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**NATIONAL
SENIOR CERTIFICATE**

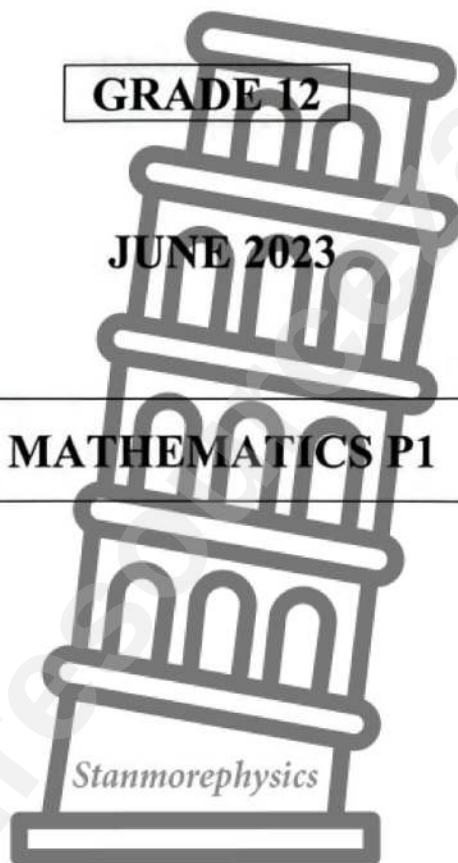
GRADE 12

JUNE 2023

MATHEMATICS P1

MARKS: 150

TIME: 3 hours



This question paper consists of 9 pages, including an information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

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



QUESTION 1

1.1 Solve for x :


$$1.1.1 \quad x^2 - 9 = 0 \quad (2)$$

$$1.1.2 \quad x - 5 + \frac{2}{x} = 0 \quad (\text{correct to TWO decimal places}) \quad (4)$$

$$1.1.3 \quad x = 1 + \sqrt{7 - x} \quad (5)$$

$$1.1.4 \quad x^2 + 2x - 15 \geq 0 \quad (3)$$

1.2 Solve simultaneously for x and y in:

$$\begin{aligned} y + 2x &= 3 \\ y^2 - y &= 3x^2 - 5x \end{aligned} \quad (6)$$

1.3 Simplify completely, WITHOUT the use of a calculator: $\sqrt[n]{\frac{10^n + 2^{n+2}}{5^{2n} + 4(5^n)}}$ (4)

[24]



QUESTION 2

2.1 Given the following geometric series: $\frac{24}{x} + 12 + 6x + 3x^2 + \dots$

2.1.1 Determine the value of r , the common ratio, in terms of x . (1)

2.1.2 Determine the values of x for which this series converges. (2)

2.1.3 If $x = 4$, determine the sum of the series to 15 terms. (3)

2.2 Calculate: $\sum_{n=1}^{\infty} 6(2)^{-n}$ (3)

2.3 The sum of the first n terms of an arithmetic series is given by $S_n = -n^2 + 8n$.

2.3.1 Calculate the sum of the first 15 terms. (2)

2.3.2 Calculate the value of T_{15} . (2)

2.3.3 If the first term of the series is 7, which term of the series will have a value of -169 ? (4)
[17]

QUESTION 3

Consider the following quadratic number pattern: 95 ; 72 ; y ; 32 ; . . .

3.1 Determine the value of y . (2)

3.2 If $y = 51$, determine the general term of the number pattern in the form $T_n = an^2 + bn + c$. (4)

3.3 Determine T_{22} . (1)

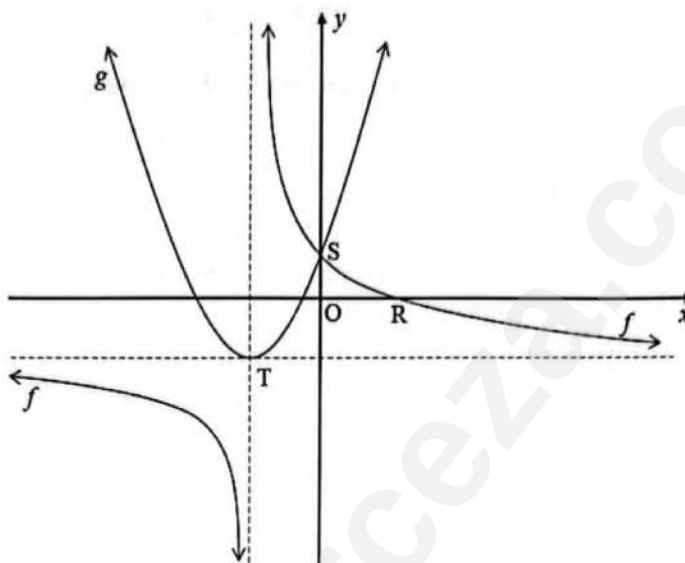
3.4 Which term in the number pattern will be equal to 1 040? (4)
[11]



QUESTION 4

The diagram below shows the graphs of $f(x) = \frac{5}{x+p} + q$ and $g(x) = 5x^2 + 10x + 3$.

