



NATIONAL SENIOR CERTIFICATE

GRADE 12

JUNE 2025

MATHEMATICS P1

MARKS: 150

TIME: 3 hours

This question paper consists of 11 pages, including 1 information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. An information sheet, with formulae, is included at the end of the question paper.
9. Number the answers correctly according to the numbering system used in this question paper.
10. Write neatly and legibly.

QUESTION 11.1 Solve for x :

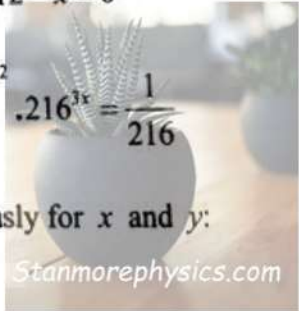


$$1.1.1 \quad x^2 + 2x + 1 = 0 \quad (2)$$

$$1.1.2 \quad x(5x - 3) = 1 \quad (\text{correct to TWO decimal places}) \quad (4)$$

$$1.1.3 \quad 2x + 3 > x^2 \quad (4)$$

$$1.1.4 \quad \sqrt{7x - 12} - x = 0 \quad (4)$$



$$1.1.5 \quad \left(\frac{1}{6}\right)^{3x+2} \cdot 216^{3x} = \frac{1}{216} \quad (4)$$

1.2 Solve simultaneously for x and y :

$$x + y = 3$$

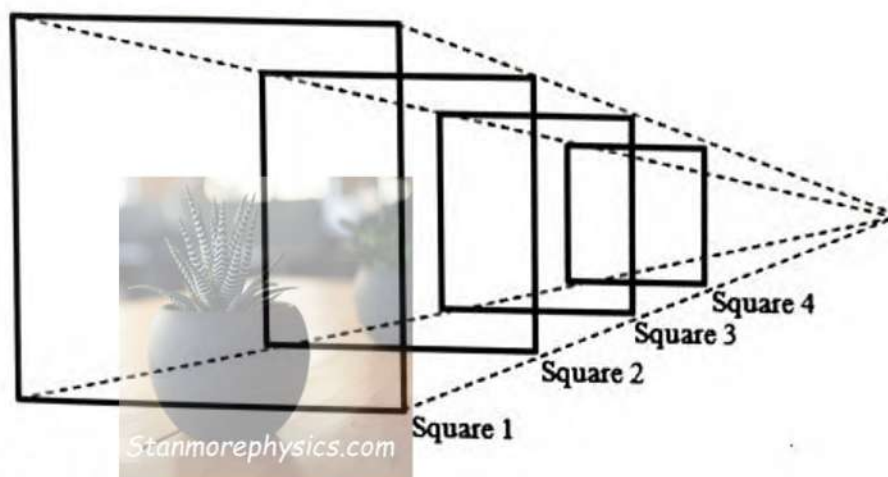
$$x^2 + 2y^2 = 18 \quad (5)$$

1.3 Given: $(\sqrt{5})^x - (\sqrt[3]{2})^y = 17$; where x and $y \in \mathbb{N}$, determine a value for $P = (x \times y)$. (4)

[27]

QUESTION 2

- 2.1 Given the following geometric series: $36 + 18 + 9 + \frac{9}{2} + \dots$ representing the areas of the squares in cm^2 , as drawn below.



- 2.1.1 Does the series converge? Justify your answer. (2)
- 2.1.2 Calculate S_{∞} . (2)
- 2.1.3 Which square will have a side length of $\frac{3}{8}$ cm? (3)
- 2.1.4 Calculate the sum of the diagonals of the first ten squares. (4)
- 2.2 The seventh term of an arithmetic sequence is 4 and the twelfth term is 14.
- 2.2.1 Determine the common difference and the first term of the sequence. (3)
- 2.2.2 Which term of the sequence will be the additive inverse of the first term? (2)
- 2.3 Given: $\sum_{p=k}^{100} (4p-1) = 19995$, determine the value of k . (5)
- [21]

QUESTION 3

3.1 Consider the quadratic number pattern: 3 ; 12 ; 33 ; 66 ; ...

3.1.1 Write down the value of the next term of the quadratic number pattern. (2)

3.1.2 If the general term of the quadratic pattern is $T_n = 6n^2 - 9n + 6$, determine the value of $T_9 - T_5$. (2)

3.2 The following information of a quadratic pattern is given:

- $T_n = an^2 + bn + 1$
- $T_4 = 27$
- $T_3 - T_2 = 8$

Determine the values of a and b .

(5)
[9]

QUESTION 4

4.1 Given the functions $f(x) = x^2 - 2x - 3$ and $g(x) = x - 3$, where $x \in \mathbb{R}$.

4.1.1 Sketch the graphs of the two functions $f(x)$ and $g(x)$ on the same system of axes. Clearly indicate the coordinates of the turning point of $f(x)$, the axis of symmetry of $f(x)$ and the x - and y -intercepts of both graphs. (6)

4.1.2 Determine the value(s) of x , for which:

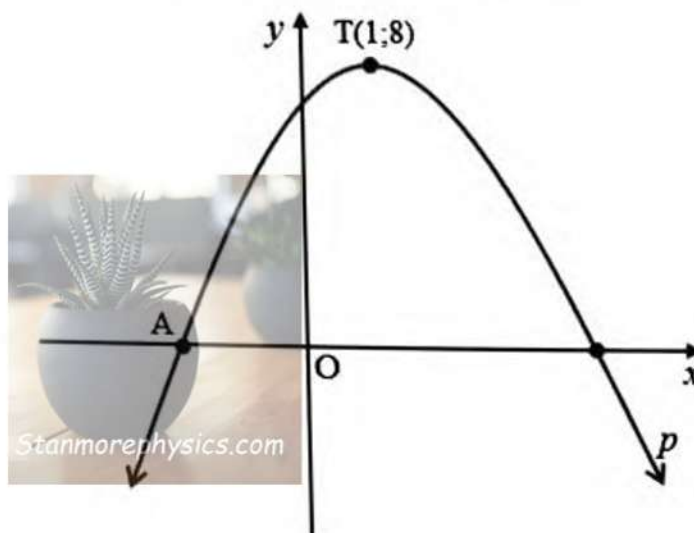
(a) $f(x) > g(x)$ (2)

