NATIONAL SENIOR CERTIFICATE

GRADE 12

JUNE 2022

MATHEMATICS P1

MARKS: 150

TIME: 3 hours

This question paper consists of 12 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, in each of the following:

      1.1.1 $x^2 = -4x$ (3)

      1.1.2 $x^2 + x - 1 = 0$ (correct to TWO decimal places)   (3)

      1.1.3 $\sqrt{x+4} - \dfrac{4}{\sqrt{x-2}} = 0$ (5)

      1.1.4 $(x+2)(-3x+1) > 0$ (3)

1.2   Solve for x and y simultaneously:

$$3 - y + 2x = 0$$
$$6x + 4y^2 = 3 + 5xy$$

                                                             (6)

1.3   Given that $9x^2 - 12px = -4p^2$. For which value(s) of p will the equation have equal roots?   (4)

                                                                [24]

QUESTION 2

2.1 Given the geometric sequence: $\dfrac{9}{2}$; 9 ; 18 ; . . . ; 2304

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

    2.1.2 How many terms are there in the sequence? (2)

2.2 Given: $\displaystyle\sum_{k=1}^{\infty} 6(m)^{k-1} = 12$. Determine the value of m.

    (2)

2.3 The 3rd term of a geometric series is 18 and the 5th term is 162. Determine the sum of the first 7 terms, where $r < 0$. (5)

2.4 The general term of a quadratic number pattern is $T_n = an^2 + bn + c$ and its first term is 8. The general term of the first differences of the pattern is $t_k = 4k - 2$.

    2.4.1 Determine the next two terms of the quadratic number pattern, T_n. (3)

    2.4.2 Hence, or otherwise, show that the general term of the quadratic number pattern is given by $T_n = 2n^2 - 4n + 10$. (3)

    2.4.3 Which term of the quadratic number pattern will be equal to 3 050? (3)

                                                                  [19]

QUESTION 3

The following figure represents a pattern of shaded triangles placed on a white rectangular board. The triangles all have equal bases of 4 units in length. The height of the first triangle is 1 unit. Each triangle's height thereafter is 1 unit more than the previous one.
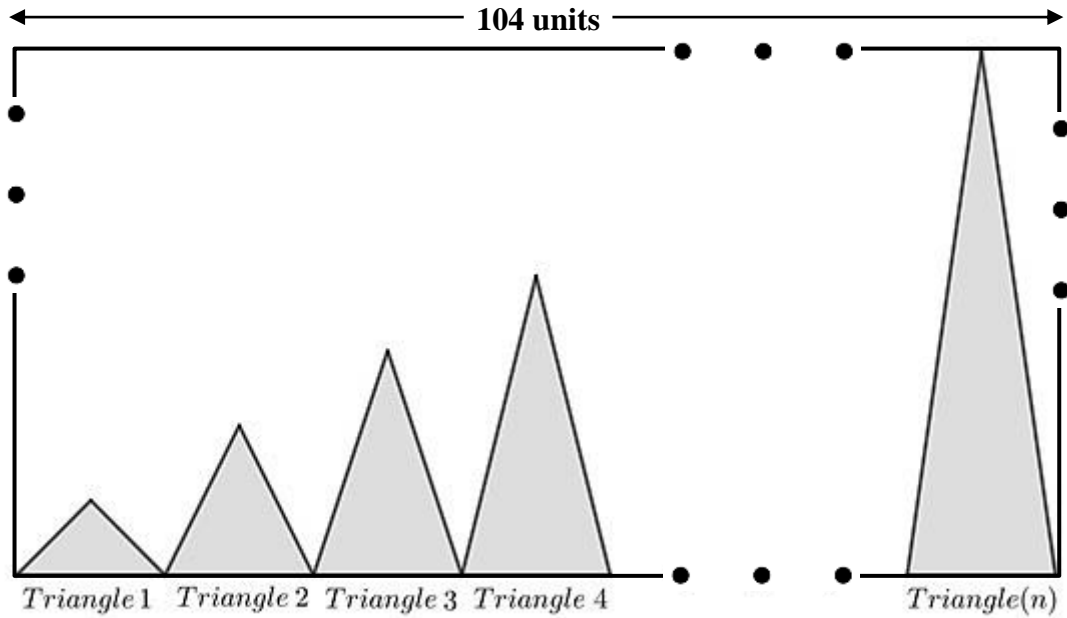
3.1 Determine the area of the first triangle. (1)

3.2 Determine the area of the 26th triangle. (2)

3.3 The triangles are placed on a rectangular board, with length 104 units, as shown above. Determine the area of the unshaded part of the white rectangular board, that is, the area of the part not covered by the shaded triangles. (5)

[8]

QUESTION 4

Given: $f(x) = \dfrac{8}{x-2} + 2$

4.1 Write down the domain of f. (2)

4.2 Calculate the y-intercept of f. (1)

4.3 Calculate the x-intercept of f. (2)

4.4 Sketch the graph of f, clearly indicating the coordinates of the x and y-intercepts as well as the asymptotes. (3)

4.5 If $y = -x + k$ is an equation of the line of symmetry of f, determine the value of k. (2)

4.6 Determine the equation of the graph formed if f is shifted 3 units to the right and then reflected across the x-axis. (3)

[13]

QUESTION 5

The graphs of $f(x) = 2(x+1)^2 - 8$ and $g(x) = \left(\dfrac{1}{2}\right)^x$ are represented in the sketch below.

