GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

NOVEMBER 2022

GRADE 10

MATHEMATICS

(PAPER 1)

TIME: **2 hours**

MARKS: **100**

6 pages and 1 information sheet

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. This question paper consists of 7 questions.
3. Present your answers according to the instructions of each question.
4. Clearly show ALL calculations, diagrams, graphs et cetera which were used in determining the answers.
5. Answers only will NOT necessarily be awarded full marks.
6. Use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. Where necessary, answers should be rounded-off to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. An INFORMATION SHEET is included on page 7 of the question paper.
10. Number the questions correctly according to the numbering system used in the question paper.
11. Write neatly and legibly.

QUESTION 1

1.1 Factorise the following expressions fully:

1.1.1 $2x^6 - 8$ (2)

1.1.2 $-x + (x-y)^3 + y$ (4)

1.2 Simplify the following completely:

1.2.1 $\left(x^{\frac{1}{2}} - 3\right)^2$ (2)

1.2.2 $x^{-3} \div x^{-5} + (x^{-2})^{-1}$ (2)

1.2.3 $\dfrac{5^{x+1}.(4^x)^3}{2^{5x-2}.10^{x-1}}$ (4)

1.2.4 $\dfrac{-11}{2x^2 - 5x - 12} - \dfrac{1}{4-x}$ (5)

1.3 Determine the value of d if $(3x+2)$ is a factor of: $6x^2 + dx - 10$ (3)

[22]

QUESTION 2

2.1 Solve for x:

2.1.1 $(3x-1)(x+2) = 0$ (2)

2.1.2 $3^x - 2.3^{x-1} = 3$ (3)

2.2 Given: $-1 \leq 1 - \dfrac{2x}{3} < 5$

2.2.1 Solve for x in the inequality. (3)

2.2.2 Write down the number of integers that will satisfy the inequality . (1)

2.3 Solve for x and y simultaneously:

$x - y = 4$ and $\dfrac{x}{5} + \dfrac{y}{2} = 5$ (5)

[14]

QUESTION 3

3.1 Your friends Zain and Letti have been trying to solve an exercise based on the following sequence: 2; 6; 10; 14 ...

3.1.1 Letti says that $T_n = 4n - 2$ and Zain says that $T_n = 4(n-1) + 2$. Who is right?

Use algebra to justify your answer. (3)