(b) $f(x) \cdot g(x) \leq 0$ (2)

4.1.3 Determine the range of h , if $h(x) = -[f(x) + 4]$. (2)

4.2 The following information of a parabola, p sketched below, is given:

- Coordinates of the turning point are $T(1;8)$
- $p'(x) = -x + 1$
- Gradient of the tangent at point A, an x -intercept of p , is 4

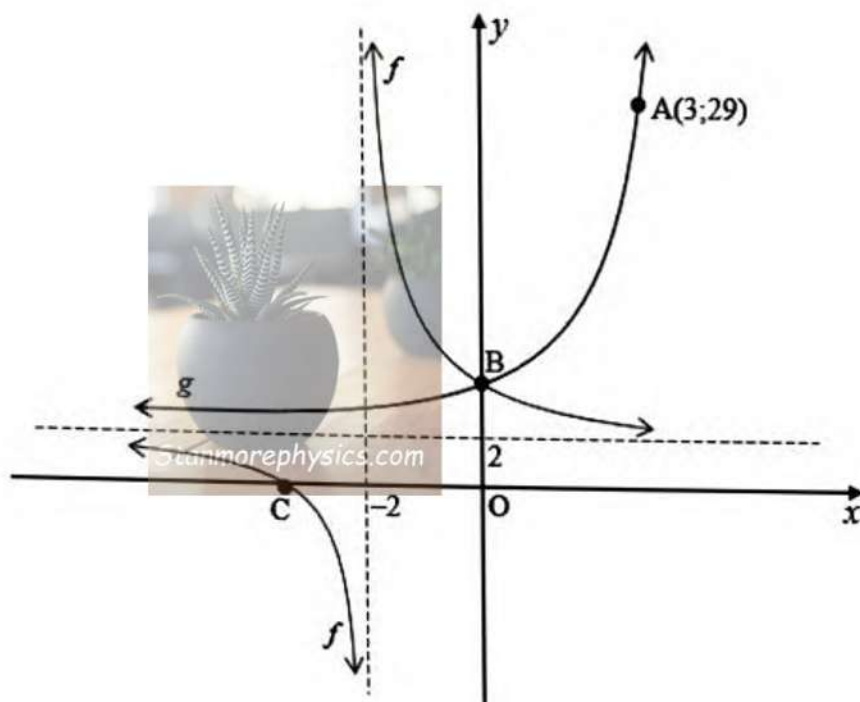


Determine the equation of the parabola, in the form $y = \dots$

(4)
[16]

QUESTION 5

In the diagram below, the graphs of $f(x) = \frac{2}{x+p} + q$ and $g(x) = b^x + 2$ are given, with point $A(3; 29)$ on g .



- 5.1 Write down the coordinates of B. (1)
- 5.2 Write down the range of $g(x)$. (1)
- 5.3 Determine the value of b . (2)
- 5.4 Determine the coordinates of C, the x-intercept of f . (2)
- 5.5 If $h(x) = g(x) - 2$, determine the equation of $h^{-1}(x)$, in the form $y = \dots$ (3)
- 5.6 Determine the equation of the axis of symmetry of f , which has a positive gradient. (2)
- 5.7 For which values of x is $f(x) \times g'(x) \leq 0$? (2)
- 5.8 Determine the area of $\triangle ABC$. (4)

[17]

QUESTION 6

6.1 Siya invested R500 000 for 5 years at an interest rate of 6,5% p.a. compounded monthly.

6.1.1 Calculate the effective interest rate of the investment. (correct to 4 decimal places) (3)

6.1.2 Hence, or otherwise calculate how much money he will get at the end of the five years. (2)

6.2 A sports car is purchased for R800 000. After how many years will the value of the car be R250 000, if the annual rate of depreciation is 20,75% p.a. on the reducing-balance method. (3)

6.3 A school is planning to build a mini-school hall. The cost is calculated to be R2 000 000 in ten years' time. On 1 January 2025, an initial deposit of R650 197,00 is made into the school hall project savings account. Interest is earned at 6,1% p.a. compounded monthly for the first 5 years. On 1 January 2030, another amount, of R x , is deposited into the savings account. The interest rate for the last 5 years is 7,47% p.a. compounded quarterly.

Determine the amount that was deposited into the savings account on 1 January 2030, i.e. calculate the value of x .

(6)
[14]

QUESTION 7

7.1 Determine $f'(x)$, from first principles, if $f(x) = x^2 + x$. (5)

7.2 Determine:

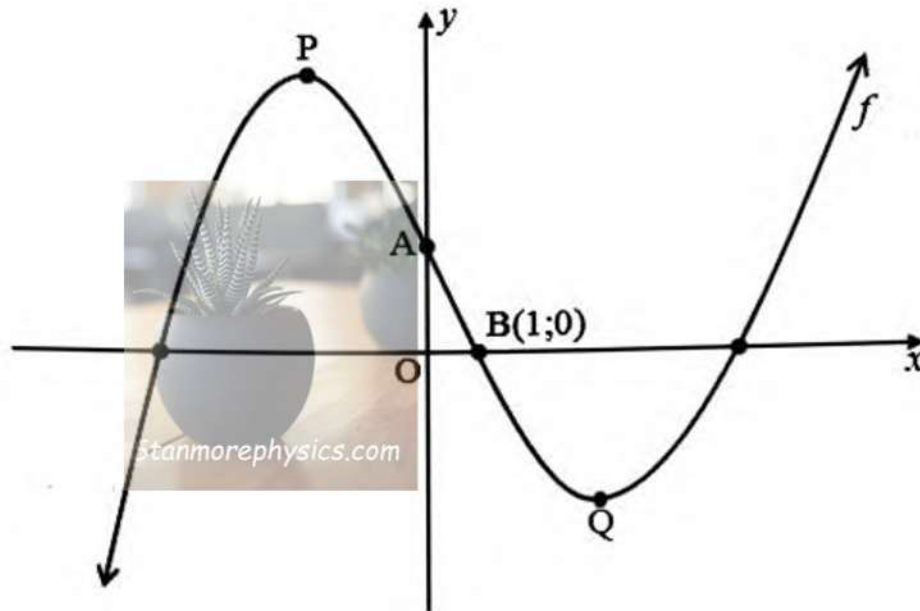
7.2.1 $f'(x)$, if $f(x) = 3x^4 - \frac{1}{2}x^{-2}$ (2)