P and Q are the x-intercepts of f and R is the turning point of f.
A$(-2;4)$ is a point on the graph of g.
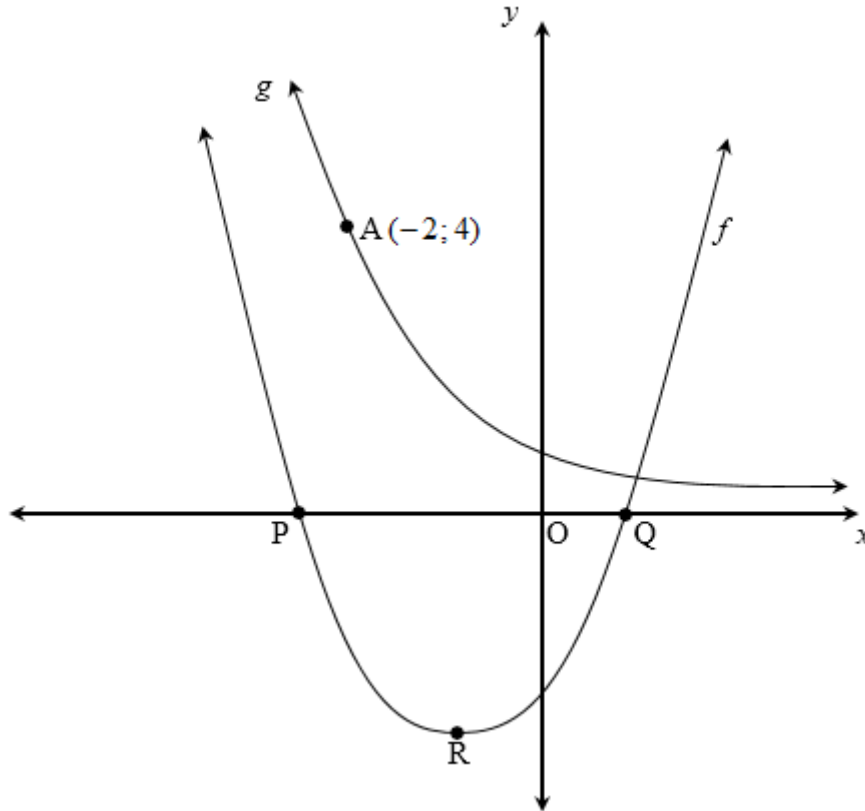
5.1 Write down the equation of the axis of symmetry of f. (1)

5.2 Write down the coordinates of R, the turning point of f. (1)

5.3 Determine the coordinates of P and Q. (4)

5.4 Determine the equation of g^{-1}, the inverse of g, in the form $y = \ldots$ (2)

5.5 Sketch the graph of g^{-1} in your ANSWER BOOK. Clearly indicate the intercept with the axis and at least ONE other point on g^{-1}. (3)

5.6 For which value(s) of x, is:

    5.6.1 $g^{-1}(x) \geq -2$? (2)

    5.6.2 $x.f(x) < 0$? (3)

                                                                                                       [16]

QUESTION 6

6.1   How long must R50 000 be invested, in order for it to double at an interest rate of 8,5% p.a. on the straight-line method? (Give your answer in years and months.)   (4)

6.2   A cellphone valued at R24 000 depreciates at 18% p.a. on the reducing balance method. Determine the value of the cellphone after 3 years.   (3)

6.3   R x (x Rand) is invested into an account at an interest rate of 12% p.a. compounded monthly. Three years later R$2x$ ($2x$ Rand) is deposited into the same account. After 7 years there is R276 558,75 in the account. Determine how much money was invested at the beginning.
(that is, the value of x)   (6)

