|
| 10.1 | $f(x) = (x - 3)(x + 1) = x^2 - 2x - 3$ | (3) | ✓ x^2 ✓ $-2x$ ✓ -3 |
|------|--|-----|------------------------------|

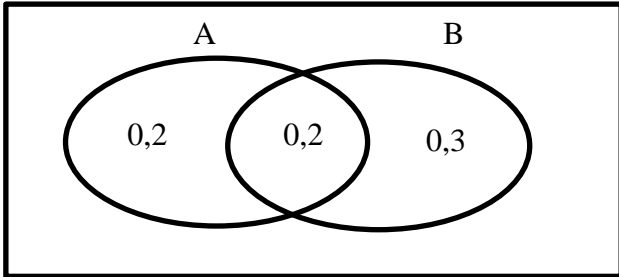
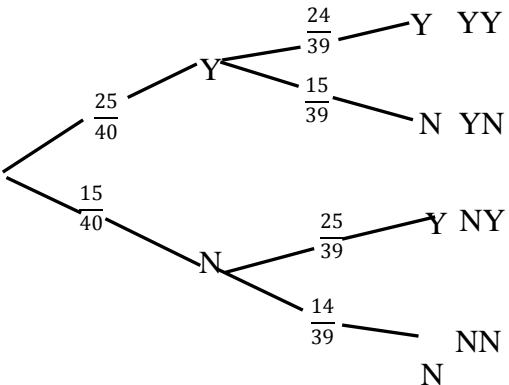
[3]

QUESTION/VRAAG 11

| | | | |
|------|---|-----|--|
| 11.1 | $P(M) \times P(N) = \frac{1731}{2201} \times \frac{1490}{2201} = 0,532$ $P(M \text{ and } N) = \frac{1364}{2201} = 0,62$ <p>∴ $P(M) \times P(N) \neq P(M \text{ and/en } N)$ ∴ M and N are not independent events ∴ M en N is nie onafhanklike gebeurtenisse</p> | (4) | ✓ P(M) correct/korrek ✓ P(N) correct/korrek ✓ P(M and N) correct P(M en N) korrek ✓ correct rule used korrekte reël gebruik |
|------|---|-----|--|

[4]

QUESTION/VRAAG 12

| | | | |
|------|---|-----|---|
| 12.1 | 12.1.1 A and/en B are independent/is onafhanklik (given/gegee) ∴ $P(A \text{ and/en } B) = P(A) \times P(B)$ $= 0,4 \times 0,5$ $= 0,2$ S  ∴ $P(A \text{ or/of } B) = 0,2 + 0,2 + 0,3 = 0,7$ | (4) | Venn diagram ✓ $P(A \text{ and/en } B) = 0,2$ ✓ $P(A \text{ and not } B) = 0,2$ $P(A \text{ en nie } B) = 2$ ✓ $P(B \text{ and not } A) = 0,3$ $P(B \text{ en nie } A) = 0,3$ ✓ $P(A \text{ or/of } B) = 0,3$ |
| | 12.1.2 $P(\text{neither/nie } A \text{ nor/of } B) = 1 - (0,2 + 0,2 + 0,3)$ $= 0,3$ | (1) | ✓ answer correct antwoord korrek |
| 12.2 | 12.2.1 Do you own a cellphone Besit jy 'n selfoon?  | (7) | ✓ tree diagram shows different outcomes ✓✓✓✓✓✓ each probability correct elke moontlikheid korrek |
| | 12.2.2 $P(\text{one will own a cellphone and the other not})$ $P(\text{een sal 'n selfoon besit en die ander nie})$ $= \frac{25}{40} \times \frac{15}{39} + \frac{15}{40} \times \frac{25}{39} = 0,48$ | (3) | ✓ first product/eerste produk ✓ second product/tweede produk ✓ answer correct antwoord korrek |

[15]