



**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2024

MATHEMATICS P1

MARKS: 150

TIME: 3 hours



This question paper consists of 13 pages including an information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

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



QUESTION 1

1.1 Solve for x :

1.1.1 $x^2 - 2x - 8 = 0$ (2)

1.1.2 $2x^2 - 3x = 7$ (answers correct to TWO decimal places) (4)

1.1.3 $(x+1)(4-x) > 0$; where $x \in \mathbb{N}$ (3)

1.2 Given: $\frac{14}{p} = p + 5$

1.2.1 Solve for p (3)

1.2.2 Hence, or otherwise, solve for x if $\frac{14}{\sqrt{x+5}} = \sqrt{x+5} + 5$ (4)

1.3 Solve for x and y simultaneously:

$-3y = 1 - x$ and $x^2 - 2xy - y^2 - 7 = 0$ (6)

1.4 If $2x^{-1} + x^{-2} = 3$ and $x < 0$, determine, **without using a calculator**, the value of $2(6x - 1)^{-1}$. (4)

[26]



QUESTION 2

2.1 Simplify fully, **without using a calculator**:

$$\frac{\sqrt{32} - \sqrt{18} + 3\sqrt{3}}{\sqrt{108} + \sqrt{8}} \quad (4)$$

2.2 Solve for x :

2.2.1 $2x^{\frac{5}{2}} = 64$ (3)

2.2.2 $3 \cdot 5^x - 5^{x-1} = 14$ (5)

2.3 Calculate a possible value for $a^2 + b^2$, if it is given that a and b are rational numbers such that $\sqrt{a} + \sqrt{b} = \sqrt{9} + \sqrt{56}$.

(5)
[17]



QUESTION 3

3.1 Consider the linear number pattern: $-5 ; -9 ; -13 ; \dots$

3.1.1 Write down the next TWO terms of the pattern. (2)

3.1.2 Determine an expression for the n^{th} term of the pattern. (2)

3.1.3 Calculate the value of n for which $T_n = -141$. (2)

3.2 In a linear number pattern the first term is x and a common difference is 5 less than the first term.

Calculate the value of the first term if it is given that the sum of the first three terms of the linear number pattern is 63. (5)

[11]



QUESTION 4

Given the number pattern 24; 10; 0; -6; ...

- 4.1 Show that the above number pattern is quadratic. (2)
- 4.2 Determine the n^{th} term of the quadratic number pattern in the form, $T_n = an^2 + bn + c$. (4)
- 4.3 Calculate the value of T_{52} . (2)
- 4.4 Determine the smallest value of the quadratic number pattern. (3)
- 4.5 Determine the value(s) of n for which the terms of the quadratic number pattern will be positive. (4)

[15]

QUESTION 5

The lines $y = -x + 4$ and $y = x - 2$ are the axes of symmetry of the function

$$f(x) = \frac{-3}{x+p} + q.$$

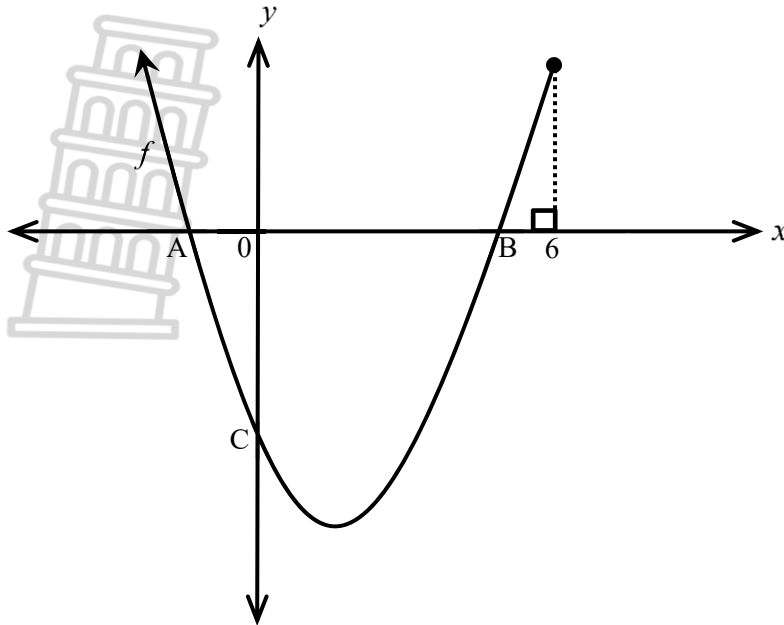
- 5.1 Show that $p = -3$ and $q = 1$. (4)
- 5.2 Calculate the x -intercept of f . (2)
- 5.3 Calculate the y -intercept of f . (2)
- 5.4 Sketch the graph of f . Clearly label all intercepts with the axes and asymptotes. (3)
- 5.5 Write down the domain of g if g is the reflection of f along the line $x = 0$. (3)
- 5.6 For which values of x will $x \cdot f(x) \leq 0$? (3)

[17]

QUESTION 6

Sketched below is the graph of $f(x) = x^2 - 4x - 5$ for $x \in (-\infty; 6]$.

A and B are the x -intercepts and C the y -intercept of f .