7.2.2 $D_x \left[\frac{x+4}{\sqrt{x}} \right]$ (4)

[11]

QUESTION 8

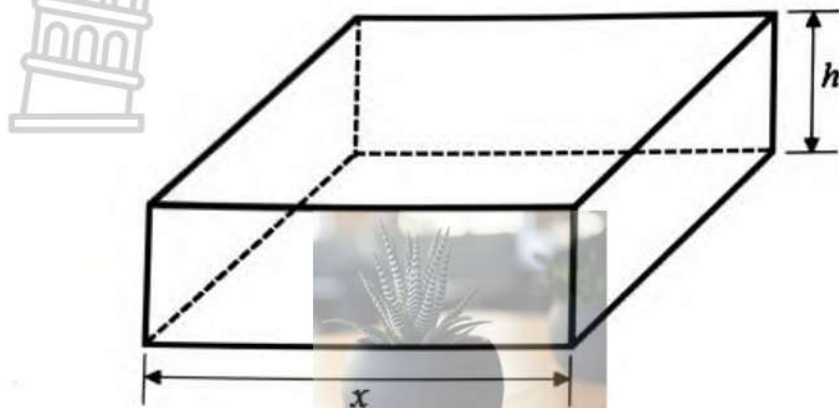
The graph of $f(x) = 2x^3 - 3x^2 + cx + 37$ is sketched below. $B(1; 0)$ is an x -intercept of f . Answer the questions that follow.



- 8.1 Write down the length of OA. (1)
 - 8.2 Show that the value of $c = -36$. (2)
 - 8.3 Determine the coordinates of P and Q, the turning points of f . (4)
 - 8.4 For which values of x is $f'(x) \geq 0$? (2)
 - 8.5 For which values of k , will $g(x) = f(x) + k$ have only one real root? (2)
 - 8.6 Determine whether f is concave up or concave down at the x -intercept, $B(1; 0)$. (3)
- [14]**

QUESTION 9

An open box with a square base is to be made out of a given quantity of pre-cut cardboard sheet. The total surface area of the outside of the box is 300 cm^2 .



Determine the value of x for which the volume of the box will be a maximum, and hence the maximum volume of the box.

[7]

QUESTION 10

- 10.1 Two events A and B are such that:
- $P(A) = 0,4$
 - $P(B) = x$
 - $P(A \text{ or } B) = 0,52$

Determine the value of x for which the events are:

10.1.1 Mutually exclusive (2)

10.1.2 Independent (3)

- 10.2 A school organised a winter camp for 120 learners. The learners were asked which hot beverage they prefer. They could choose from coffee (C), milo (M) and tea (T).

The following information was collected:

- 5 learners do not drink coffee, milo or tea
- 10 learners drink only milo
- 8 learners drink only coffee
- 35 learners do not drink tea
- 6 learners drink only tea
- 66 learners drink coffee and tea
- 75 learners drink milo and tea
- x learners drink coffee, milo and tea

10.2.1 Draw a Venn diagram to represent the above information. (3)

10.2.2 Determine the value of x . (2)

10.2.3 Determine the probability that a learner chosen at random drinks coffee and tea. (1)

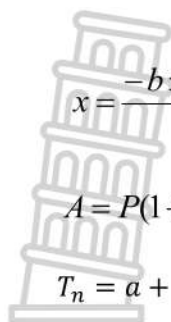
10.2.4 Determine the probability that a learner chosen at random prefers at least TWO of the beverages. (1)

10.2.5 $P(\text{not C and not T}) = \dots$ (2)

[14]

TOTAL: 150

INFORMATION SHEET: MATHEMATICS



$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 - i)^n$$

$$A = P(1 + i)^n$$

$$T_n = a + (n - 1)d$$

$$S_n = \frac{n}{2}(2a + (n - 1)d)$$

$$T_n = ar^{n-1}$$

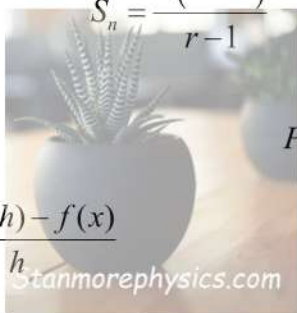
$$S_n = \frac{a(r^n - 1)}{r - 1}; \quad r \neq 1$$

$$S_\infty = \frac{a}{1 - r}; \quad -1 < r < 1$$

$$F = \frac{x[(1+i)^n - 1]}{i}$$

$$P = \frac{x[1 - (1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$



$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

$$(x - a)^2 + (y - b)^2 = r^2$$

In $\triangle ABC$:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2 \sin^2 \alpha \\ 2 \cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2 \sin \alpha \cdot \cos \alpha$$

$$\bar{x} = \frac{\sum x}{n}$$

$$\hat{\sigma}^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$



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**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE 12/GRAAD 12

JUNE/JUNIE 2025

**MATHEMATICS P1 MARKING GUIDELINE/
WISKUNDE V1 NASIENRIGLYN**

MARKS/PUNTE: 150

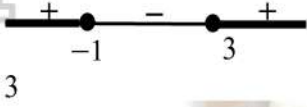
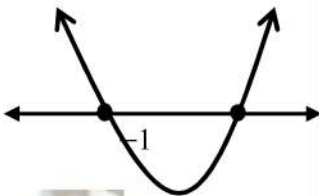
This marking guideline consists of 18 pages./
Hierdie nasienriglyn bestaan uit 18 bladsye.