                                                       [13]
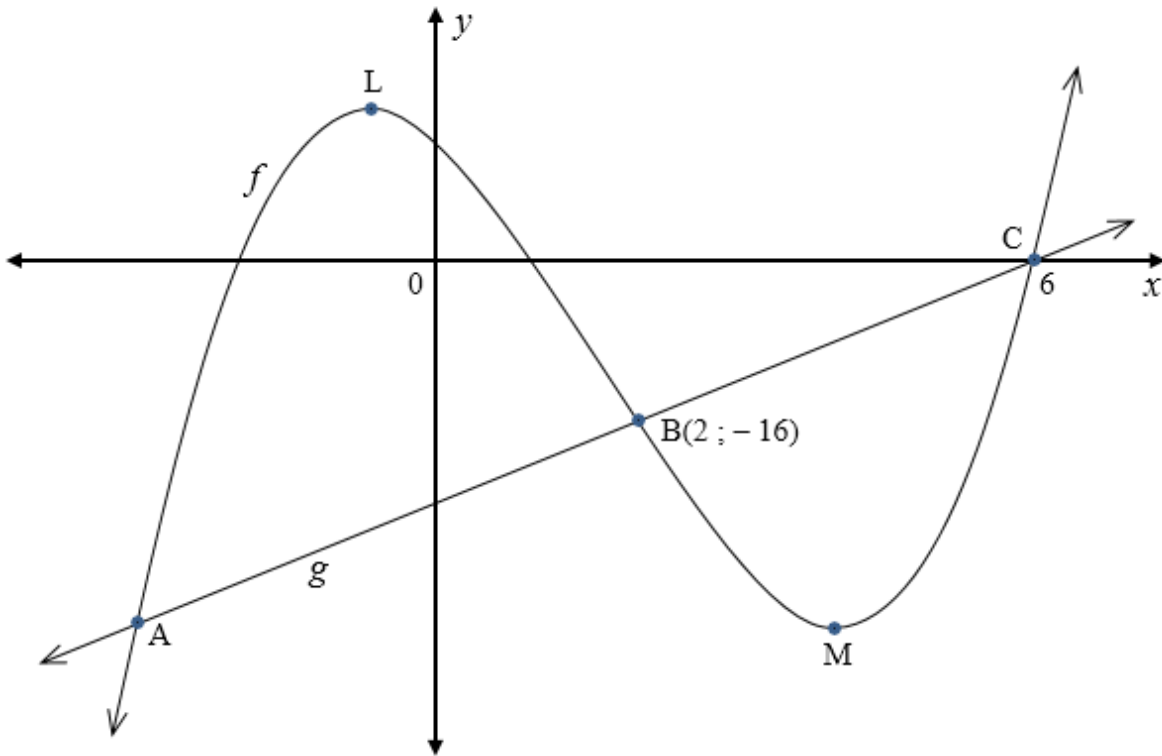
QUESTION 7

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

7.2   Determine:

7.2.1 $D_x \left[\dfrac{-5x}{\sqrt{x}} - \dfrac{x^2}{5} \right]$ (3)

7.2.2 $\dfrac{d}{dx} \left[\left(x + \dfrac{2}{x} \right) \left(x - \dfrac{2}{x} \right) \right]$ (4)

                                                       [12]

QUESTION 8

The sketch below represents the functions $f(x) = x^3 + bx^2 + cx + d$ and $g(x) = ax + q$.

The points A, $B(2; -16)$ and C are the points where the two graphs intersect.

$C(6;0)$ is a $x-$intercept of f, while L and M are the turning points of f.

8.1   Show that $b = -5$, $c = -8$ and $d = 12$ if it is given that, $f'(x) = 3x^2 - 10x - 8$.   (4)

8.2   Determine the coordinates of the turning points, L and M, of f.   (5)

8.3   Determine the equation of g.   (3)

8.4   If it is further given that the coordinates of point A are $(x; -36)$, determine the length of AM.   (3)

8.5   For which value(s) of x:

    8.5.1   is the graph, f increasing?   (2)

    8.5.2   is the graph, f concave down?   (2)
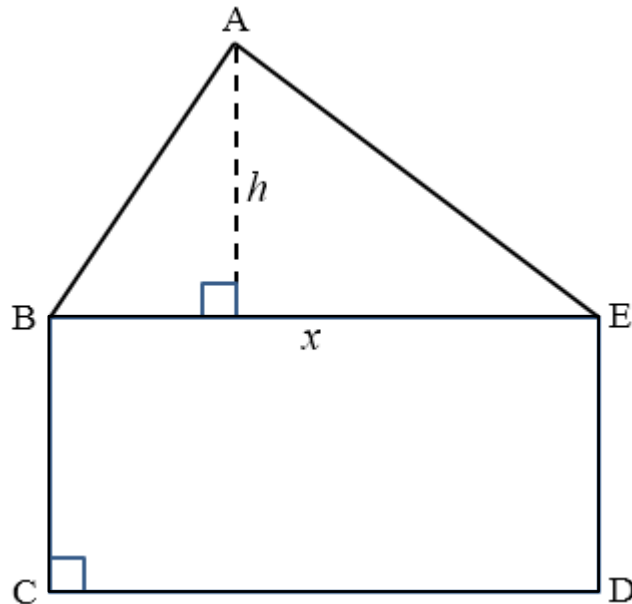
                            [19]

QUESTION 9

In the figure below, $\triangle$ABE has a base of length x metres.
The base and the perpendicular height of the triangle add up to 10 metres.
The triangle is mounted on a rectangle BCDE which has a perimeter of 32 metres.

9.1   Show that the area of the figure ABCDE is equal to $-\dfrac{3}{2}x^2 + 21x$ m^2 .

(5)

9.2   Determine the value of x for which ABCDE has a maximum area.

(3)

9.3   Hence, determine the maximum area of ABCDE.

(2)

[10]

QUESTION 10

10.1   In a survey, 1 530 people were asked if they had ever broken a limb. The results of the survey were as follows:

	Broken a limb	**Not Broken a limb**	**Total**
Male	463	b	782
Female	a	c	d
Total	913	617	1 530

      10.1.1   Calculate the values of $a, b, c,$ and d.   (4)
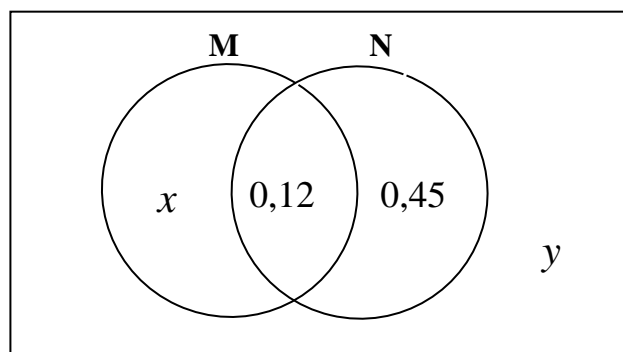
      10.1.2   If a person is chosen at random, what is the probability that it will be a female who has not broken a limb?   (2)