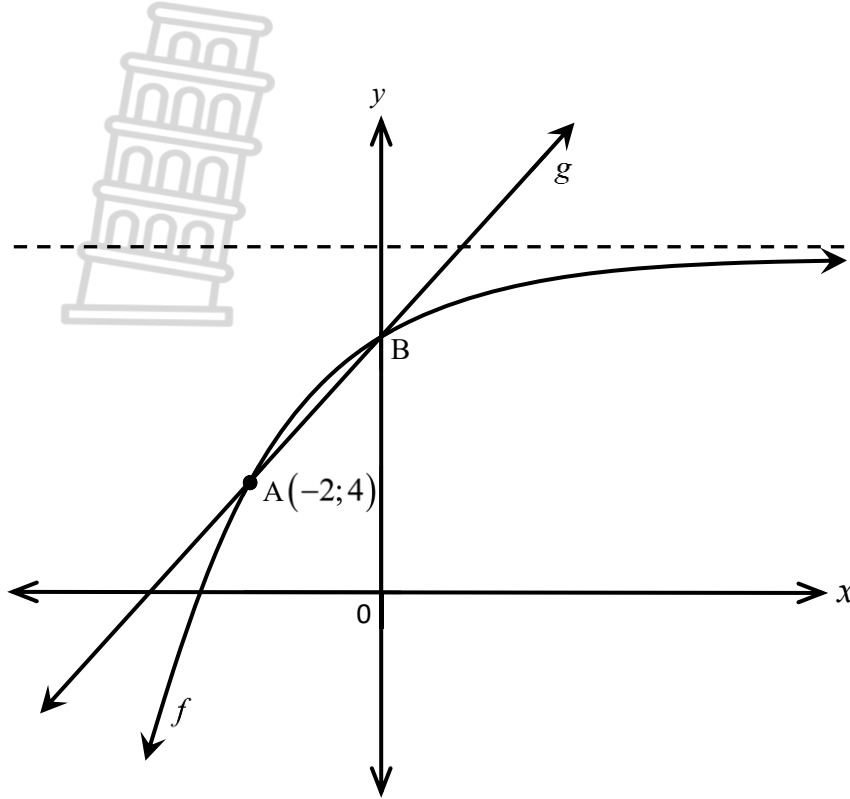
- 6.1 Determine the value of $f(6)$. (1)
- 6.2 Determine the coordinates of A and B. (3)
- 6.3 Hence, calculate the length of AB. (1)
- 6.4 Write down the equation of g in the form $g(x) = ax^2 + bx + c$, if it is given that $g(x)$ is obtained by shifting $f(x)$ two units to the right and five units up. (3)
- 6.5 Suppose h is a tangent, to the curve f at a certain point, with a gradient of -2 . Calculate the y -intercept of h . (5)
- 6.6 For which values of k will $f(x) - k = 0$ have just one real root? (3)

[16]

QUESTION 7

The graphs of $f(x) = -(b)^x + 8$ and $g(x) = \frac{3}{2}x + 7$ are drawn below.

A(-2; 4) and B are points of intersection of f and g . B is the y -intercept of both graphs f and g .



- 7.1 Write down the coordinates of B. (1)
- 7.2 Show that $b = \frac{1}{2}$. (2)
- 7.3 Write down the average gradient of f between A and B. (2)
- 7.4 Write down the equation of the asymptote of f . (1)
- 7.5 Calculate the vertical distance between f and g at $x = -1$. (3)
- 7.6 Describe the transformation of f to h if $h(x) = \left(\frac{1}{2}\right)^x - 5$. (2)
- 7.7 For which values of x is $f(x) \geq g(x)$? (2)

[13]

QUESTION 8

- 8.1 A Google Chromebook costs R14 500 and depreciates by 13% p.a. compounded annually calculated on the reducing-balance method.

Calculate what a Google Chromebook will be worth after exactly 5 years. (3)

- 8.2 Koza deposits R15 000 into a bank account for a period of 10 years. The interest rate for the first four years is 6% per annum compounded monthly. For the next six years, the interest rate changes to 10% per annum compounded semi-annually.

8.2.1 Convert the nominal rates to annual effective rates. (Answers correct to FOUR decimal places) (4)

8.2.2 Hence, use the effective rates or otherwise, calculate the future value of the savings at the end of the ten-year period. (4)

8.2.3 The interest rate for the first 4 years remains at 6% p.a. compounded monthly. For the next 2 years the interest rate is x % p.a. compounded quarterly. For the last 4 years the interest rate is x % p.a. compounded semi-annually.

If Koza receives R48 897,03 at the end of the 10-year period, determine the interest rate for the last 6 years, i.e. the value of x . (5)
[16]



QUESTION 9

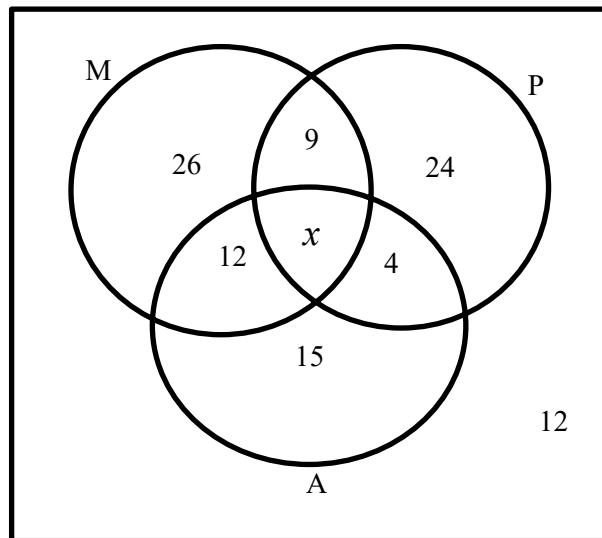
9.1 A certain company uses a camera detector system to detect trespassers. Two independent cameras, A and B are installed, one at the front main gate and the other one at the back of the building. If someone trespasses, the probability that the person will be detected by camera A is 0,5 and the probability that the person will be detected by camera B is 0,6.