NOTE/LET WEL:

- If a candidate answers a question TWICE, mark the FIRST attempt ONLY.
Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk SLEGS die EERSTE poging.
- Consistent accuracy applies in ALL aspects of the marking guideline.
Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die nasienriglyn.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
Indien 'n kandidaat 'n poging vir 'n vraag deurgetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deurgetrek is.
- The mark for substitution is awarded for substitution into the correct formula.
Die punt vir substitusie word vir substitusie in die korrekte formule toegeken.

QUESTION/VRAAG 1

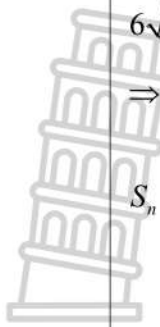
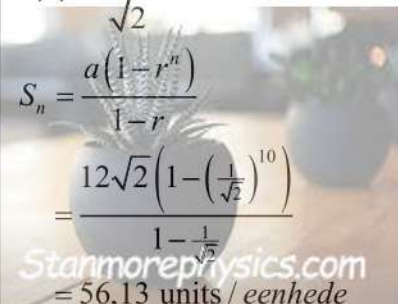
1.1.1	$x^2 + 2x + 1 = 0$ $(x+1)(x+1) = 0$ $x+1 = 0 \text{ or/of } x+1 = 0$ $x = -1 \text{ or/of } x = -1$ OR/OF $x^2 + 2x + 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(2) \pm \sqrt{(2)^2 - 4(1)(1)}}{2(1)}$ $= \frac{-2 \pm \sqrt{0}}{2}$ $x = -1 \text{ or / of } x = -1$ Answers only – Full Marks Slegs antwoorde – Volpunte	✓ factors / faktore ✓ both answers / beide antwoorde OR/OF ✓ correct substitution into correct formula / korrekte vervanging in korrekte formule ✓ both answers / beide antwoorde (2)
1.1.2	$x(5x-3) = 1$ $5x^2 - 3x - 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(5)(-1)}}{2(5)}$ $x = \frac{3 \pm \sqrt{29}}{10}$ $\therefore x = -0,24 \text{ or / of } x = 0,84$ Penalise 1 mark for incorrect rounding off./ Penaliseer 1 punt vir verkeerde afroning.	✓ standard form / standaardvorm ✓ substitution / vervanging ✓✓ x-values / x-waardes (4)

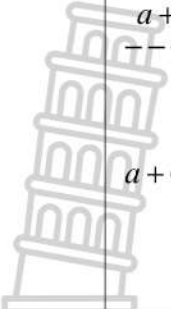
1.1.3 	$2x+3 > x^2$ $-x^2 + 2x + 3 > 0$ $x^2 - 2x - 3 < 0$ critical values/kritieke waardes $(x+1)(x-3) = 0$ $x = -1 \text{ or/of } x = 3$   $-1 < x < 3, x \in \mathbf{R}$ OR/OF $x \in (-1 ; 3), x \in \mathbf{R}$ 	✓ standard form / <i>standaardvorm</i> ✓ critical values / <i>kritieke waardes</i> ✓✓ $-1 < x < 3, x \in \mathbf{R}$ (accuracy / <i>akkuraatheid</i>) OR/OF $x \in (-1 ; 3), x \in \mathbf{R}$ (4)
1.1.4	$\sqrt{7x-12} - x = 0$ $\sqrt{7x-12} = x$ $(\sqrt{7x-12})^2 = (x)^2$ $7x-12 = x^2$ $x^2 - 7x + 12 = 0$ $(x-3)(x-4) = 0$ $\therefore x = 3 \text{ or / of } x = 4$	✓ isolating surd / <i>isoleer wortelvorm</i> ✓ square both sides / <i>kwadreeer beide kante</i> ✓ standard form / <i>standaardvorm</i> ✓ both answers / <i>beide antwoorde</i> (4)
1.1.5	$\left(\frac{1}{6}\right)^{3x+2} \cdot 216^{3x} = \frac{1}{216}$ $6^{-3x-2} \times 6^{9x} = 6^{-3}$ $\therefore 6x - 2 = -3$ $6x = -1$ $x = -\frac{1}{6}$	✓ same base / <i>dieselfde basis</i> ✓ exponential law / <i>eksponentwet</i> ✓ equating exponents / <i>gelykstel van eksponente</i> ✓ answer / <i>antwoord</i> (4)

1.2	$x + y = 3 \dots\dots\dots (1)$ $x^2 + 2y^2 = 18 \dots\dots (2)$ From/Vanaf (1): $y = -x + 3 \dots\dots\dots (3)$ (3) into/in (2): $x^2 + 2(-x + 3)^2 = 18$ $x^2 + 2(x^2 - 6x + 9) - 18 = 0$ $x^2 + 2x^2 - 12x + 18 - 18 = 0$ $3x^2 - 12x = 0$ $3x(x - 4) = 0$ $3x = 0$ or/of $x - 4 = 0$ $x = 0$ or/of $x = 4$ $y = 3$ or/of $y = -1$	$\checkmark y = -x + 3$ $\checkmark$ substitution / <i>vervanging</i> $\checkmark$ standard form / <i>standaardvorm</i> $\checkmark$ x-values / <i>waardes</i> $\checkmark$ y-values / <i>waardes</i> (5)
1.3	$(\sqrt{5})^x - (\sqrt[3]{2})^y = 17$ $(5)^{\frac{1}{2}x} - (2)^{\frac{1}{3}y} = 25 - 8$ $(5)^{\frac{1}{2}x} - (2)^{\frac{1}{3}y} = 5^2 - 2^3$ $\therefore \frac{1}{2}x = 2$ and/en $\frac{1}{3}y = 3$ $\Rightarrow x = 4$ and/en $y = 9$ $P = (4 \times 9) = 36$	$\checkmark$ converting to exponential form / <i>herlei na eksponensiale vorm</i> $\checkmark 17 = 25 - 8$ $\checkmark$ equating exponents / <i>gelykstel van eksponente</i> $\checkmark$ answer / <i>antwoord</i> (4)
		[27]