The two graphs intersect at S, the y-intercept of both graphs. R is the x-intercept of f . The asymptotes of f cut at T, the turning point of g .



- 4.1 Write down the coordinates of S. (2)
- 4.2 Determine:
- 4.2.1 The coordinates of T (4)
- 4.2.2 The values of p and q (2)
- 4.2.3 The length of OR (2)
- 4.2.4 The range of g (2)
- 4.3 Determine the equation of:
- 4.3.1 The tangent to g at S (3)
- 4.3.2 The axis of symmetry of f , with a positive gradient (2)
- 4.4 For which values of x will $g'(x) \cdot f(x) \leq 0$? (2)

[19]

QUESTION 5

Given: $h(x) = a^x$; $a > 0$ and $a \neq 1$. $B\left(-1; \frac{1}{2}\right)$ is a point that lies on h , the graph of $h(x)$.

5.1 Determine the value of a . (2)

5.2 Write down the equation of h^{-1} in the form $y = \dots$. (2)

5.3 Sketch the graphs of h and h^{-1} on the same set of axes. Clearly show all intercepts with the axes. (4)

5.4 Write down the domain of h^{-1} . (1)

5.5 Determine the value(s) of x for which $h^{-1}(x) > 1$. (1)

5.6 If it is given that $t(x) = \left(\frac{1}{2}\right)^x - 1$.

5.6.1 Describe the transformation from h to t . (2)

5.6.2 Determine the equation of the asymptote of t . (1)

[13]

QUESTION 6

6.1 A school bought computers for R980 000. The value of the computers depreciates annually at a rate of 9,2% p.a. on the reducing-balance method. Calculate the book value of the computers after 7 years. (3)

6.2 Siphokazi invests R13 500 for a certain number of years. She earns interest at a rate of 8,2% per annum, compounded annually. The final value of the investment is worth R20 020,28.
For how many years was the money invested? (4)

6.3 On 1 January 2017 Nelson deposited R3 500 into a savings account. On 1 January 2020, he deposited another R5 700 into the same account. The interest rate for the first two years (starting from 1 January 2017) is 7% per annum compounded quarterly, and the interest rate for the last three years is 8% per annum compounded monthly. Calculate the amount in the savings account after 5 years. (6)

[13]



QUESTION 7

7.1 Determine $f'(x)$, from first principles, if $f(x) = 5 - 2x^2$. (4)

7.2 Determine

7.2.1 $f'(x)$, if $f(x) = 2x^5 - 7\sqrt{x} + \frac{1}{x}$ (4)

7.2.2 $\frac{d}{dx} \left[\frac{2x^2 - x - 6}{2x + 3} \right]$ (3)
[11]

QUESTION 8

Given: $f(x) = x^3 - 5x^2 - 8x + 12$ and $g(x) = ax + q$. A, B(2; -16) and C(6; 0) are the points of intersection of f and g .

8.1 Determine the coordinates of the turning points of f . (4)

8.2 Determine the other two x -intercepts of f . (3)

8.3 Sketch the graph of f , clearly indicating turning points and intercepts with the axes. (4)

8.4 Determine the values of a and q . (2)

8.5 Determine whether the graph is concave up or concave down at point B. (3)

8.6 For which values of x , is $f(x) \geq g(x)$? (4)
[20]



QUESTION 9

A large cruise ship uses fuel at a cost of $4x^2$ rand per hour, where x is the speed of the ship in km/h.

Other operating costs, including labour, amount to R1 000 per hour.