9.1.1 If there is a trespasser, what is the probability that the trespasser will be detected by at least one camera? (3)

9.1.2 Determine the probability that the trespasser will not be detected. (2)

9.2 At a certain high school, a survey was carried out on 110 learners, about their subject choices. The Venn diagram shows the results of the survey in terms of:

- Mathematics (M)
- Physical Sciences (P)
- Accounting (A)



9.2.1 Show that $x = 8$. (2)

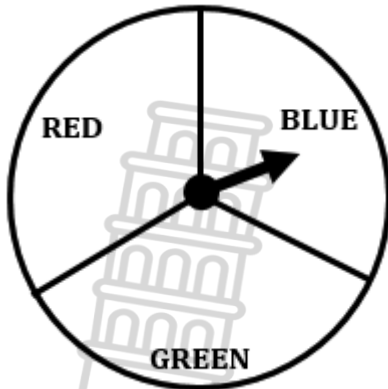
9.2.2 Calculate the probability that a learner chosen at random does only one of the three subjects. (2)

9.2.3 Calculate the probability that a learner chosen at random does Mathematics and Accounting, but not Physical Sciences. (2)

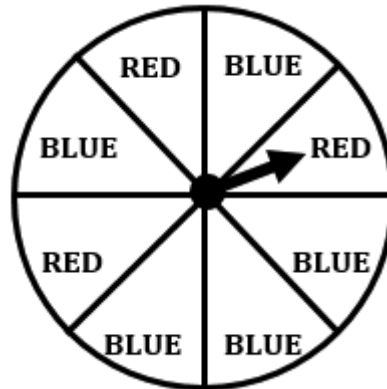
[11]

QUESTION 10

Bennie has two fair spinners. (Circles are divided into 3 and 8 equal parts, respectively)



SPINNER 1



SPINNER 2

Bennie is going to spin both spinners. What is the probability that it lands on the same colour after spinning each spinner once?

[8]

TOTAL: 150



INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

$$T_n = ar^{n-1} \quad S_n = \frac{a(r^n - 1)}{r - 1}; \quad r \neq 1 \quad S_\infty = \frac{a}{1 - r}; \quad -1 < r < 1$$

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

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

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

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

$$m = \tan \theta$$

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

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A \quad \text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

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

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

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

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

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

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

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

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

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

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

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

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



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GRADE/*GRAAD* 11

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

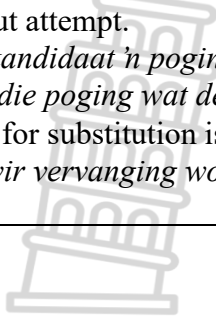
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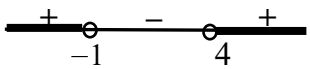
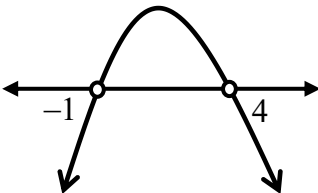
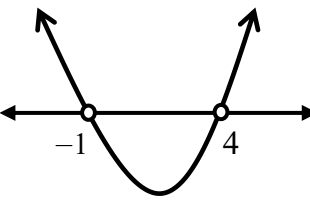


This marking guideline consists of 16 pages.
Hierdie nasienriglyn bestaan uit 16 bladsye.

NOTE/NOTA:

- If a candidate answered a question TWICE, mark the FIRST attempt ONLY.
Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, merk SLEGS die EERSTE poging.
- Consistent accuracy (CA) 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 vervanging word toegeken vir vervanging in die korrekte formule.



QUESTION 1/VRAAG 1			
1.1	1.1.1	$x^2 - 2x - 8 = 0$ $(x - 4)(x + 2) = 0$ $x - 4 = 0$ or/of $x + 2 = 0$ $x = 4$ or/of $x = -2$	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Answers only – Full Marks Slegs antwoorde – Volpunte </div> ✓ $x = -4$ ✓ $x = -2$ (2)
	1.1.2	$2x^2 - 3x - 7 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-7)}}{2(2)}$ $\therefore x = 2,77$ or/of $x = -1,27$	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> Penalise 1 mark for incorrect rounding off./ Penaliseer 1 punt vir verkeerde afronding. </div> ✓ standard form / <i>standaardvorm</i> ✓ substitution / <i>vervanging</i> ✓✓ <i>x-values / x-waardes</i> (4)
	1.1.3	$(x + 1)(4 - x) > 0$ $(x + 1)(x - 4) < 0$ critical values/ <i>kritieke waardes</i> $x = -1$ or/of $x = 4$  $-1 < x < 4$, but/ <i>maar</i> $x \in \mathbb{N}$ $\therefore x \in \{1; 2; 3\}$ <p style="text-align: center;">OR/OF</p> $x \in (-1; 4)$, but/ <i>maar</i> $x \in \mathbb{N}$ $\therefore x = 1$ or/of $x = 2$ or/of $x = 3$ <p style="text-align: center;">OR/OF</p> $(x + 1)(4 - x) > 0$ critical values/ <i>kritieke waardes</i> $x = -1$ or/of $x = 4$  $-1 < x < 4$, but/ <i>maar</i> $x \in \mathbb{N}$ $\therefore x \in \{1; 2; 3\}$	 ✓ critical values / <i>kritieke waardes</i> ✓ $-1 < x < 4$, but/ <i>maar</i> $x \in \mathbb{N}$ ✓ $\therefore x \in \{1; 2; 3\}$ <p style="text-align: center;">OR/OF</p> ✓ critical values / <i>kritieke waardes</i> ✓ $x \in (-1; 4)$, but/ <i>maar</i> $x \in \mathbb{N}$ ✓ $\therefore x = 1$ or/of $x = 2$ or/of $x = 3$ <p style="text-align: center;">OR/OF</p> ✓ critical values / <i>kritieke waardes</i> ✓ $-1 < x < 4$, but/ <i>maar</i> $x \in \mathbb{N}$ ✓ $\therefore x \in \{1; 2; 3\}$ (3)