10.2   Two learners are selected at random from a group of 10 boys and 12 girls. Determine the probability that:

      10.2.1   They are both girls   (2)

      10.2.2   One is a boy and one is a girl   (3)

10.3   In the Venn diagram below, M and N are independent events.

Calculate, giving answers correct to two decimal places:

      10.3.1   The value of x.   (3)

      10.3.2   The value of y.   (2)

                                                       [16]

                                                TOTAL: **150**

INFORMATION SHEET: MATHEMATICS

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

$$A = P(1 + ni) \qquad A = P(1 - ni) \qquad A = P(1 - i)^n \qquad A = P(1 + i)^n$$

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

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

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

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

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

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

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

In $\triangle ABC$:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad a^2 = b^2 + c^2 - 2bc.\cos A \qquad area\, \triangle ABC = \frac{1}{2}ab.\sin C$$

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

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

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

$$\bar{x} = \frac{\sum x}{n} \qquad\qquad \partial^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n} \qquad\qquad P(A) = \frac{n(A)}{n(S)}$$

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

$$\hat{y} = a + bx \qquad\qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

NATIONAL
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SENIOR SERTIFIKAAT

GRADE/*GRAAD* 12

JUNE/*JUNIE* 2022

MATHEMATICS P1 MARKING GUIDELINE/
WISKUNDE V1 NASIENRIGLYN
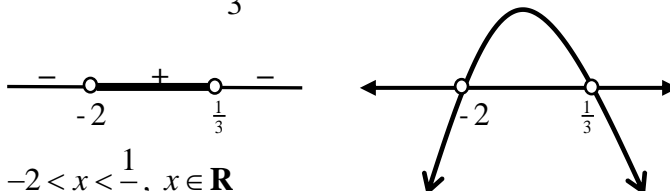
MARKS/*PUNTE*:   150

This marking guideline consists of 16 pages./
Hierdie nasienriglyn bestaan uit 16 *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 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 toegeken vir substitusie in die korrekte formule.

QUESTION 1/*VRAAG 1*

| 1.1.1 | $x^2 = -4x$ $x^2 + 4x = 0$ $x(x+4) = 0$ $x = 0$ or/*of* $x + 4 = 0$ $x = 0$ or/*of* $x = -4$ **OR / *OF*** $x^2 + 4x = 0$ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \dfrac{-4 \pm \sqrt{(4)^2 - 4(1)(0)}}{2(1)}$ $x = 0$ or / *of* $x = -4$ | Answers only – Full marks *Slegs antwoorde – Volpunte* | ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ both answers / *beide antwoorde* **OR / *OF*** ✓ standard form / *standaardvorm* ✓ correct substitution into correct formula / *korrekte vervanging in korrekte formule* ✓ both answers / *beide antwoorde* (3) |
| 1.1.2 | $x^2 + x - 1 = 0$ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \dfrac{-(1) \pm \sqrt{(1)^2 - 4(1)(-1)}}{2(1)}$ $x = \dfrac{-1 \pm \sqrt{5}}{2}$ $\therefore x = 0,62$ or/*of* $x = -1,62$ | Penalise 1 mark for incorrect rounding off./ *Penaliseer 1 punt vir verkeerde afronding.* | ✓ substitution / *vervanging* ✓✓ x-values / *waardes* (3) |

1.1.3	$\sqrt{x+4} - \dfrac{4}{\sqrt{x-2}} = 0$	
	$\sqrt{x+4} = \dfrac{4}{\sqrt{x-2}}$	✓ isolating surd / *isoleer wortelvorm*
	$\left(\sqrt{x+4}\right)^2 = \left(\dfrac{4}{\sqrt{x-2}}\right)^2$	✓ square both sides / *kwadreer beide kante*
	$x+4 = \dfrac{16}{x-2}$	
	$(x+4)(x-2) = 16$	✓ standard form / *standaardvorm*
	$x^2 + 2x - 24 = 0$	✓ factors / *faktore*
	$(x+6)(x-4) = 0$	
	$\therefore x \neq -6 \ or / of \ x = 4$	✓ selection / keuse
		(5)

1.1.4	$(x+2)(-3x+1) > 0$	
	critical values/*kritieke waardes*	
	$x = -2 \ \text{or}/of \ x = \dfrac{1}{3}$	✓ critical values / *kritieke waardes*
	$-2 < x < \dfrac{1}{3}, \ x \in \mathbf{R}$	✓✓ $-2 < x < \dfrac{1}{3}$ (accuracy / *akkuraatheid*)
	OR/*OF*	**OR/*OF***
	$x \in \left(-2 \ ; \dfrac{1}{3}\right), \ x \in \mathbf{R}$	$x \in \left(-2 \ ; \dfrac{1}{3}\right)$
		(3)