[Hint: distance = speed $\times$ time: $s = vt$]

9.1 Show that the total cost for a trip of 500 km is given by, $C(x) = 2\,000x + \frac{500\,000}{x}$. (3)

9.2 At what speed should the ship travel on this 500 km trip to keep the total cost as low as possible? (5)
[8]

QUESTION 10

10.1 Events A and B are mutually exclusive. It is further given that:

- $3P(B) = P(A)$
- $P(A \text{ or } B) = 0,64$

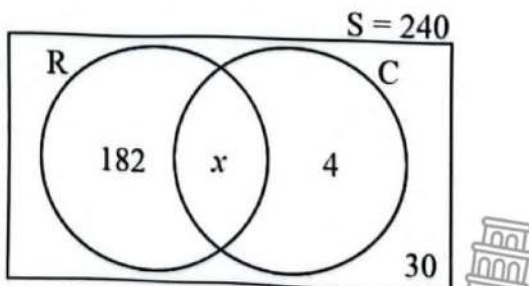
Calculate $P(B)$. (3)

10.2 The probability that it will not rain on a given day is 37%. A child has a 12% chance of falling in dry weather and is three times as likely to fall in wet weather.

10.2.1 Draw a tree diagram to represent ALL the possible ways in which the weather could affect whether a child falls or not. Show the probabilities associated with EACH branch, as well as the outcomes. (4)

10.2.2 What is the probability that a child will not fall on any given day? (2)

10.3 A group of 240 learners were asked whether they play Rugby (R) or Cricket (C) as a school sport. 206 of the learners indicated that they play rugby, 28 said they play cricket, 30 said they play neither and x said they play both. The information is represented in the Venn diagram below.



10.3.1 Determine the value of x . (2)

10.3.2 Would you regard playing rugby and cricket as independent events? Support your answer with calculations. (Round answers correct to 2 decimal places.) (3)

[14]

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

$$y = mx + c$$

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

In $\triangle ABC$:

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

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

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

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

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

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

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

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

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

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

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

$$y - y_1 = m(x - x_1) \quad m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

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

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

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

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

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

$$P(A) = \frac{n(A)}{n(S)} \quad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

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



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**NATIONAL
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NASIONALE
SENIORSERTIFIKAAT**

GRADE/GRAAD 12

JUNE/JUNIE 2023

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

MARKS/PUNTE: 150



This marking guideline consists of 15 pages./
Hierdie nasienriglyn bestaan uit 15 bladsye.

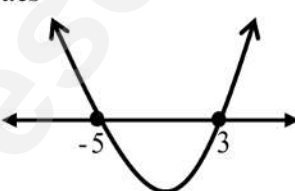
NOTE/LET OP:

- 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 memorandum.
Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die memorandum.
- 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 1/VRAAG 1

1.1.1	$x^2 - 9 = 0$ $(x+3)(x-3) = 0$ $x+3 = 0$ or/of $x-3 = 0$ $x = -3$ or/of $x = 3$ OR / OF $x^2 - 9 = 0$ $x^2 = 9$ $x = \pm\sqrt{9}$ $x = \pm 3$ OR / OF $x^2 - 9 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(0) \pm \sqrt{(0)^2 - 4(1)(-9)}}{2(1)}$ $= \frac{\pm\sqrt{36}}{2}$ $x = -3$ or / of $x = 3$ OR / OF Answers only – Full marks Slegs antwoorde - Volpunte $x^2 - 9 = 0$ $x^2 = 9$ $x = \pm\sqrt{9}$ $x = \pm 3$	$x^2 - 9 = 0$ $x^2 = 9$ $x = \pm\sqrt{9}$ $x = \pm 3$ ✓ factors / faktore ✓ both answers / beide antwoorde OR / OF $x^2 - 9 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(0) \pm \sqrt{(0)^2 - 4(1)(-9)}}{2(1)}$ $= \frac{\pm\sqrt{36}}{2}$ $x = -3$ or / of $x = 3$ ✓ correct substitution into correct formula / korrekte vervanging in korrekte formule ✓ both answers / beide antwoorde (2)
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1.1.2	$x - 5 + \frac{2}{x} = 0$ $x^2 - 5x + 2 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(2)}}{2(1)}$ $x = \frac{5 \pm \sqrt{17}}{2}$ $\therefore x = 4,56 \text{ or/of } x = 0,44$ Penalise 1 mark for incorrect rounding off. / Penaliseer 1 punt vir verkeerde afronding.	✓ standard form / standaardvorm ✓ substitution / vervanging ✓✓ x-values / waardes (4)
1.1.3	$x = 1 + \sqrt{7 - x}$ $x - 1 = \sqrt{7 - x}$ $(x - 1)^2 = (\sqrt{7 - x})^2$ $x^2 - 2x + 1 = 7 - x$ $x^2 - x - 6 = 0$ $(x + 2)(x - 3) = 0$ $\therefore x \neq -2 \text{ or/of } x = 3$	✓ isolating surd / isoleer wortelvorm ✓ square both sides / kwadreer beide kante ✓ standard form / standaardvorm ✓ factors / faktore ✓ selection / keuse (5)
1.1.4	$x^2 + 2x - 15 \geq 0$ $(x + 5)(x - 3) \geq 0$ critical values/kritieke waardes $x = -5 \text{ or/of } x = 3$ $\begin{array}{c} + & - & + \\ \bullet & & \bullet \\ -5 & & 3 \end{array}$  $x \leq -5 \text{ or/of } x \geq 3, x \in \mathbf{R}$ OR/OF $x \in (-\infty; -5] \text{ or/of } x \in [3; \infty), x \in \mathbf{R}$	✓ critical values / kritieke waardes ✓✓ $x \leq -5 \text{ or/of } x \geq 3, x \in \mathbf{R}$ (accuracy / akkuraatheid) OR/OF $x \in (-\infty; -5] \text{ or/of } x \in [3; \infty), x \in \mathbf{R}$ (3)