1.2	1.2.1	$\frac{14}{p} = p + 5$ $p(p+5) = 14$ $p^2 + 5p - 14 = 0$ $(p+7)(p-2) = 0$ $p = -7 \text{ or / of } p = 2$	<ul style="list-style-type: none"> ✓ multiplying by LCD <i>vermenigvuldig met KGD</i> ✓ factors / <i>faktore</i> ✓ answer / <i>antwoord</i> <p style="text-align: right;">(3)</p>
	1.2.2	$\frac{14}{\sqrt{x+5}} = \sqrt{x+5} + 5$ <p>Let/Laat $\sqrt{x+5} = p$</p> $2 = \sqrt{x+5} \text{ or / of } -7 = \sqrt{x+5}$ <p>But/Maar $-7 \neq \sqrt{x+5}$</p> $x+5 = (2)^2$ $x = 4 - 5$ $x = -1$	<ul style="list-style-type: none"> ✓ $2 = \sqrt{x+5}$ or / of $-7 = \sqrt{x+5}$ ✓ $-7 \neq \sqrt{x+5}$ ✓ square both sides / <i>kwadreer beide kante</i> ✓ x-value/x-waarde <p style="text-align: right;">(4)</p>
1.3	$-3y = 1 - x \dots\dots\dots(1)$ $x^2 - 2xy - y^2 - 7 = 0 \dots\dots(2)$ <p>From / Vanaf (1): $x = 1 + 3y \dots\dots\dots(3)$</p> <p>(3) into/in (2):</p> $(1+3y)^2 - 2y(1+3y) - y^2 - 7 = 0$ $1 + 6y + 9y^2 - 2y - 6y^2 - y^2 - 7 = 0$ $2y^2 - 4y - 6 = 0$ $y^2 - 2y - 3 = 0$ $(y-3)(y+1) = 0$ $y = 3 \text{ or/of } y = -1$ $x = 10 \text{ or/of } x = -2$	<ul style="list-style-type: none"> ✓ $x = 1 + 3y$ ✓ substitution / <i>vervanging</i> ✓ standard form / <i>standaardvorm</i> ✓ factors / <i>faktore</i> ✓ y-values / <i>y-waardes</i> ✓ x-values / <i>x-waardes</i> <p style="text-align: right;">(6)</p>	



1.4	$\frac{2}{x} + \frac{1}{x^2} = 3$ $2x + 1 - 3x^2 = 0$ $3x^2 - 2x - 1 = 0$ $(3x + 1)(x - 1) = 0$ $x = -\frac{1}{3} \text{ or / of } x = 1 \text{ but / maar } x < 0$ $\therefore x = -\frac{1}{3}$ $2(6x - 1)^{-1}$ $= \frac{2}{6x - 1}$ $= \frac{2}{6\left(-\frac{1}{3}\right) - 1}$ $= \frac{2}{-2 - 1}$ $= -\frac{2}{3}$	<p>✓ multiplying by LCD <i>vermenigvuldig met KGD</i></p> <p>✓ x-value / x-waarde</p> <p>✓ substitution / <i>vervanging</i></p> <p>✓ answer / <i>antwoord</i></p> <p>(4)</p> <p>[26]</p>
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QUESTION 2/VRAAG 2			
2.1	$\frac{\sqrt{32} - \sqrt{18} + 3\sqrt{3}}{\sqrt{108} + \sqrt{8}}$ $= \frac{\sqrt{16 \times 2} - \sqrt{9 \times 2} + 3\sqrt{3}}{\sqrt{36 \times 3} + \sqrt{4 \times 2}}$ $= \frac{4\sqrt{2} - 3\sqrt{2} + 3\sqrt{3}}{6\sqrt{3} + 2\sqrt{2}}$ $= \frac{3\sqrt{3} + \sqrt{2}}{6\sqrt{3} + 2\sqrt{2}}$ $= \frac{3\sqrt{3} + \sqrt{2}}{2(3\sqrt{3} + \sqrt{2})}$ $= \frac{1}{2}$	<p>✓ factors of 32, 18, 108 and 8 (square number and prime factor) <i>faktore van 32, 18, 108 en 8</i> (vierkantgetal en priemgetal)</p> <p>✓ $\frac{4\sqrt{2} - 3\sqrt{2} + 3\sqrt{3}}{6\sqrt{3} + 2\sqrt{2}}$</p> <p>✓ $\frac{3\sqrt{3} + \sqrt{2}}{2(3\sqrt{3} + \sqrt{2})}$</p> <p>✓ answer / <i>antwoord</i> (4)</p>	
2.2	2.2.1	$2x^{\frac{-5}{2}} = 64$ $x^{\frac{-5}{2}} = 32$ $x = (2^5)^{\frac{2}{-5}}$ $x = 2^{-2}$ $x = \frac{1}{2^2}$ $x = \frac{1}{4}$	<p>✓ dividing by 2 / <i>deel deur 2</i></p> <p>✓ raising by the reciprocal of $-\frac{5}{2}$ <i>tot die mag van omgekeerde van $-\frac{5}{2}$</i></p> <p>✓ answer / <i>Antwoord</i> (3)</p>
	2.2.2	$3 \cdot 5^x - 5^{x-1} = 14$ $3 \cdot 5^x - 5^x \cdot 5^{-1} = 14$ $5^x \left(3 - \frac{1}{5} \right) = 14$ $5^x \cdot \frac{14}{5} = 14$ $5^x = 14 \times \frac{5}{14}$ $5^x = 5$ $\therefore x = 1$	<p>✓ reversing the law / <i>die omkeer van die wet $a^m \times a^n = a^{m+n}$</i> application of / <i>toepassing van $a^{m+n} = a^m \times a^n$</i></p> <p>✓ common factor / <i>gemene faktor</i></p> <p>✓ simplification / <i>vereenvoudiging</i></p> <p>✓ $5^x = 5$</p> <p>✓ answer / <i>antwoord</i> (5)</p>