3.1.2 Determine the value of the 27th term of the sequence. (2)

3.2 Consider the following sequence: $-3\ ;\ 2\ ;\ 7\ ;\ 12\ ;\ 17\ ;\ \ldots$

3.2.1 Determine the n^{th} term of the sequence. (2)

3.2.2 Determine the value of the 52nd number to end in a 7. (3)

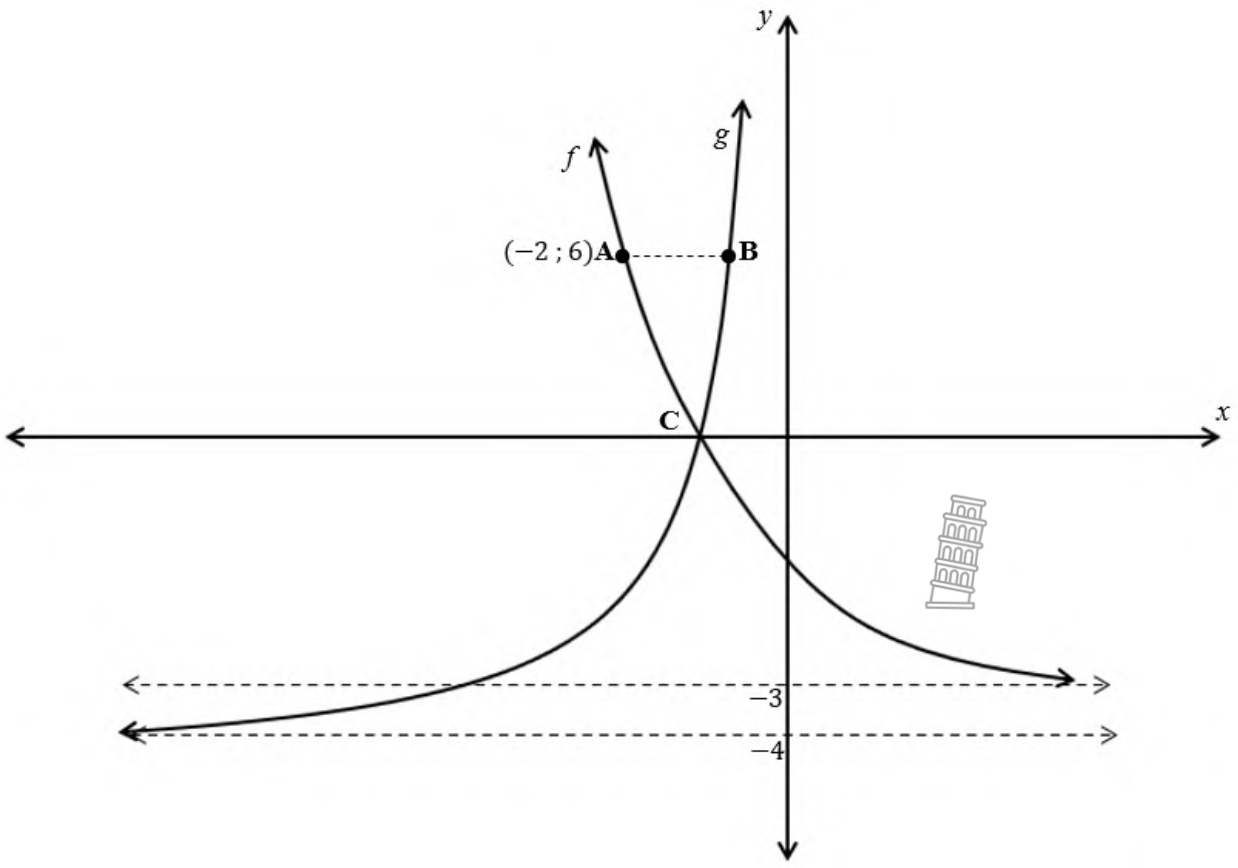
[10]

QUESTION 4

The sketch below shows the graphs of $f(x) = a^x - 3$ and $g(x) = -\frac{4}{x} - 4$.

A$(-2\ ;\ 6)$ is a point on the graph of f and B is a point on the graph of g.

C is the x-intercept of the graphs.



4.1 Write down the:

4.1.1 Domain of f (1)

4.1.2 Range of g (1)

4.1.3 Equation of the asymptote of f (1)

4.2 Show that the value of a is 3^{-1}. (2)

4.3 Determine the coordinates of C. (3)

4.4 Write down the values of x for which $g(x) > f(x)$ (2)

4.5 Determine the equation of:

4.5.1 The straight line through A and C (4)

4.5.2 The axis of symmetry of g with a negative gradient (2)

4.6 If AB is a horizontal line, calculate the length of AB. (3)

[19]

QUESTION 5

Consider a quadratic function, h, with the following characteristics:

- Axis of symmetry is the y-axis
- The x-intercepts are $(-4; 0)$ and $(4; 0)$
- The graph cuts the y-axis at -8

5.1 Sketch the graph of h on a system of axes. Clearly show ALL intercepts with the axes. (3)

5.2 Determine the equation of the graph in the form $h(x) = ax^2 + q$. (3)

5.3 Write down the values of x for which $h(x) \leq 0$. (2)

5.4 Write down the equation of k if $k(x) = -h(x) - 6$. (2)

[10]

QUESTION 6

6.1 Amy needs to buy a new computer. The computer costs R7 990. Amy does not have the full amount of money available, so she has decided to enter into a hire purchase agreement. The terms of the agreement are as follows;

15% per annum simple interest
48 monthly payments
Monthly processing fee of R13,50

Determine the monthly amount payable, including interest and fees. (5)

6.2 On his 29th birthday, John invested R5 000 on the Johannesburg Stock Exchange. His shares increased in value by 20% compounded annually. How much would his investment be worth on his 60th birthday? (5)

[10]

QUESTION 7

7.1 For any two events, A and B, it is given that P(A) = 0,25, P(B) = 0,89 and P(A or B)′ = 0,05

7.1.1 Calculate P(A or B). (2)

7.1.2 Are the two events mutually exclusive? Justify your answer. (2)

7.1.3 Calculate P(A and B). (2)

7.1.4 What is the probability of event B only? (2)

7.2 In a small town of 1 500 people, there are two main banks, Add Savings and Multiplier Bank. Most of the people in the town bank with one or both of these banks. 600 people bank with Add Savings and 950 bank with Multiplier Bank. 235 people in the town do not use either Add Savings or Multiplier Bank.