1.2	$y + 2x = 3 \dots\dots\dots(1)$ $y^2 - y = 3x^2 - 5x \dots\dots\dots(2)$ <i>From / Vanaf</i> (1): $y = -2x + 3 \dots\dots\dots(3)$ (3) into/in (2): $(-2x + 3)^2 - (-2x + 3) = 3x^2 - 5x$ $4x^2 - 12x + 9 + 2x - 3 = 3x^2 - 5x$ $4x^2 - 12x + 9 + 2x - 3 - 3x^2 + 5x = 0$ $x^2 - 5x + 6 = 0$ $(x - 2)(x - 3) = 0$ $x = 2$ or/of $x = 3$ $y = -1$ or/of $y = -3$ OR / OF $y + 2x = 3 \dots\dots\dots(1)$ $y^2 - y = 3x^2 - 5x \dots\dots\dots(2)$ $x = \frac{3 - y}{2} \dots\dots\dots(3)$ Subst./ Verv. (3) into / in (2): $y^2 - y = 3\left(\frac{3 - y}{2}\right)^2 - 5\left(\frac{3 - y}{2}\right)$ $y^2 - y = 3\left(\frac{9 - 6y + y^2}{4}\right) - 5\left(\frac{3 - y}{2}\right)$ $y^2 - y = \frac{27 - 18y + 3y^2}{4} + \frac{-15 + 5y}{2}$ $4y^2 - 4y - 27 + 18y - 3y^2 + 30 - 10y = 0$ $y^2 + 4y + 3 = 0$ $(y + 1)(y + 3) = 0$ $y = -1$ or / of $y = -3$ $x = 2$ or / of $x = 3$	✓ $y = -2x + 3$ ✓ substitution / vervanging ✓ standard form / standaardvorm ✓ factors / faktore ✓ x-values / waardes ✓ y-values / waardes OR / OF ✓ $x = \frac{3 - y}{2}$ ✓ substitution / vervanging ✓ standard form / standaardvorm ✓ factors / faktore ✓ y-values / waardes ✓ x-values / waardes
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(6)



1.3	$\sqrt[n]{10^n + 2^{n+2}}$ $= \sqrt[n]{5^{2n} + 4(5^n)}$ $= \left[\frac{2^n \times 5^n + 2^n \cdot 2^2}{5^n \cdot 5^n + 4(5^n)} \right]^{\frac{1}{n}}$ $= \left[\frac{2^n (5^n + 4)}{5^n (5^n + 4)} \right]^{\frac{1}{n}}$ $= \left[\left(\frac{2}{5} \right)^n \right]^{\frac{1}{n}}$ $= \frac{2}{5}$	$\checkmark \frac{2^n \times 5^n + 2^n \cdot 2^2}{5^n \cdot 5^n + 4(5^n)}$ ✓ factors / faktore ✓ changing surd to exponent / verandering van wortel na eksponent ✓ answer / antwoord (4)
		[24]



QUESTION 2/VRAAG 2

2.1.1	$r = \frac{T_3}{T_2} = \frac{6x}{12}$ $= \frac{x}{2}$	✓ answer / antwoord (1)
2.1.2	$-1 < r < 1$ $-1 < \frac{x}{2} < 1$ $-2 < x < 2$	✓ substitution / vervanging ✓ answer / antwoord (2)
2.1.3	$x = 4 \Rightarrow a = 6 \text{ \& } r = 2$ $S_{15} = \frac{a(r^n - 1)}{r - 1}$ $= \frac{6(2^{15} - 1)}{2 - 1}$ $= 196\,602$	✓ values of a and r / waardes van a en r ✓ substitution / vervanging ✓ answer / antwoord (3)
2.2	$T_1 = 6(2)^{-1} = 3$ $T_2 = 6(2)^{-2} = \frac{3}{2}$ $\therefore r = \frac{1}{2}$ $S_{\infty} = \frac{a}{1 - r}$ $= \frac{3}{1 - \frac{1}{2}}$ $= 6$	✓ values of a and r / waardes van a en r ✓ substitution / vervanging ✓ answer / antwoord (3)