<p>2.3</p>	$\sqrt{a} + \sqrt{b} = \sqrt{9 + \sqrt{56}}$ $(\sqrt{a} + \sqrt{b})^2 = (\sqrt{9 + \sqrt{56}})^2$ $a + b + 2\sqrt{ab} = 9 + \sqrt{2 \times 14}$ $a + b + 2\sqrt{ab} = 9 + 2\sqrt{14}$ <p>but / <i>maar</i>, $\sqrt{56} = 2\sqrt{14}$</p> $\therefore a + b = 9 \quad \text{and / en } 2\sqrt{ab} = 2\sqrt{14} \Rightarrow ab = 14$ <p>by inspection / <i>deur inspeksie</i>:</p> $a = 2 \quad \text{or / of } b = 7$ $\therefore a^2 + b^2 = (2)^2 + (7)^2$ $= 53$ <p style="text-align: center;">OR/OF</p> $\sqrt{a} + \sqrt{b} = \sqrt{9 + \sqrt{56}}$ $(\sqrt{a} + \sqrt{b})^2 = (\sqrt{9 + \sqrt{56}})^2$ $a + b + 2\sqrt{ab} = 9 + \sqrt{2 \times 14}$ $a + b + 2\sqrt{ab} = 9 + 2\sqrt{14}$ <p>but / <i>maar</i>, $\sqrt{56} = 2\sqrt{14}$</p> $\therefore a + b = 9 \quad \text{and / en } 2\sqrt{ab} = 2\sqrt{14} \Rightarrow ab = 14$ $a = 9 - b \dots \dots \dots (1)$ $ab = 14 \dots \dots \dots (2)$ $b(9 - b) = 14$ $9b - b^2 - 14 = 0$ $b^2 - 9b + 14 = 0$ $(b - 2)(b - 7) = 0$ $b = 2 \quad \text{or / of } b = 7$ <p>for / <i>vir</i> $b = 2$: $a = 7$</p> <p>for / <i>vir</i> $b = 7$: $a = 2$</p> $\therefore a^2 + b^2 = 53$	<p>✓ squaring both sides <i>kwadreer albei kante</i></p> <p>✓ $\sqrt{56} = 2\sqrt{14}$</p> <p>✓ $a + b = 9$ and/en $2\sqrt{ab} = 2\sqrt{14}$</p> <p>✓ $a = 2$ or / of $b = 7$</p> <p>✓ $a^2 + b^2 = 53$</p> <p style="text-align: center;">OR/OF</p> <p>✓ squaring both sides <i>kwadreer albei kante</i></p> <p>✓ $\sqrt{56} = 2\sqrt{14}$</p> <p>✓ $a + b = 9$ and/en $2\sqrt{ab} = 2\sqrt{14}$</p> <p>✓ $a = 2$ or / of $b = 7$</p> <p>✓ $a^2 + b^2 = 53$</p> <p style="text-align: right;">(5)</p> <p style="text-align: right;">[17]</p>
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QUESTION 3/VRAAG 3			
3.1	3.1.1	-5; -9; -13; ... -17; -21	✓ -17 ✓ -21 (2)
	3.1.2	$T_n = dn + c$ $d = -4$ $T_n = -4n + c$ Subst./Verv. ($T_1 = -5$) $-5 = -4(1) + c$ $\therefore c = -1$ $T_n = -4n - 1$	✓ $d = -4$ ✓ $c = -1$ (2)
	3.1.3	$-141 = -4n - 1$ $-140 = -4n$ $\therefore n = 35$	✓ equating / gelykstel ✓ value of n / waarde van n (2)
3.2		$T_1 = x$ $d = x - 5$ Sequence / Ry : $x; x + (x - 5); x + 2(x - 5)$ Equation / Vergelyking : $x + x + (x - 5) + x + 2(x - 5) = 63$ $4x - 5 + 2x - 10 = 63$ $6x = 78$ $x = 13$	✓ $x - 5$ ✓ T_2 & T_3 ✓ equating to 63 / stel gelyk aan 63 ✓ simplification / vereenvoudiging ✓ value of x / waarde van x (5)
			[11]