7.2.1 Draw a Venn diagram to illustrate the information given above. (4)

7.2.2 What is the probability that a person from the town uses both banks? (1)

7.2.3 What is the probability that a person from the town does not use Multiplier Bank? (2)

[15]

TOTAL: 100

END

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

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

$$area\ \Delta ABC = \frac{1}{2}\ ab.\sin C$$

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

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

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

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

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

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

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

PROVINSIALE EKSAMEN

NOVEMBER 2022

GRADE 10/*GRAAD 10*

MARKING GUIDELINES/

NASIENRIGLYNE

MATHEMATICS (PAPER 1)/*WISKUNDE (VRAESTEL 1)*

9 pages/*bladsye*

NOTE/*LET WEL:*

- If a candidate answered a QUESTION TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a problem is unacceptable.

- *As 'n kandidaat 'n VRAAG TWEE KEER beantwoord het, merk slegs die EERSTE poging.*
- *As 'n kandidaat 'n antwoord deurgehaal het en dit nie oorgedoen het nie, merk die deurgehaalde antwoord.*
- *Konsekwente akkuraatheid is van toepassing op ALLE aspekte van die nasienriglyne.*
- *Om waardes/antwoorde te aanvaar om 'n probleem op te los is onaanvaarbaar.*

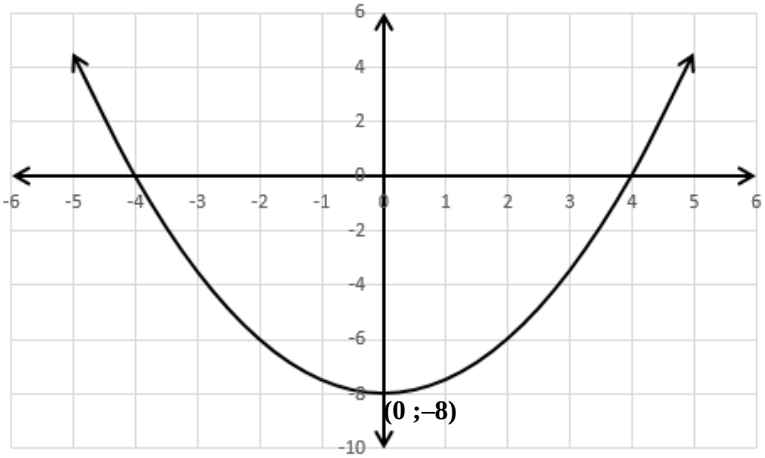
QUESTION/*VRAAG* 1				
1.1	1.1.1	$2x^6-8$ $=2(x^6-4)$ $=2\left(x^3+2\right)\left(x^3-2\right)$	✓ factorise/*faktoriseer* ✓ factorise/*faktoriseer*	(2)
	1.1.2	$-x+(x-y)^3+y$ $=(x-y)^3-(x-y)$ $=(x-y)[(x-y)^2-1]$ $=(x-y)(x-y+1)(x-y-1)$	✓ $-(x-y)$ ✓ common factor $(x-y)$ *gemeenskaplike faktor* $(x-y)$ ✓ $[(x-y)^2-1]$ ✓ diff. of two squares/ *verskil tussen twee vierkante*	(4)
1.2	1.2.1	$\left(x^{\frac{1}{2}}-3\right)^2$ $=x^{\frac{1}{4}}-6x^{\frac{1}{2}}+9$	✓ $x^{\frac{1}{4}}$ and/*en* 9 ✓ $-6x^{\frac{1}{2}}$	(2)
	1.2.2	$x^{-3}\div x^{-5}+(x^{-2})^{-1}$ $=x^{-3-(-5)}+x^2$ $=x^2+x^2$ $=2x^2$	✓ division x^{-3+5} and brackets/ *deel* x^{-3+5} *en hakies* ✓ simplify/*vereenvoudig*	(2)
	1.2.3	$\frac{5^{x+1}.(4^x)^3}{2^{5x-2}.10^{x-1}}$ $=\frac{5^{x+1}.(2^{2x})^3}{2^{5x-2}.(5.2)^{x-1}}$ $=\frac{5^{x+1}.2^{6x}}{2^{5x-2}.5^{x-1}.2^{x-1}}$ $=5^{x+1-x+1}.2^{6x-5x+2-x+1}$ $=5^2.2^3$ $=200$	✓ bases primefactors/ *basisse priemfaktore* ✓ simplify numerator/ *vereenvoudig teller* ✓ simplify denominator/ *vereenvoudig noemer* ✓ final answer/ *finale antwoord*	(4)