QUESTION/VRAAG 2

2.1.1	Yes / Ja ; $-1 < \frac{1}{2} < 1$	✓ Yes / Ja ✓ reason / rede (2)
2.1.2	$S_{\infty} = \frac{a}{1-r}$ $= \frac{36}{1-\frac{1}{2}}$ $= 72 \text{ cm}^2$	✓ substitution / vervanging ✓ answer / antwoord (2)
2.1.3	Side length series / Sylengte reeks: $6 + 3\sqrt{2} + 3 ; \dots \Rightarrow r = \frac{1}{2}$ $T_n = 6\left(\frac{1}{\sqrt{2}}\right)^{n-1} = \frac{3}{8}$ $\left(\frac{1}{\sqrt{2}}\right)^{n-1} = \left(\frac{1}{16}\right)$ $\left(\frac{1}{\sqrt{2}}\right)^{n-1} = \left(\frac{1}{\sqrt{2}}\right)^8$ $\therefore n-1 = 8$ $n = 9$ OR/OF Area series / Oppervlakte reeks side length / sylengte = $\frac{3}{8} \Rightarrow$ Area / Oppervlakte = $\frac{9}{64}$ $T_n = 36\left(\frac{1}{2}\right)^{n-1} = \frac{9}{64}$ $\left(\frac{1}{2}\right)^{n-1} = \left(\frac{1}{256}\right)$ $\left(\frac{1}{2}\right)^{n-1} = \left(\frac{1}{2}\right)^8$ $\therefore n-1 = 8$ $n = 9$	✓ new series / nuwe reeks ✓ substitution / vervanging ✓ answer / antwoord OR/OF ✓ Area / Oppervlakte = $\frac{9}{64}$ ✓ substitution / vervanging ✓ answer / antwoord (3)

2.1.4 	Series of ONE diagonal / Reeks van EEN hoeklyn: $6\sqrt{2} + 6 + 3\sqrt{2} + 3 + \dots$ $\Rightarrow r = \frac{1}{\sqrt{2}}$ $S_n = \frac{a(1-r^n)}{1-r}$ $= \frac{6\sqrt{2}\left(1-\left(\frac{1}{\sqrt{2}}\right)^{10}\right)}{1-\frac{1}{\sqrt{2}}}$ $= 28,07 \text{ units / eenhede}$ $\therefore$ there are two diagonals: $\therefore$ daar twee hoeklyne is: $\Rightarrow 2 \times 28,07 = 56,14 \text{ units / eenhede}$  OR/OF Series of TWO diagonals / Reeks van TWEE hoeklyne: $12\sqrt{2} + 12 + 6\sqrt{2} + 6 + \dots$ $\Rightarrow r = \frac{1}{\sqrt{2}}$ $S_n = \frac{a(1-r^n)}{1-r}$ $= \frac{12\sqrt{2}\left(1-\left(\frac{1}{\sqrt{2}}\right)^{10}\right)}{1-\frac{1}{\sqrt{2}}}$ $= 56,13 \text{ units / eenhede}$ 	✓ diagonal series / hoeklyn reeks ✓ $r = \frac{1}{\sqrt{2}}$ ✓ substitution / vervanging ✓ answer / antwoord OR/OF ✓ diagonal series / hoeklyn reeks ✓ $r = \frac{1}{\sqrt{2}}$ ✓ substitution / vervanging ✓ answer / antwoord (4)
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2.2.1 	$ \begin{aligned} a + 11d &= 14 \quad \dots\dots\dots(1) \\ a + 6d &= 4 \quad \dots\dots\dots(2) \\ \hline 5d &= 10 \\ d &= 2 \\ a + 6(2) &= 4 \\ a &= -8 \end{aligned} $	✓ both equations / beide vergelykings ✓ value of d / waarde van d ✓ value of a / waarde van a (3)
2.2.2	$ \begin{aligned} T_n &= -8 + (n-1)(2) \\ &= 2n - 10 \\ 2n - 10 &= 8 \\ 2n &= 18 \\ n &= 9 \\ T_9 &= 8, \text{ is the additive inverse of first term} \\ &\text{is die optellingsinvers van die eerste term} \end{aligned} $ 	✓ Equating $T_n = 8$ / Stel $T_n = 8$ ✓ answer / antwoord (2)
2.3	$ \begin{aligned} T_1 &= 3 ; T_2 = 7 ; T_3 = 11 \Rightarrow d = 4 \\ T_{100} &= 399 \\ S_n &= \frac{n}{2}(a+l) \\ 19995 &= \frac{101-k}{2}[(4k-1) + 399] \\ 39990 &= (101-k)(4k+398) \\ 4k^2 - 6k - 208 &= 0 \\ 2k^2 - 3k - 104 &= 0 \\ k &= 8 \quad \text{or} \quad k \neq -\frac{13}{2} \end{aligned} $	✓ $T_1 = 4k - 1$ & $T_{100} = 399$ ✓ $n = 101 - k$ ✓ substitution / vervanging ✓ standard form / standaardvorm ✓ answer / antwoord (5)
		[21]

QUESTION/VRAAG 3

3.1.1	$3 ; 12 ; 33 ; 66 ; T_5$ $9 ; 21 ; 33 ; 45$ $12 ; 12 ; 12$ $T_5 = 111$	✓ 2 nd difference / 2 ^{de} verskil ✓ answer / antwoord (2)
3.1.2	$T_9 = 6(9)^2 - 9(9) + 6$ $= 411$ $T_9 - T_5 = 411 - 111$ $= 300$	✓ value of T_9 / waarde van T_9 ✓ answer / antwoord (2)
3.2	$T_n = an^2 + bn + 1$ $T_4 = 27 \Rightarrow 16a + 4b + 1 = 27$ $T_3 - T_2 = 8 \Rightarrow 5a + b = 8$ $20a + 4b = 32$ $16a + 4b = 26$ $4a = 6$ $a = \frac{3}{2}$ $5\left(\frac{6}{4}\right) + b = 8$ $b = 8 - \frac{15}{2}$ $b = \frac{1}{2}$	✓ $16a + 4b + 1 = 27$ ✓ $5a + b = 8$ ✓ method of solving / (elimination or substitution) <i>metode om op te los</i> <i>(eliminatie of vervanging)</i> ✓ value of a / waarde van a ✓ value of b / waarde van b (5)
		[9]