2.3.1	$S_{15} = -(15)^2 + 8(15)$ $= -105$	✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> (2)
2.3.2	$T_{15} = S_{15} - S_{14}$ $= -105 - (-84)$ $= -21$	✓ method / <i>metode</i> ✓ answer / <i>antwoord</i> (2)
2.3.3	$T_1 = S_1 = 7$ $S_2 = -(2)^2 + 8(2) = 12$ $\therefore T_2 = 5$ $\Rightarrow d = -2$ $a + (n-1)d = T_n$ $7 + (n-1)(-2) = -169$ $7 - 2n + 2 = -169$ $-2n = -178$ $n = 89$ OR / OF $S_n - S_{n-1} = T_n$ $-n^2 + 8n - [-(n-1)^2 + 8(n-1)] = -169$ $-n^2 + 8n - [-n^2 + 2n - 1 + 8n - 8] = -169$ $-n^2 + 8n + n^2 - 2n + 1 - 8n + 8 = -169$ $-2n = -178$ $n = 89$	$a + 14d = -21$ $7 + 14d = -21$ $14d = -28$ $d = -2$ ✓ $T_2 = 5$ OR / OF $14d = -28$ ✓ $d = -2$ ✓ substitution / <i>vervanging</i> ✓ answer / <i>antwoord</i> OR / OF ✓ formula / <i>formule</i> ✓ substitution / <i>vervanging</i> ✓ simplification / <i>vereenvoudiging</i> ✓ answer / <i>antwoord</i> (4)
		[17]



QUESTION 3/VRAAG 3

3.1	$95 ; 72 ; y ; 32 ; \dots$ $-23 ; y - 72 ; 32 - y ; \dots$ (first diff. / eerste verskille) $y - 49 ; -2y + 104$ $\therefore y - 49 = -2y + 104$ $3y = 153$ $y = 51$	$\checkmark$ equating 2 nd differences / gelykstel van 2 ^{de} verskille $\checkmark$ answer / antwoord (2)
3.2	$\begin{array}{ccccccc} 95 & ; & 72 & ; & 51 & ; & 32 \\ & -23 & ; & -21 & ; & -19 & \\ & & 2 & ; & 2 & & \end{array}$ $2a = 2 \quad 3(1) + b = -23 \quad 1 - 26 + c = 95$ $a = 1 \quad b = -26 \quad c = 120$ $T_n = n^2 - 26n + 120$	$\checkmark$ 2 nd difference / 2 ^{de} verskil $\checkmark a = 1$ $\checkmark b = -26$ $\checkmark c = 120$ (4)
3.3	$T_{22} = (22)^2 - 26(22) + 120$ $= 32$	$\checkmark$ answer / antwoord (1)
3.4	$n^2 - 26n + 120 = 1040$ $n^2 - 26n - 920 = 0$ $(n - 46)(n + 20) = 0$ $n = 46$ or / of $n \neq -20$ OR / OF $n^2 - 26n + 120 = 1040$ $n^2 - 26n - 920 = 0$ $n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-26) \pm \sqrt{(-26)^2 - 4(1)(-920)}}{2(1)}$ $\therefore n = 46$ or / of $n \neq -20$	$\checkmark$ equating / gelykstel $\checkmark$ standard form / standaardvorm $\checkmark$ factors / faktore $\checkmark$ answer / antwoord OR / OF $\checkmark$ equating / gelykstel $\checkmark$ standard form / standaardvorm $\checkmark$ substitution / vervanging $\checkmark$ answer / antwoord (4)
		[11]