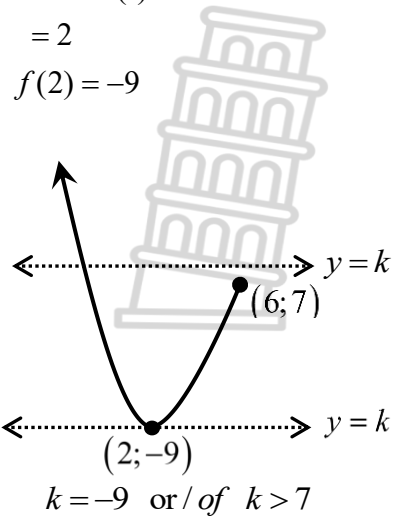
QUESTION 4/VRAAG 4		
4.1	$24 \quad ; \quad 10 \quad ; \quad 0 \quad ; \quad -6$ $-14 \quad ; \quad -10 \quad ; \quad -6$ $4 \quad ; \quad 4$	✓ first difference / <i>eerste verskil</i> ✓ second difference / <i>tweede verskil</i> (2)
4.2	$2a = 4$ $a = 2$ $3(2) + b = -14$ $b = -14 - 3(2)$ $b = -20$ $a + b + c = 24$ $c = 24 - 2 + 20$ $c = 42$ $T_n = 2n^2 - 20n + 42$	✓ $a = 6$ ✓ $b = -9$ ✓ $c = 6$ ✓ $T_n = 2n^2 - 20n + 42$ (4)
4.3	$T_{52} = 2(52)^2 - 20(52) + 42$ $= 4410$	✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> (2)
4.4	$T_n = 2n^2 - 20n + 42$ $n = \frac{-b}{2a}$ $n = \frac{-(-20)}{2(2)} = 5$ $T_5 = 2(5)^2 - 20(5) + 42$ $= -8$ Therefore, the smallest value of the sequence is -8 <i>Daarom is die kleinste waarde van die ry -8</i> <p style="text-align: center;">OR / OF</p> $T_n = 2n^2 - 20n + 42$ $T_n = 2(n^2 - 10n + 21)$ $T_n = 2(n^2 - 10n + (-5)^2 - (-5)^2 + 21)$ $T_n = 2((n-5)^2 - 4)$ $T_n = 2(n-5)^2 - 8$ Therefore, the smallest value of the sequence is -8 <i>Daarom is die kleinste waarde van die ry -8</i>	✓ value of n / <i>waarde van n</i> ✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> <p style="text-align: center;">OR / OF</p> ✓ common factor <i>gemene faktor</i> ✓ completing the square <i>voltooiing van die vierkant</i> ✓ answer / <i>antwoord</i> (3)
4.5	$T_n = 2n^2 - 20n + 42$ $2n^2 - 20n + 42 > 0$ $n^2 - 10n + 21 > 0$ $(n-7)(n-3) > 0$ <i>c. v's{3; 7}</i> $\therefore 1 \leq n < 3$ or / of $n > 7, n \in \mathbb{N}$ Accept/Aanvaar: $1 \leq n \leq 3$ or $n \geq 7, n \in \mathbb{N}$	✓ $T_n > 0$ ✓ factors / <i>faktore</i> ✓ $1 \leq n < 3$ or / of $n > 7$ ✓ $n \in \mathbb{N}$ (4)
[15]		

QUESTION 5/VRAAG 5		
5.1	$x - 2 = -x + 4$ $2x = 6$ $x = 3$ $x - 3 = 0$ $\therefore p = -3$ $y = x - 2$ $= (3) - 2$ $= 1$ $\therefore q = 1$ <p style="text-align: center;">OR/OF</p> $y = -x + 4$ $= -(3) + 4$ $= 1$ $q = 1$	✓ equating / <i>gelyk stel</i> ✓ $x - 3 = 0$ ✓ substituting x / <i>vervang x</i> ✓ $y = 1$ (4)
5.2	$x - \text{int} / x - \text{afsnit} : (y = 0)$ $\frac{-3}{x - 3} + 1 = 0$ $\frac{-3}{x - 3} = -1$ $-x + 3 = -3$ $x = 6$	✓ Letting / <i>Laat $y = 0$</i> ✓ $x = 6$ (2)
5.3	$y - \text{int} / y - \text{afsnit} : (x = 0)$ $y = \frac{-3}{0 - 3} + 1$ $y = 2$	✓ Letting / <i>Laat $x = 0$</i> ✓ $y = 2$ (2)
5.4		✓ shape / <i>vorm</i> ✓ asymptotes / <i>asimptote</i> ✓ intercepts / <i>afsnitte</i>  (3)

<p>5.5</p>	<p>Vertical asymptote of g (by inspection) : $x = -3$ <i>Vertikale asimptoot van g (deur inspeksie)</i> $\therefore x \in \mathbb{R}; x \neq -3$</p> <p style="text-align: center;">OR/OF</p> <p>$f(x) = \frac{-3}{x-3} + 1$ $x = 0 \Rightarrow y\text{-axis / } y\text{-as}$ $g(x) = f(-x) = \frac{-3}{-x-3} + 1$ $-x - 3 = 0$ $x = -3$ $\therefore x \in \mathbb{R}; x \neq -3$</p>	<p>✓ vertical asymptote <i>vertikale asimptoot</i> ✓✓ $x \in \mathbb{R}; x \neq -3$</p> <p style="text-align: center;">OR/OF</p> <p>✓ vertical asymptote <i>vertikale asimptoot</i> ✓✓ $x \in \mathbb{R}; x \neq -3$ (3)</p>
<p>5.6</p>	<p>$x \leq 0$ or / of $3 < x \leq 6$</p>	<p>✓ $x \leq 0$ ✓✓ $3 < x \leq 6$ (3)</p>
		<p>[17]</p>