QUESTION/VRAAG 4

4.1.1

$$f(x) = x^2 - 2x - 3$$

$$y\text{-int}(x=0): y = -3$$

$$x\text{-int}(y=0): x^2 - 2x - 3 = 0$$

$$x = 3 \text{ or } x = -1$$

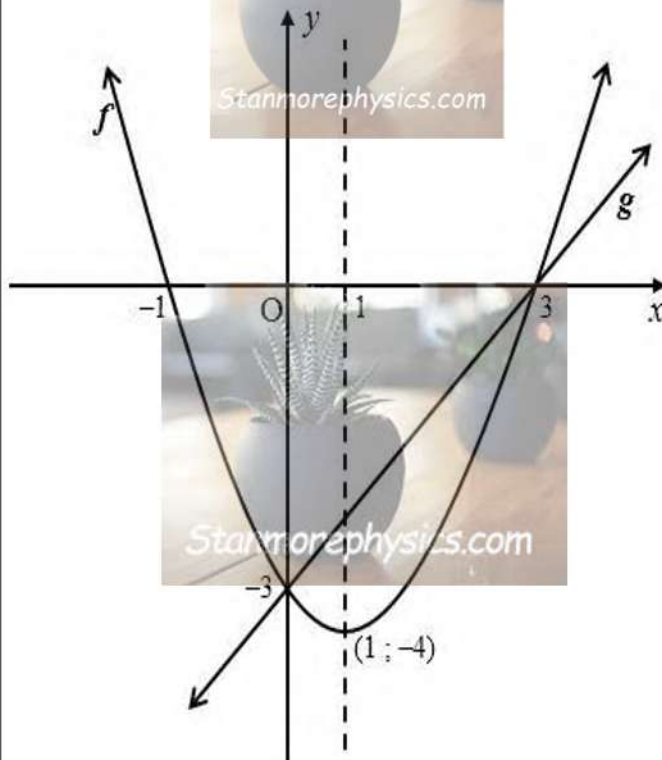
$$x = -\frac{b}{2a} = \frac{-(-2)}{2(1)} = 1$$

$$y = (1)^2 - 2(1) - 3 = -4 \Rightarrow TP \text{ is } (1; -4)$$

$$g(x) = x - 3$$

$$x\text{-int}(y=0): y = -3$$

$$y\text{-int}(x=0): x = 3$$



**Marks are awarded on sketch
NOT for working**

**Punte word op skets toegeken
NIE vir bewerkings NIE**

Graph of $f(x)$ / Grafiek van $f(x)$

- ✓ x-intercepts / x-afsnitte
- ✓ y-intercept / y-afsnit
- ✓ turning point / draaipunt
- ✓ shape / vorm

Graph of $g(x)$ / Grafiek van $g(x)$

- ✓ x-intercept / x-afsnit
- ✓ y-intercept / y-afsnit

(6)

4.1.2 (a)

$$x < 0 \text{ or / of } x > 3$$

$$\checkmark x < 0 \text{ and/en } \checkmark x > 3$$

(2)

4.1.2 (b)

$$x \leq -1$$

✓✓ answer / antwoord

(2)

4.1.3

Range of h / Waardeversameling (Terrein) van h
: $y \leq 0; y \in \mathbb{R}$

✓✓ answer / antwoord

(2)

4.2	$-x + 1 = 4$ $-x = 3$ $x = -3 \Rightarrow A(-3; 0)$ $y = a(x + p)^2 + q$ $y = a(x - 1)^2 + 8$ $0 = a(-3 - 1)^2 + 8$ $-8 = 16a$ $-\frac{1}{2} = a$ $\Rightarrow p(x) = -\frac{1}{2}(x - 1)^2 + 8$	✓ $A(-3; 0)$ ✓ substitution of T/P and A / vervanging van T/P en A ✓ $a = -\frac{1}{2}$ ✓ answer / antwoord
		(4)
		[16]

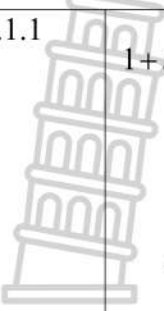
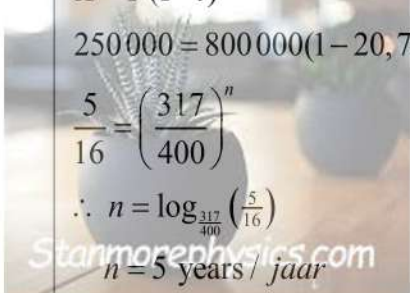
Stanmorephysics.com

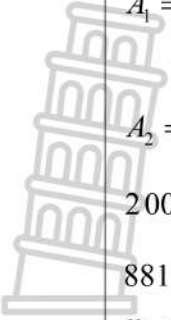
QUESTION/VRAAG 5

5.1	$B(0; 3)$	✓ answer / <i>antwoord</i> (1)
5.2	Range of / <i>Waardeversameling van</i> g : $y > 2; y \in \mathbb{R}$	✓ answer / <i>antwoord</i> (1)
5.3	$g(x) = b^x + 2$ $29 = b^3 + 2$ $3^3 = b^3$ $\therefore b = 3$	✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> (2)
5.4	$\frac{2}{x+2} + 2 = 0$ $2 + 2x + 4 = 0$ $2x = -6$ $x = -3$	✓ equating to 0 / <i>gelyk stel aan 0</i> ✓ answer / <i>antwoord</i> (2)
5.5	$h(x) = 3^x + 2 - 2$ $= 3^x$ $h^{-1}(x): x = 3^y$ $\therefore y = \log_3 x$	✓ $h(x) = 3^x$ ✓ swapping x and y / <i>omruil van x en y</i> ✓ answer / <i>antwoord</i> (3)
5.6	original axis of symmetry: <i>oorspronklikesimmetrie-as</i> $y = x$ $\therefore y = (x + 2) + 2$ $y = x + 4$	✓ method / <i>metode</i> ✓ answer / <i>antwoord</i> (2)