1.2		
	$3 - y + 2x = 0$	
	$y = 2x + 3$ ....(1)	✓ $y = 2x + 3$
	$6x + 4y^2 = 3 + 5xy$ .....(2)	
	(1) into/*in* (2):	
	$6x + 4(2x + 3)^2 = 3 + 5x(2x + 3)$	✓ substitution / *vervanging*
	$6x + 4(4x^2 + 12x + 9) = 3 + 5x(2x + 3)$	
	$6x + 16x^2 + 48x + 36 = 3 + 10x^2 + 15x$	
	$6x^2 + 39x + 33 = 0$	✓ standard form / *standaardvorm*
	$2x^2 + 13x + 11 = 0$	
	$(2x + 11)(x + 1) = 0$	✓ factors / *faktore*
	$x = -\dfrac{11}{2}$ or/*of* $x = -1$	✓ x-values / *waardes*
	$y = -8$ or/*of* $y = 1$	✓ y-values / *waardes*
	OR / *OF*	**OR / *OF***
	$3 - y + 2x = 0$ ....(1)	
	$6x + 4y^2 = 3 + 5xy$ ....(2)	
	$x = \dfrac{y - 3}{2}$ ....(3)	✓ $x = \dfrac{y - 3}{2}$
	Subst./*Verv.* (3) into / *in* (2):	
	$6\left(\dfrac{y-3}{2}\right) + 4y^2 = 3 + 5y\left(\dfrac{y-3}{2}\right)$	✓ substitution / *vervanging*
	$6(y - 3) + 8y^2 = 6 + 5y(y - 3)$	
	$6y - 18 + 8y^2 = 6 + 5y^2 - 15y$	
	$3y^2 + 21y - 24 = 0$	✓ standard form / *standaardvorm*
	$y^2 + 7y - 8 = 0$	
	$(y - 1)(y + 8) = 0$	✓ factors / *faktore*
	$y = 1$ or / *of* $y = -8$	✓ y-values / *waardes*
	$x = -1$ or / *of* $x = -\dfrac{11}{2}$	✓ x-values / *waardes*
		(6)

1.3	$9x^2 - 12px + 4p^2 = 0$ For equal roots/*Vir gelyke wortel*s: $\Delta = 0$ $\therefore b^2 - 4ac = 0$ $(-12p)^2 - 4(9)(4p^2) = 0$ $144p^2 - 144p^2 = 0$ $0 = 0$ $\Rightarrow$For all Real values / *Vir alle Reële waardes* $p \in \mathbb{R}$	✓ standard form / *standaardvorm* ✓ $\Delta = 0$ ✓ answer / *antwoord* ✓ conclusion / *gevolgtrekking* (4)
		[24]

QUESTION 2/*VRAAG 2*

2.1.1	$r = \dfrac{T_3}{T_2} = \dfrac{18}{9} = 2$	✓ answer / *antwoord* (1)
2.1.2	$T_n = a.r^{n-1}$ $2304 = \left(\dfrac{9}{2}\right)(2)^{n-1}$ $2^{n-1} = 512$ $\qquad = 2^9$ $\therefore n - 1 = 9$ $\qquad n = 10$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
2.2	$S_\infty = \dfrac{a}{1-r}$ $12 = \dfrac{6}{1-m}$ $12 - 12m = 6$ $\qquad -12m = -6$ $\qquad m = \dfrac{1}{2}$	✓ substitution / vervanging ✓ answer / antwoord (2)
2.3	$\dfrac{T_5}{T_3} = \dfrac{ar^4}{ar^2} = \dfrac{162}{18}$ $r^2 = 9$ $r = \pm 3$ $a.(-3)^2 = 18$ $\qquad a = 2$ $S_7 = \dfrac{2\left((-3)^7 - 1\right)}{-3-1}$ $\qquad = 1094$	✓ setting up both equations *opstel van beide vergelykings* ✓ value(s) of r / *waarde(s) van r* ✓ value of a / *waarde van a* ✓ substitution into S_n / *vervanging in S_n* ✓ answer / *antwoord* (5)
2.4.1	$T_1 = 8 \ and / en \ t_n = 4n - 2$ $t_1 = 4(1) - 2 = 2$ $t_2 = 4(2) - 2 = 6$ $\therefore T_2 = 10 \ ; \ T_3 = 16$	✓ *finding t_1 and t_2 / berekening van t_1 en t_2* ✓ $T_2 = 10$ ✓ $T_3 = 16$ (3)

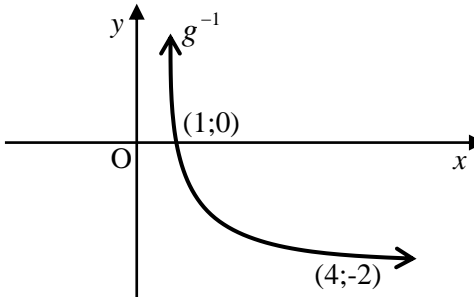| 2.4.2	$\begin{array}{ccccccc} 8 & ; & 10 & ; & 16 & ; & 26 \\ & 2 & ; & 6 & ; & 10 & \\ & & 4 & ; & 4 & & \end{array}$	
	$2a = 4 \qquad 3a+b=2 \qquad a+b+c=8$ $\quad a = 2 \qquad 3(2)+b=2 \quad (2)+(-4)+c=8$ $\qquad\qquad\qquad\quad b=-4 \qquad\qquad c=10$ $\therefore\ T_n = 2n^2 - 4n + 10$	✓ value of a / *waarde van a* ✓ value of b / *waarde van b* ✓ value of c / *waarde van c* (3)
	OR/OF	**OR/OF**
	$T_n = T_1 + s_{n-1}$ $= 8 + \dfrac{n-1}{2}\big(2(2)+(n-2)4\big)$ $= 8 + \dfrac{n-1}{2}(4n-4)$ $= 8 + (n-1)(2n-2)$ $= 8 + 2n^2 - 4n + 2$ $= 2n^2 - 4n + 10$	✓ method /*metode* ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (3)
2.4.3	$2n^2 - 4n + 10 = 3050$ $2n^2 - 4n - 3040 = 0$ $n^2 - 2n - 1520 = 0$ $(n-40)(n+38) = 0$ $n = 40$ or / *of* $n \neq -38$	✓ equating / *gelyk stel* ✓ factors / *faktore* ✓ selection / *keuse* $(n = 40)$ (3)
		[19]