QUESTION 4/VRAAG 4

4.1	$S(0;3)$	✓✓ answer / antwoord (2)
4.2.1	$x = -\frac{b}{2a} = -\frac{10}{2(-5)}$ $x = -1$ $T(-1; -2)$ $y = 5(-1)^2 + 10(-1) + 3$ $y = -2$	✓ method / metode ✓ x-coordinate / x-koördinaat ✓ substitution / vervanging ✓ y-coordinate / y-koördinaat (4)
4.2.2	$p = 1$ and / en $q = -2$	✓ $p = 1$ ✓ $q = -2$ (2)
4.2.3	$\frac{5}{x+1} - 2 = 0$ $\therefore x = \frac{3}{2}$ $\Rightarrow \text{OR} = 1,5 \text{ units / eenhede}$	✓ equating to 0 / stel gelyk aan 0 ✓ answer / antwoord (2)
4.2.4	$y \geq -2$; $y \in \square$	✓✓ answer / antwoord (2)
4.3.1	$m = 10x + 10$ $= 10(0) + 10$ $= 10$ $y - y_1 = m(x - x_1)$ $y - 3 = 10(x - 0)$ $y = 10x + 3$	✓ $m = 10$ ✓ substitution into eqn of line / vervanging in verg. van lyn ✓ answer / antwoord (3)
4.3.2	$y = (x + 1) - 2$ $y = x - 1$ OR / OF $y = x + k$ $-2 = -1 + k$ $k = -1$ $\therefore y = x - 1$	✓ substitution / vervanging ✓ answer / antwoord (2)
4.4	$x \geq \frac{3}{2}$	✓✓ answer / antwoord (A) (2)
		[19]



QUESTION 5/VRAAG 5

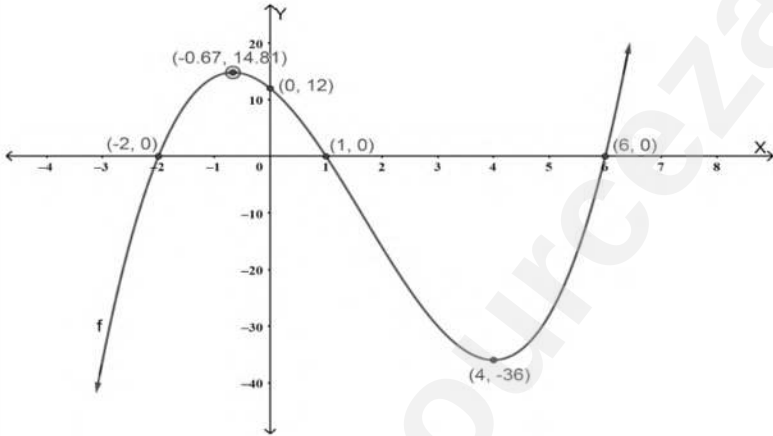
5.1	$h(x) = a^x$ $\frac{1}{2} = a^{-1}$ $\therefore a = 2$	✓ substitution / vervanging ✓ answer / antwoord (2)
5.2	$y = 2^x$ $x = 2^y$ $\therefore h^{-1}(x) : y = \log_2 x$	✓ interchanging x and y / omruil van x en y ✓ answer / antwoord (2)
5.3		✓ y-intercept for h / y-afsnit vir h ✓ shape and asymptote of h vorm en asimptoot van h ✓ x-intercept for h^{-1} / x-afsnit vir h^{-1} ✓ shape and asymptote of h^{-1} vorm en asimptoot van h^{-1} (4)
5.4	$x > 0 ; x \in \square$	✓ answer / antwoord (1)
5.5	$x > 2 ; x \in \square$ OR / OF $\log_2 x > 1$ $\therefore x > 2$ (algebraically/algebraïes)	✓ answer / antwoord OR / OF ✓ answer / antwoord (1)
5.6.1	$t(x) = \left(\frac{1}{2}\right)^x - 1$ $= 2^{-x} - 1$ $\Rightarrow$ reflection about the y -axis / refleksie om die y -as shift of 1 unit down / skuif van 1 eenheid af	✓ reflection / refleksie ✓ shift / skuif (2)
5.6.2	$y = -1$	✓ answer / antwoord (1)
		[13]