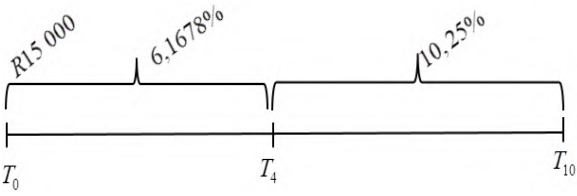


QUESTION 6/VRAAG 6		
6.1	$f(x) = x^2 - 4x - 5$ $f(6) = (6)^2 - 4(6) - 5$ $= 7$	✓ answer / antwoord (1)
6.2	$x^2 - 4x - 5 = 0$ $(x - 5)(x + 1) = 0$ $x = 5$ or / of $x = -1$ $\therefore A(-1; 0) \quad B(5; 0)$	✓ factors / faktore ✓ coordinates of A / koördinate van A ✓ coordinates of B / koördinate van B (3)
6.3	$AB = x_B - x_A$ $= 5 - (-1) = 6$ units / eenhede	✓ answer / antwoord (1)
6.4	$g(x) = (x - 2)^2 - 4(x - 2) - 5 + 5$ $= x^2 - 4x + 4 - 4x + 8 - 5 + 5$ $= x^2 - 8x - 12$	✓ $(x - 2)$ ✓ +5 ✓ answer / antwoord (3)
6.5	$h(x) = -2x + c$ $f(x) = x^2 - 4x - 5$ $x^2 - 4x - 5 = -2x + c$ $x^2 - 2x - 5 - c = 0$ $\Delta = b^2 - 4ac$ $= (-2)^2 - 4(1)(-5 - c)$ $= 4 - 4(-5 - c)$ $= 4 + 20 + 4c$ $= 24 + 4c$ Tangent \Rightarrow one solution / Raaklyn \Rightarrow een oplossing $\therefore \Delta = 0$ $24 + 4c = 0$ $4c = -24$ $c = -6$ Therefore, y-int = -6 / Daarom, y-afsnit = -6	✓ $f(x) = g(x)$ ✓ simplification / vereenvoudiging ✓ $\Delta = 24 + 4c$ ✓ $\Delta = 0$ ✓ $c = -6$ (5)

<p>6.6</p>	<p>$f(x) = k$</p> $x = \frac{-b}{2a}$ $= \frac{-(-4)}{2(1)}$ $= 2$ <p>$f(2) = -9$</p>  <p>$k = -9$ or / of $k > 7$</p>	<p>✓ $f(2) = -9$</p> <p>✓✓ $k = -9$ or / of $k > 7$</p> <p style="text-align: right;">(3)</p>
[16]		

QUESTION 7 / VRAAG 7

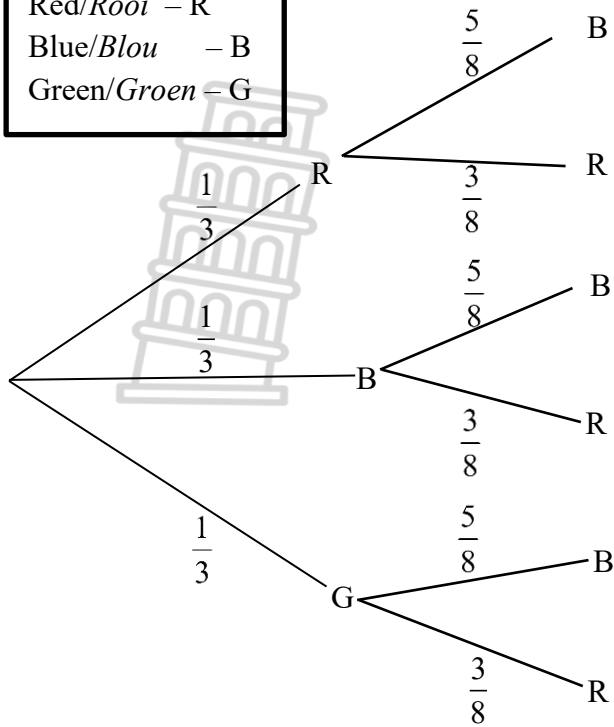
<p>7.1</p>	<p>B(0;7)</p>	<p>✓ answer / antwoord (1)</p>
<p>7.2</p>	<p>$f(x) = -b^x + 8$ subst. / verv.: (-2;4) $4 = -b^{-2} + 8$ $b^{-2} = 4$ $\frac{1}{b^2} = 4$ $b^2 = \frac{1}{4}$ $b = \pm \sqrt{\frac{1}{4}}$ $\therefore b = \frac{1}{2} ; b > 0$</p>	<p>✓ substitution of (-2;4) vervanging van (-2;4)</p> <p>✓ $b = \pm \sqrt{\frac{1}{4}}$</p> <p style="text-align: right;">(2)</p>
<p>7.3</p>	<p>Average gradient / Gemiddelde gradiënt = $\frac{3}{2}$</p>	<p>✓✓ $\frac{3}{2}$</p> <p style="text-align: right;">(2)</p>
<p>7.4</p>	<p>$y = 8$</p>	<p>✓ answer / antwoord (1)</p>