QUESTION 3/*VRAAG 3*

3.1	$Area\,\Delta_1 = \dfrac{1}{2}b \times h$ $= \dfrac{1}{2}(4)(1)$ $= 2\ units^2 / eenhede^2$	✓ answer / *antwoord* (1)
3.2	$Area\,\Delta_{26} = \dfrac{1}{2}b \times h$ $= \dfrac{1}{2}(4)(26)$ $= 52\ units^2 / eenhede^2$	✓ $h = 26$ ✓ answer / *antwoord* (2)
3.3	*Area of* rectangle/*Area van reghoek* $= l \times b$ $= 104 \times 26$ $= 2704\ units^2 / eenhede^2$ *Sum of Areas of Triangles / Som van Areas van Driehoeke* $= \dfrac{26}{2}[2 + 52]$ $= 702\ units^2 / eenhede^2$ *Area of unshaded part / Area van nie − gearseerde deel* $= 2704 - 702$ $= 2002\ units^2 / eenhede^2$	✓ answer / *antwoord* ✓ substitution / *vervanging* ✓ answer / *antwoord* ✓ method / *metode* ✓ answer / *antwoord* (5)
		[8]

QUESTION 4/*VRAAG 4*

4.1	$x \in \mathbb{R}; x \neq 2$	✓✓ answer / *antwoord* (2)
4.2	$y = \dfrac{8}{0-2} + 2 = -2$	✓ answer / *antwoord* (1)
4.3	$\dfrac{8}{x-2} + 2 = 0$ $\dfrac{8}{x-2} = -2$ $-2x + 4 = 8$ $-2x = 4$ $x = -2$	✓ equating to 0 / *stel gelyk aan* 0 ✓ answer / *antwoord* (2)
4.4	$f: y = \dfrac{8}{x-2} + 2$	✓ both intercepts / *beide afsnitte* ✓ asymptotes / *asimptote* ✓ shape / *vorm* (3)
4.5	$y = -(x-2) + 2 \qquad\qquad y = -x + k$ $y = -x + 4 \qquad$ OR / *OF* $\qquad 2 = -2 + k$ $\therefore\ k = 4 \qquad\qquad\qquad \therefore\ k = 4$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
4.6	$y = \dfrac{8}{(x-5)} + 2$ $y = -\left[\dfrac{8}{(x-5)} + 2\right]$ $y = -\dfrac{8}{(x-5)} - 2$	✓ shift 3 units to the right *skuif 3 eenhede na regs* ✓ reflection in the *x*-axis *refleksie in die x-as* ✓ answer / *antwoord* (3)
		[13]

QUESTION 5/*VRAAG 5*

5.1	$x = -1$	✓ answer / *antwoord* (1)
5.2	$R(-1\,;\,-8)$	✓ answer / *antwoord* (1)
5.3	$2(x+1)^2 - 8 = 0$ $(x+1)^2 = 4$ $x+1 = \pm 2$ $\therefore\ x = 1\ $ or / *of* $\ x = -3$ $P(-3;0)\ $ and / *en* $\ Q(1;0)$ **OR / *OF*** $2(x+1)^2 - 8 = 0$ $2(x^2 + 2x + 1) - 8 = 0$ $2x^2 + 4x - 6 = 0$ $x^2 + 2x - 3 = 0$ $(x-1)(x+3) = 0$ $x = 1\ $ or / *of* $\ x = -3$ $P(-3;0)\ $ and / *en* $\ Q(1;0)$	✓ equating to 0 / *gelyk stel aan* 0 ✓ simplification / *vereenvoudiging* ✓ x-values / *x-waardes* ✓ coordinates / *koördinate* **OR / *OF*** ✓ equating to 0 / *gelyk stel aan* 0 ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ coordinates / *koördinate* (4)
5.4	$g:\ y = \left(\dfrac{1}{2}\right)^x$ $g^{-1}: x = \left(\dfrac{1}{2}\right)^y$ $\therefore\ g^{-1}:\ y = \log_{\frac{1}{2}} x$ $\boxed{\begin{array}{l} \text{Answer only – Full marks} \\ \textit{Slegs antwoord – Volpunte} \end{array}}$	 ✓ interchanging x and y *omruil van x en y* ✓ answer / *antwoord* (2)
5.5		✓ x-intercept / *x-afsnit* ✓ other point / *ander punt* ✓ shape / *vorm* (3)

5.6.1	$0 < x \leq 4$ OR / *OF* $x \in (0;4]$	✓✓ answer / *antwoord* (2)
5.6.2	$x < -3$ or / *of* $0 < x < 1$ OR / *OF* $(0;-3) \cup (0;1)$	✓ $x < -3$ ✓ $0 < x < 1$ ✓ $\cup$ / or / *of* (3)
		[16]