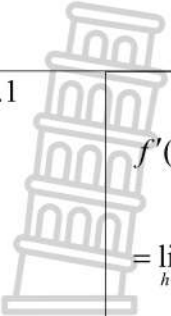
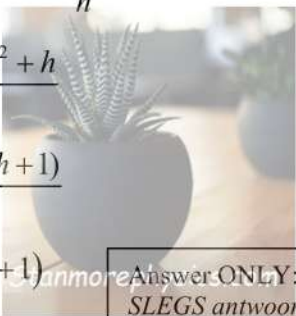
5.7	$-3 \leq x < -2$	✓✓ answer / antwoord (2)
Area of $\Delta ACD = \frac{1}{2}(6)(29) = 87 \text{ units}^2 / \text{eenhede}^2$ Area of $\Delta BCO = \frac{1}{2}(3)(3) = 4,5 \text{ units}^2 / \text{eenhede}^2$ Area of Trap. BODA = $\left(\frac{3+29}{2}\right) \times 3 = 48 \text{ units}^2 / \text{eenhede}^2$ $\therefore \text{Area } \Delta ABC = 87 - (4,5 + 48) = 34,5 \text{ units}^2 / \text{eenhede}^2$ NOTE: There are many different alternative solutions to this question. Follow learner's solution and award marks accordingly. LET WEL: Daar is baie verskillende alternatiewe oplossings vir hierdie vraag. Volg leerder se oplossing en ken punte dienooreenkomstig toe.		✓ Area of ΔACD / oppervlakte van ΔACD ✓ Area of ΔBCO / oppervlakte van ΔBCO ✓ Area of Trapezium BODA / Oppervlakte van Trapezium BODA ✓ Area of ΔABC / oppervlakte van ΔABC (4)
		[17]

QUESTION/VRAAG 6

6.1.1 	$1 + i_{\text{eff}} = \left(1 + \frac{i_{\text{nom}}}{m}\right)^m$ $= \left(1 + \frac{6,5\%}{12}\right)^{12}$ $i_{\text{eff}} = \left(1 + \frac{6,5\%}{12}\right)^{12} - 1$ $= 0,066971852\dots$ effective rate / <i>effektiewe koers</i> = 6,6972% p.a.	✓ substitution / <i>vervang</i> ✓ simplification / <i>vereenvoudiging</i> ✓ answer / <i>antwoord</i> (3)
6.1.2	$A = P(1+i)^n$ $= 500\,000(1+6,6972\%)^5$ $= R691\,409,14$  OR/OF $A = P(1+i)^n$ $= 500\,000\left(1 + \frac{6,5\%}{12}\right)^{60}$ $= R691\,408,66$ Stanmorephysics.com	✓ substitution / <i>vervang</i> ✓ answer / <i>antwoord</i> (2) OR/OF ✓ substitution / <i>vervang</i> ✓ answer / <i>antwoord</i> (2)
6.2	$A = P(1-i)^n$ $250\,000 = 800\,000(1-20,75\%)^n$ $\frac{5}{16} = \left(\frac{317}{400}\right)^n$ $\therefore n = \log_{\frac{317}{400}}\left(\frac{5}{16}\right)$ $n = 5 \text{ years / jaar}$  Stanmorephysics.com	✓ substitution / <i>vervang</i> ✓ simplification (correct use of Logs) / <i>vereenvoudiging (korrekte gebruik van Logs)</i> ✓ answer / <i>antwoord</i> (3)

6.3 	$A_1 = 650197 \left(1 + \frac{6,1\%}{12} \right)^{60} = R881392,29$ $A_2 = P(1+i)^n$ $2000\,000 = (881392,29 + x) \left[1 + \frac{7,47\%}{4} \right]^{20}$ $881392,29 + x = 138\,292,32$ $x = R500\,000,00$ 	✓ substitution / <i>vervang</i> ✓ answer / <i>antwoord</i> ✓ adding Rx / <i>by tel van Rx</i> ✓ substitution / <i>vervang</i> ✓ simplification / <i>vereenvoudiging</i> ✓ answer / <i>antwoord</i> (6)
		[14]

QUESTION/VRAAG 7

		Penalise 1 mark for incorrect notation in 7.1 only Penaliseer 1 punt vir verkeerde notasie, slegs in 7.1
7.1	 $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{(x+h)^2 + (x+h) - (x^2 + x)}{h}$ $= \lim_{h \rightarrow 0} \frac{x^2 + 2xh + h^2 + x + h - x^2 - x}{h}$ $= \lim_{h \rightarrow 0} \frac{2xh + h^2 + h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(2x + h + 1)}{h}$ $= \lim_{h \rightarrow 0} (2x + h + 1)$ $= 2x + 1$  Answer ONLY: 0 marks SLEGS antwoord: 0 punte	✓ substitution / vervanging ✓ $x^2 + 2xh + h^2 + x + h$ ✓ simplification / vereenvoudiging ✓ factorisation / faktorisering (dividing by h / deel deur h) ✓ answer / antwoord (5)
7.2.1	$f(x) = 3x^4 - \frac{1}{2}x^{-2}$ $f'(x) = 12x^3 + x^{-3}$ $= 12x^3 + \frac{1}{x^3}$	✓ $12x^3$ ✓ x^{-3} (2)
7.2.2	$D_x \left[\frac{x+4}{\sqrt{x}} \right]$ $= D_x \left[\frac{x}{x^{\frac{1}{2}}} + \frac{4}{x^{\frac{1}{2}}} \right]$ $= D_x \left[x^{\frac{1}{2}} + 4x^{-\frac{1}{2}} \right]$ $= \frac{1}{2}x^{-\frac{1}{2}} - 2x^{-\frac{3}{2}}$	✓ $x^{\frac{1}{2}}$ ✓ $4x^{-\frac{1}{2}}$ ✓ $\frac{1}{2}x^{-\frac{1}{2}}$ ✓ $-2x^{-\frac{3}{2}}$ (4)
		[11]