6.1	$A = P(1-i)^n$ $A = 980\,000(1-9,2\%)^7$ $A = R498\,685,82$	✓ formula / formule ✓ substitution / vervanging ✓ answer / antwoord	(3)
6.2	$A = P(1+i)^n$ $20\,020,28 = 13\,500(1+8,2\%)^n$ $1,4829837037 = 1,082^n$ $\therefore n = \log_{(1,082)} [1,4829837037]$ $n = 5 \text{ years / jaar}$	✓ substitution / vervanging ✓ simplification / vereenvoudiging ✓ use of logs / gebruik van logs ✓ answer / antwoord	(4)
6.3	Amount in savings account / <i>Bedrag in spaarrekening</i> : $= 3500 \left(1 + \frac{0,07}{4}\right)^8 \left(1 + \frac{0,08}{12}\right)^{36} + 5700 \left(1 + \frac{0,08}{12}\right)^{24}$ $= R11\,793,19$ OR / OF $A_1 = 3500 \left(1 + \frac{7\%}{4}\right)^8 = R4\,021,08624$ $A_2 = 4\,021,08624 \left(1 + \frac{8\%}{12}\right)^{12} = R4\,354,834415$ $A_3 = 4\,354,834415 + 5\,700 = R10\,054,834415$ Final Amount / <i>Finale Bedrag</i> $= 10\,054,834415 \left(1 + \frac{8\%}{12}\right)^{24}$ $= R11\,793,19$	✓ $n = 8$ and / en $i = 0,07/4$ ✓ substitution / vervanging ✓ $n = 36$ and / en $i = 0,08/12$ ✓ substitution / vervanging ✓ addition / optelling ✓ answer / antwoord	(6)

QUESTION 7/VRAAG 7

7.1	$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{5 - 2(x+h)^2 - (5 - 2x^2)}{h}$ $= \lim_{h \rightarrow 0} \frac{5 - 2x^2 - 4xh - 2h^2 - 5 + 2x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{-4xh - 2h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-4x - 2h)}{h}$ $= \lim_{h \rightarrow 0} (-4x - 2h)$ $= -4x$ Answer ONLY: 0 marks SLEGS antwoord: 0 punte	Penalise 1 mark for incorrect notation in this question Penaliseer 1 punt vir verkeerde notasie in hierdie vraag ✓ $5 - 2x^2 - 4xh - 2h^2$ ✓ simplification / vereenvoudiging ✓ factorisation / faktorisering (dividing by h / deel deur h) ✓ answer / antwoord (4)
7.2.1	$f(x) = 2x^5 - 7\sqrt{x} + \frac{1}{x}$ $= 2x^5 - 7x^{\frac{1}{2}} + x^{-1}$ $f'(x) = 10x^4 - \frac{7}{2}x^{-\frac{1}{2}} - x^{-2}$ $= 10x^4 - \frac{7}{2\sqrt{x}} - \frac{1}{x^2}$	✓ $2x^5 - 7x^{\frac{1}{2}} + x^{-1}$ ✓ $10x^4$ ✓ $-\frac{7}{2}x^{-\frac{1}{2}}$ ✓ $-x^{-2}$ (4)
7.2.2	$\frac{d}{dx} \left[\frac{2x^2 - x - 6}{2x + 3} \right]$ $\frac{d}{dx} \left[\frac{(2x+3)(x-2)}{(2x+3)} \right]$ $\frac{d}{dx} [x - 2]$ $= 1$	✓ factors / faktore ✓ simplification / vereenvoudiging ✓ answer / antwoord (3)
	[11]	

QUESTION 8/VRAAG 8

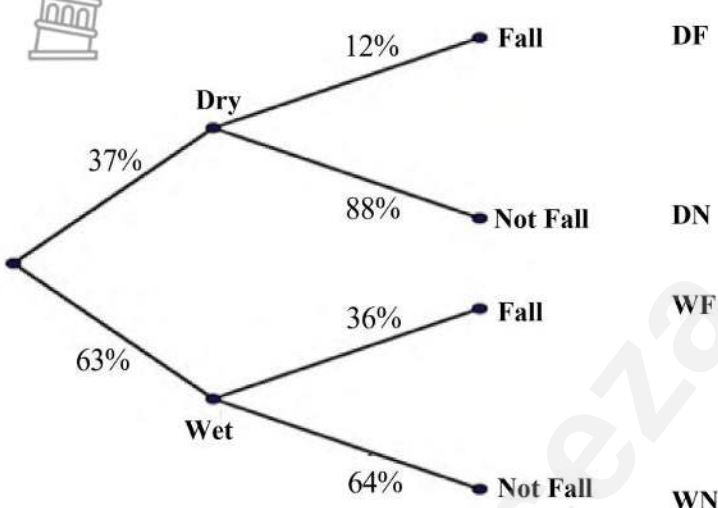
8.1	$f'(x) = 3x^2 - 10x - 8 = 0$ $(3x + 2)(x - 4) = 0$ $x = -\frac{2}{3}$ or / of $x = 4$ $y = -\frac{400}{27}$ (14,81) or / of $y = -36$ $L\left(-\frac{2}{3}; -\frac{400}{27}\right)$ and / en $M(4; -36)$	$\checkmark f'(x) = 0$ $\checkmark$ factors / faktore $\checkmark$ x-values / x-waardes $\checkmark$ y-values / y-waardes	(4)
8.2	$f(x) = x^3 - 5x^2 - 8x + 12 = 0$ $(x - 6)(x - 1)(x + 2) = 0$ $\therefore x = 6 ; x = 1 ; x = -2$	$\checkmark$ factors / faktore $\checkmark x = 1$ $\checkmark x = -2$	(3)
8.3		$\checkmark$ x-intercepts / x-afsnitte $\checkmark$ y-intercept / y-afsnit $\checkmark$ turning points / draaipunte $\checkmark$ shape / vorm	(4)
8.4	$m = \frac{0 - (-16)}{6 - 2} = 4$ $y - y_1 = m(x - x_1)$ $y - 0 = 4(x - 6)$ $y = 4x - 24$ $\therefore a = 4$ and / en $q = -24$	$\checkmark a = 4$ $\checkmark q = -24$	(2)
8.5	$f''(x) = 6x - 10$ $f''(2) = 6(2) - 10$ $= 2 > 0$ $\Rightarrow$ concave up / konkaaf op	$\checkmark f''(x)$ $\checkmark$ substitution / vervanging $\checkmark$ conclusion / gevolgtrekking	(3)
8.6	$4x - 24 = -36$ $x = -3$ $\therefore -3 \leq x \leq 2$ or / of $x \geq 6$	$\checkmark$ equating / gelyk stel $\checkmark x = -3$ $\checkmark$ answer / antwoord	(4)
[20]			