QUESTION 6/*VRAAG 6*

6.1	$A = P(1 + in)$ $100\,000 = 50\,000(1 + 0,085n)$ $2 = 1 + 0,085n$ $1 = 0,085n$ $\therefore n = 11,7647...$ $n = 11$ years / *jaar* 10 months / *maande* (since: $0,7647... \times 12 = 9,17$ *months we round up*)	✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ value of n / *waarde van n* ✓ answer / *antwoord* (4)
6.2	$A = P(1 - i)^n$ $A = 24\,000(1 - 0,18)^3$ $A = R13\,232,83$	✓ formula / *formule* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
6.3	$x\left(1 + \dfrac{12\%}{12}\right)^{84} + 2x\left(1 + \dfrac{12\%}{12}\right)^{48} = R276\,558,75$ $x\left[\left(1 + \dfrac{12\%}{12}\right)^{84} + 2\left(1 + \dfrac{12\%}{12}\right)^{48}\right] = 276\,558,75$ $x = \dfrac{276\,558,75}{\left(1 + \dfrac{12\%}{12}\right)^{84} + 2\left(1 + \dfrac{12\%}{12}\right)^{48}}$ $x = R50\,000,00$	✓ 84 ✓ 48 ✓ $x\left(1 + \dfrac{12\%}{12}\right)^{84} + 2x\left(1 + \dfrac{12\%}{12}\right)^{48} = R276\,558,75$ ✓ common factor x / *gemene faktor x* ✓ $x = \dfrac{276\,558,75}{\left(1 + \dfrac{12\%}{12}\right)^{84} + 2\left(1 + \dfrac{12\%}{12}\right)^{48}}$ ✓ answer / *antwoord* (6)
		[13]

Penalise 1 mark for incorrect notation in this question
Penaliseer 1 punt vir verkeerde notasie in hierdie vraag

QUESTION 7/*VRAAG 7*

7.1	$f(x) = -2x^2 + x$	
	$f(x+h) = -2(x+h)^2 + (x+h)$	
	$\quad = -2x^2 - 4xh - 2h^2 + x + h$	✓ $-2x^2 - 4xh - 2h^2 + x + h$
	$\dfrac{f(x+h) - f(x)}{h} = \dfrac{-2x^2 - 4xh - 2h^2 + x + h - (-2x^2 + x)}{h}$	✓ substitution / *vervanging*
	$\quad = \dfrac{-4xh - 2h^2 + h}{h}$	✓ simplification / *vereenvoudiging*
	$\quad = \dfrac{h(-4x - 2h + 1)}{h}$	✓ factorisation / *faktorisering* (dividing by h / *deel deur h*)
	$f'(x) = \lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$	
	$\quad = \lim\limits_{h \to 0} (-4x - 2h + 1)$	✓ answer / *antwoord*
	$\quad = -4x + 1$	(5)
	Answer ONLY: 0 marks / *SLEGS antwoord*: 0 *punte*	

7.2.1	$D_x\left[5\sqrt{x} - \dfrac{x^5}{5} \right]$	
	$D_x\left[5x^{\frac{1}{2}} - \dfrac{1}{5}x^5 \right]$	✓ $5x^{\frac{1}{2}}$
	$= \dfrac{5}{2}x^{-\frac{1}{2}} - x^4$	✓ $\dfrac{5}{2}x^{-\frac{1}{2}}$ ✓ $-x^4$
		(3)

7.2.2	$\dfrac{d}{dx}\left[\left(x + \dfrac{2}{x} \right)\left(x - \dfrac{2}{x} \right) \right]$	
	$\dfrac{d}{dx}\left[x^2 - \dfrac{4}{x^2} \right]$	✓ $x^2 - \dfrac{4}{x^2}$
	$\dfrac{d}{dx}\left[x^2 - 4x^{-2} \right]$	✓ $-4x^{-2}$
	$= 2x + 8x^{-3}$	✓ $2x$ ✓ $+8x^{-3}$
		(4)
		[12]

QUESTION 8/*VRAAG 8*
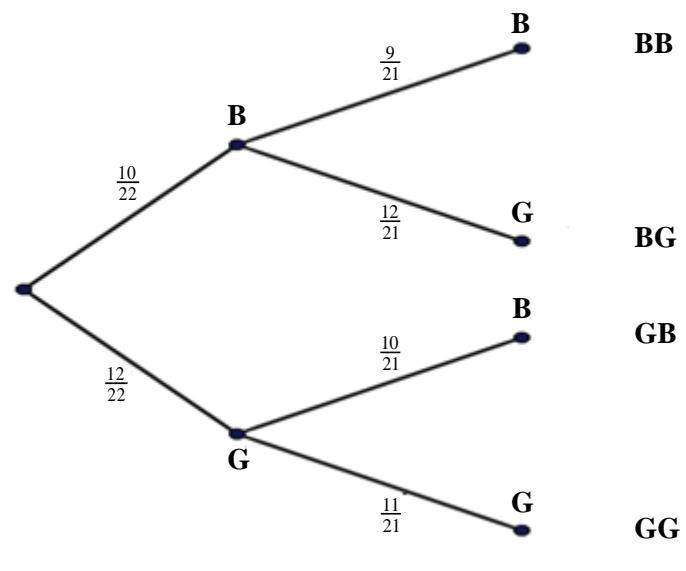
8.1	$f'(x) = 3x^2 + 2bx + c$	✓ $f'(x) = 3x^2 + 2bx + c$
	$2b = -10$ $b = -5$	✓ $2b = -10$
	$c = -8$	✓ $c = -8$
	$f(x) = x^3 - 5x^2 - 8x + d$ $f(2) = (2)^3 - 5(2)^2 - 8(2) + d = -16$ $\quad\quad 8 - 20 - 16 + d = -16$ $\therefore\ d = 12$	✓ substitution of point (2 ; -16) *vervanging van punt* (2 ; -16) (4)
8.2	$f'(x) = 3x^2 - 10x - 8 = 0$	✓ $f'(x) = 0$
	$(3x + 2)(x - 4) = 0$	✓ factors / *faktore*
	$x = -\dfrac{2}{3}$ or / *of* $x = 4$	✓ x-values / *x-waardes*
	$y = \dfrac{400}{27}$ or / *of* $y = -36$	✓ y-values / *y-waardes*
	$L\left(-\dfrac{2}{3}; \dfrac{400}{27}\right)$ & $M(4; -36)$	✓ correct coordinates / *korrekte koördinate* (5)
8.3	$m = \dfrac{0 + 16}{6 - 2} = 4$	✓ gradient / *gradiënt*
	$y - y_1 = m(x - x_1)$ $y - 0 = 4(x - 6)$	✓ substitution / *vervanging*
	$y = 4x - 24$	✓ answer / *antwoord*
	OR / *OF*	**OR /** *OF*
	$m = \dfrac{0 + 16}{6 - 2} = 4$	✓ gradient / *gradiënt*
	$y = mx + c$ $y = 4x + c$ $-16 = 4(2) + c$	✓ substitution / *vervanging*
	$\therefore\ c = -24$ $y = 4x - 24$	✓ answer / *antwoord* (3)