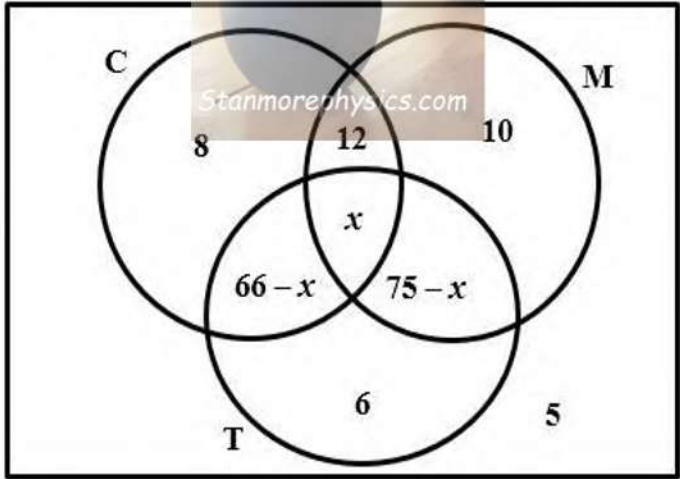
QUESTION/VRAAG 8

8.1	OA = 37 units/eenhede	✓ answer / antwoord (1)
8.2	$f(x) = 2x^3 - 3x^2 - cx + 37$ $f(1) = 2(1)^3 - 3(1)^2 - c(1) + 37 = 0$ $2 - 3 - c + 37 = 0$ $c = -36$	✓ substitution of 1 and equating to 0 / vervanging van 1 en gelyk stel aan 0 ✓ answer / antwoord (2)
8.3	$f(x) = 2x^3 - 3x^2 - 36x + 37$ $f'(x) = 6x^2 - 6x - 36 = 0$ $x^2 - x - 6 = 0$ $(x+2)(x-3) = 0$ $x = -2$ or / of $x = 3$ $y = 81$ or / of $y = -44$ $P(-2; 81)$; $Q(3; -44)$	✓ $f'(x)$ ✓ $f'(x) = 0$ ✓ x-values / x-waardes ✓ y-values / y-waardes (4)
8.4	$x \leq -2$ or / of $x \geq 3$	✓✓ answer / antwoord (2)
8.5	$k < -81$ or / of $k > 44$	✓✓ answer / antwoord (2)
8.6	$f''(x) = 12x - 6$ $f''(1) = 12(1) - 6$ $= 6 > 0$ $\Rightarrow f$ is concave up / konkaaf op OR/OF $f''(x) = 12x - 6 = 0$ $x = \frac{1}{2}(x - \text{coordinate of p.o.i})$ $(x - \text{koördinaat van buigpunt})$ $\therefore$ since B lies to the right of the p.o.i and a is +ve omdat B regs van buigpunt lê en a is +ve $\Rightarrow f$ is concave up at point B / f is konkaaf op by punt B	✓ f'' ✓ answer / antwoord ✓ conclusion / gevolgtrekking (3) OR/OF ✓ f'' ✓ answer / antwoord ✓ conclusion / gevolgtrekking (3)
		[14]

QUESTION/VRAAG 9

9.1	$T.S.A = x^2 + 4xh$ $x^2 + 4xh = 300$ $h = \frac{300 - x^2}{4x}$ $Volume = x \times x \times h$ $= x^2 \times \left(\frac{300 - x^2}{4x} \right)$ $= 75x - \frac{1}{4}x^3$ Maximum Volume / Maksimum Volume: $V'(x) = 75 - \frac{3}{4}x^2 = 0$ $-\frac{3}{4}x^2 = -75$ $x^2 = 100$ $x = 10 ; \because x > 0$ $V = 75(10) - \frac{1}{4}(10)^3$ $= 750 - 250$ $= 500 \text{ units}^2 / \text{eenhede}^2$	$\checkmark x^2 + 4xh = 300$ $\checkmark h$ in terms of x / h in terme van x $\checkmark$ substitution / vervanging $\checkmark$ answer / antwoord $\checkmark A'(x) = 0$ $\checkmark$ answer / antwoord $\checkmark$ answer / Antwoord (7)
		[7]

QUESTION 10/VRAAG 10

10.1.1	$P(A \text{ or / of } B) = P(A) + P(B)$ $0,52 = 0,4 + x$ $x = 0,12$	✓ substitution into correct formula / vervanging in korrekte formule ✓ answer / antwoord (2)
10.1.2	$P(A \text{ or / of } B) = P(A) + P(B) - P(A).P(B)$ $0,52 = 0,4 + x - 0,4x$ $0,6x = 0,12$ $x = 0,2$	✓ $P(A \text{ and/en } B) = P(A) \times P(B)$ ✓ substitution into correct formula / vervanging in korrekte formule ✓ answer / antwoord (3)
10.2.1		✓ 5 ; 6 ; 8 ; 10 ✓ x ; $66 - x$; $75 - x$ ✓ 12 (3)
10.2.2	$8 + 12 + 10 + x + 66 - x + 75 - x + 6 + 5 = 120$ $182 - x = 120$ $x = 62$	✓ adding and equating / optel en gelyk stel ✓ answer / antwoord (2)
10.2.3	$P(C \text{ and / en } T) = \frac{66}{120}$	✓ answer / antwoord (1)
10.2.4	$P(\text{at least 2 / ten minste 2}) = \frac{91}{120}$	✓ answer / antwoord (1)
10.2.5	$P(\text{not } C \text{ and not } T) = \frac{15}{120}$ $P(\text{nie } C \text{ en nie } T) = \frac{15}{120}$	✓✓ answer / antwoord (2)
		[14]

TOTAL/TOTAAL: 150