QUESTION 9/VRAAG 9

9.1	Hourly cost = fuel cost + other costs <i>Uurlikse koste = brandstofkoste + ander koste</i> $= 4x^2 + 1000$  Duration of trip/<i>Tydsduur van reis</i> = $\frac{\text{distance/afstand}}{\text{speed/spoed}} = \frac{500}{x}$ Total cost/<i>Totale koste</i> $= (\text{hourly cost/uurlikse koste}) \times (\text{number of hours/aantal ure})$ $C(x) = (4x^2 + 1000) \times \left(\frac{500}{x}\right)$ $= 2000x + \frac{500\,000}{x}$	✓ $4x^2 + 1000$ ✓ $\frac{500}{x}$ ✓ $(4x^2 + 1000) \times \left(\frac{500}{x}\right)$ (3)
9.2	$C'(x) = 2000 - \frac{500\,000}{x^2} = 0$ $2000x^2 - 500\,000 = 0$ $2000x^2 = 500\,000$ $x^2 = 250$ $x = \sqrt{250} = 15,81 \text{ km/h}$	✓ $C'(x)$ ✓ $C'(x) = 0$ ✓ standard form / <i>standaardvorm</i> ✓ simplification / <i>vereenvoudiging</i> ✓ answer / <i>antwoord</i> (5)
		[8]



QUESTION 10/VRAAG 10

10.1	$P(A \text{ or / of } B) = P(A) + P(B)$ $0,64 = 3P(B) + P(B)$ $0,64 = 4P(B)$ $\therefore P(B) = 0,16$	✓ rule / reël ✓ substitution / vervanging ✓ answer / antwoord (3)
10.2.1		✓ 37% and / en 63% ✓ 12% and / en 88% ✓ 36% and / en 64% ✓ outcomes / uitkomst (4)
10.2.2	$(37\% \times 88\%) + (63\% \times 64\%)$ $= 0,7288 \approx \frac{73}{100}$	✓ $(37\% \times 88\%) + (63\% \times 64\%)$ ✓ answer / antwoord (2)
10.3.1	$182 + x + 4 + 30 = 240$ OR / OF $x + 182 = 206$ OR / OF $x + 4 = 28$ $x = 240 - 216$ $x = 24$ $x = 24$ $x = 24$	✓ equation / vergelyking ✓ answer / antwoord (2)
10.3.2	For independent events Vir onafhanklike gebeurtenisse $P(R) \times P(C) = P(R \cap C)$ $P(R \text{ and / en } C) = \frac{24}{240} = 0,10$ $P(R) \times P(C)$ $= \left(\frac{206}{240}\right) \times \left(\frac{28}{240}\right)$ $= 0,10$ $\therefore$ Yes, the events are independent. Ja, die gebeurtenisse is onafhanklik.	✓ $P(R \cap C) = 0,10$ ✓ $P(R) \times P(C) = 0,10$ ✓ conclusion / gevolgtrekking (3)
		[14]
		TOTAL/TOTAAL: 150