8.4	$y = 4x - 24$ $-36 = 4x - 24$ $-12 = 4x$ $\therefore x = -3$ $\Rightarrow AM = 7$ units / *eenhede*	✓ substitution of $(x\,;\,-36)$ / *vervanging van* $(x\,;\,-36)$ ✓ $x = -3$ ✓ answer / *antwoord* (3)
8.5.1	$\left(-\infty;-\dfrac{2}{3}\right)\cup(4;\infty)$	✓✓ answer / *antwoord* (2)
8.5.2	$f''(x) = 6x - 10 = 0$ $\therefore x = \dfrac{5}{3}$ $\Rightarrow$ Concave down / *Konkaaf af* : $x < \dfrac{5}{3}$	✓ method / *metode* ✓ answer /*antwoord* (2)
		[19]

QUESTION 9/*VRAAG 9*

9.1	$x + h = 10 \Rightarrow h = (10 - x)$ m
	
	Let width of rectangle $= y$ / *Laat die breedte van reghoek* $= y$
	$\therefore\ 2x + 2y = 32$
	      $y = (16 - x)$ m
	Area of figure / *Oppervlakte van figuur* :
	= Area of Triangle + Area of Rectangle
	  (*Oppervlakte van Driehoek* + *Oppervlakte van* Re *ghoek*)
	$= \dfrac{1}{2}(b \times h) + (l \times b)$
	$= \dfrac{1}{2}(x)(10 - x) + x(16 - x)$
	$= 5x - \dfrac{1}{2}x^2 + 16x - x^2$
	$= -\dfrac{3}{2}x^2 + 21x$
		✓ $h = (10 - x)$
		
		✓ $y = (16 - x)$
		
		✓ $\dfrac{1}{2}(x)(10 - x)$
		✓ $x(16 - x)$
		
		✓ simplification / *vereenvoudiging*
		
		     (5)

9.2	$A'(x) = -3x + 21 = 0$
	        $-3x = -21$
	          $x = 7$
		✓ $A'(x) = -3x + 21$
		✓ $A'(x) = 0$
		✓ answer / antwoord
		     (3)

9.3	$A = -\dfrac{3}{2}(7)^2 + 21(7)$
	   $= 73,5\ m^2$
		✓ substitution / *vervanging*
		✓ answer / *antwoord*
		     (2)

		[10]

QUESTION 10/*VRAAG 10*

10.1.1	$a = 450$	✓ value of a / *waarde van a*
	$b = 319$	✓ value of b / *waarde van b*
	$c = 298$	✓ value of c / *waarde van c*
	$d = 748$	✓ value of d / *waarde van d*
		(4)
10.1.2	$P(F / Not) = \dfrac{298}{1530}$	✓✓ answer / *antwoord*
		(2)
10.2		
10.2.1	$\dfrac{12}{22} \times \dfrac{11}{21} = \dfrac{2}{7} \approx 0,29$	✓ answer / *antwoord*
		(2)
10.2.2	$\left(\dfrac{10}{22} \times \dfrac{12}{21}\right) + \left(\dfrac{12}{22} \times \dfrac{10}{21}\right)$	✓ $\left(\dfrac{10}{22} \times \dfrac{12}{21}\right)$ ✓ $\left(\dfrac{12}{22} \times \dfrac{10}{21}\right)$
	$= \dfrac{40}{77} \approx 0,52$	✓ answer / *antwoord*
		(3)

10.3.1	$P(M) \times P(N)$ $= (0,12 + x)(0,57)$ $= 0,57x + 0,0684$ For independent events/*Vir onafhanklike gebeurtenisse* $P(M) \times P(N) = P(M \cap N)$ $0,57x + 0,0684 = 0,12$ $0,57x = 0,0516$ $x = 0,09$	✓ $0,57x + 0,0684$ ✓ $0,57x + 0,0684 = 0,12$ ✓ answer / *antwoord* (3)
10.3.2	$y = 1 - (0,09 + 0,12 + 0,45)$ $\quad = 0,34$	✓ $1 - (0,09 + 0,12 + 0,45)$ ✓ answer / *antwoord* (2)
		[16]
		TOTAL/*TOTAAL*: **150**