7.5	$f(-1) = -\left(\frac{1}{2}\right)^{-1} + 8 = 6$ $g(-1) = \frac{3}{2}(-1) + 7 = \frac{11}{2}$ $f(-1) - g(-1) = 6 - \frac{11}{2}$ $= \frac{1}{2} \text{ unit/eenheid}$	✓ $f(-1) = 6$ ✓ $g(-1) = \frac{11}{2}$ ✓ $f(-1) - g(-1) = \frac{1}{2}$ (3)
7.6	- Reflection along x -axis / <i>Refleksie langs die x-as</i> $-f(x) = \left(\frac{1}{2}\right)^x - 8$ - then, vertical translation by 3 units upwards <i>dan, vertikale translasie van 3 eenhede opwaarts</i> $h(x) = \left(\frac{1}{2}\right)^x - 8 + 3$ $= \left(\frac{1}{2}\right)^x - 5$	✓ Reflection along x -axis <i>Refleksie langs die x-as</i> ✓ 3 units upwards <i>3 eenhede opwaarts</i> (2)
7.7	$-2 \leq x \leq 0$ or / of $x \in [-2; 0]$	✓✓ answer / <i>antwoord</i> (2)
[13]		
QUESTION 8/VRAAG 8		
8.1	$A = P(1-i)^n$ $= 14\,500(1-0,13)^5$ $= R7\,227,10$	✓ $i = 0,13$ ✓ substitution into the correct formula <i>vervanging in die korrekte formule</i> ✓ answer / <i>antwoord</i> (3)
8.2	8.2.1 $i_{eff} = \left(1 + \frac{0,06}{12}\right)^{12} - 1$ $= 6,1678\%$ $i_{eff} = \left(1 + \frac{0,1}{2}\right)^2 - 1$ $= 10,25\%$	✓ $i_{eff} = \left(1 + \frac{0,06}{12}\right)^{12} - 1$ ✓ 6,1678% ✓ $i_{eff} = \left(1 + \frac{0,1}{2}\right)^2 - 1$ ✓ 10,25% (4)
8.2.2	 $A = 15\,000 \left(1 + \frac{6,1678}{100}\right)^4 (1 + 0,1025)^6$ $= R34\,224,26$	✓ $15\,000 \left(1 + \frac{6,1678}{100}\right)^4$ ✓ $\times (1 + 0,1025)^6$ ✓ $n = 4$ and / en $n = 6$ ✓ answer / <i>antwoord</i> (4)

	8.2.3	$15\,000\left(1+\frac{0,06}{12}\right)^{48}\left(1+\frac{x}{4}\right)^8\left(1+\frac{x}{2}\right)^8 = 48\,897,03$ $\left[\left(1+\frac{x}{4}\right)\left(1+\frac{x}{2}\right)\right]^8 = 2,565784627$ $1+\frac{x}{2}+\frac{x}{4}+\frac{x^2}{8} = 1,125$ $8+4x+2x+x^2 = 9$ $x^2+6x-1=0$ $x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(1)(-1)}}{2(1)}$ $x = 0,1623 \text{ or/of } x = -6,1623$ $\therefore \text{Interest rate/Rentekoers} = 16,23\%$	<p>✓</p> $15000\left(1+\frac{6\%}{12}\right)^{48}\left(1+\frac{x}{4}\right)^8\left(1+\frac{x}{2}\right)^8 = 48897,03$ <p>✓ $\left[\left(1+\frac{x}{4}\right)\left(1+\frac{x}{2}\right)\right]^8 = 2,565784627$</p> <p>✓ multiplying by the LCD / <i>vermenigvuldig met KGD</i></p> <p>✓ standard form / <i>standaardvorm</i></p> <p>✓ answer / <i>antwoord</i> (5)</p>
		[16]	
QUESTION 9/VRAAG 9			
9.1	9.1.1	<p>At least detected by one camera $\Rightarrow A$ or B <i>Ten minste deur een kamera opgespoor</i> $\Rightarrow A$ of B</p> $P(A \text{ or / of } B) = P(A) + P(B) - P(A \text{ and / en } B)$ $= 0,5 + 0,6 - (0,5 \times 0,6)$ $= 0,8$	<p>✓ $0,5 \times 0,6$</p> <p>✓ substitution into the correct formula <i>vervanging in die korrekte formule</i></p> <p>✓ answer / <i>antwoord</i> (3)</p>
	9.1.2	<p>$P(\text{Not detected}) = 1 - (\text{at least detected by one})$ <i>P(Nie opgespoor) = 1 - (ten minste deur een opgespoor)</i></p> $= 1 - 0,8$ $= 0,2$	<p>✓ $1 - 0,8$</p> <p>✓ answer / <i>antwoord</i> (2)</p>
9.2	9.2.1	$x = 110 - (26 + 9 + 12 + 4 + 24 + 15 + 12)$ $= 8$	<p>✓✓ $110 - (26 + 9 + 12 + 4 + 24 + 15 + 12)$ (2)</p>
	9.2.2	$\frac{26 + 24 + 15}{110}$ $= \frac{65}{110} \approx 0,59$	<p>✓ 65</p> <p>✓ $\frac{65}{110}$ or / of $\frac{13}{22}$ or / of 0,59 (2)</p>
	9.2.3	$\frac{12}{110}$ $\frac{6}{55} \approx 0,12$	<p>✓ 12</p> <p>✓ $\frac{6}{55}$ or / of 0,12 (2)</p>
		[11]	

QUESTION 10/VRAAG 10

Let / Laat
 Red/Rooi – R
 Blue/Blou – B
 Green/Groen – G



$$\frac{1}{3} \times \frac{5}{8} = \frac{5}{24}$$

$$\frac{1}{3} \times \frac{3}{8} = \frac{1}{8}$$

$$\therefore \frac{5}{24} + \frac{1}{8} = \frac{1}{3}$$

$P(\text{same colour / dieselfde kleur})$
 $= \frac{1}{3}$ or / of $\approx 0,33$

- ✓✓ branches/takke
(R ; B)
- ✓ probabilities/waarskynlikhede
(R ; R)
- ✓ outcomes/uikomste
(B ; B)
- (B ; R)
- (R ; B)
- (G ; R)

- ✓ $\frac{5}{24}$
- ✓ $\frac{1}{8}$

✓ answer / antwoord

(8)

Alternative Marking / Alternatiewe Nasien

✓ $\frac{1}{3}$ ✓ $\frac{5}{8}$ ✓ $\frac{5}{24}$

✓ $\frac{1}{3}$ ✓ $\frac{3}{8}$ ✓ $\frac{1}{8}$

✓ addition / optelling

✓ answer / antwoord

[8]

TOTAL / TOTAAL: 150