	1.2.4	$\frac{-11}{2x^2-5x-12}-\frac{1}{4-x}$ $=\frac{-11}{(2x+3)(x-4)}+\frac{1}{x-4}$ $=\frac{-11+2x+3}{(2x+3)(x-4)}$ $=\frac{2x-8}{(2x+3)(x-4)}$ $=\frac{2(x-4)}{(2x+3)(x-4)}$ $=\frac{2}{2x+3}$	✓ Factorise trinomial/ *Faktoriseer drieterm* ✓ Change of sign/ *Verandering van teken* ✓ Numerator/*Teller* ✓ LCD/KGV ✓ Simplified answer/ *Vereenvoudigde antwoord*	(5)
1.3		$(3x+2)(2x-5)$ $=6x^2-11x-10$ $\therefore d=-11$	✓ $(2x-5)$ ✓ Simplify/*Vereenvoudig* ✓ Answer/*Antwoord*	(3)
				[22]
QUESTION/*VRAAG* 2				
2.1	2.1.1	$(3x-1)(x+2)=0$ $x=\frac{1}{3}$ or/*of* $x=-2$	✓ $\frac{1}{3}$ ✓ -2	(2)
	2.1.2	$3^x-2.3^{x-1}=3$ $3^x(1-2.3^{-1})=3$ $3^x\left(\frac{1}{3}\right)=3$ $3^x=3^2$ $x=2$ If answer ONLY NO marks/ *SLEGS antwoord GEEN punte nie*	✓ Factorise/*Factorise* ✓ Simplify/*Vereenvoudig* ✓ Answer/*Antwoord*	(3)
2.2	2.2.1	$-1\le 1-\frac{2x}{3}<5$ $-2\le -\frac{2x}{3}<4$ $-6\le -2x<12$ $3\ge x>-6$ $-6<x\le 3$	✓ Subtract 1 on both sides/ *Trek 1 aan albei kante af* ✓ $\times 3$ ✓ $\div(-2)$ and change of inequalities/*en verandering van ongelykhede*	(3)
	2.2.2	9 integers satisfy the equation/*9 heelgetalle voldoen aan die vergelyking*	✓ Answer/*Antwoord*	(1)

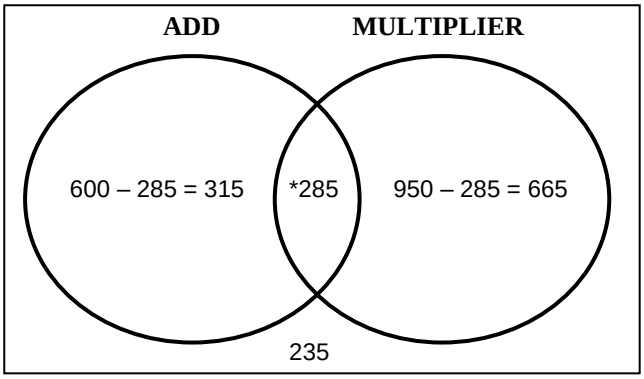
2.3	Solve for x and y simultaneously/*Los vir x en y gelyktydig op*: $x - y = 4$ and/*en* $\frac{x}{5} + \frac{y}{2} = 5$ $x = y + 4$……(1) $2x + 5y = 50$……..(2) subst/*vervang* (1) into/*in* (2) $2(y + 4) + 5y = 50$ $2y + 8 + 5y = 50$ $7y = 42$ $y = 6$ $x = 6$ $x = 10$ **OR/*OF*** $y = x - 4$……(1) subst/*vervang* (1) into/*in* (2) $2x + 5(x - 4) = 50$ $2x + 5x - 20 = 50$ $7x = 70$ $x = 10$ $y = 10 - 4$ $y = 6$	✓ Make x the subject of the equation (1)/*Maak x die onderwerp van die vergelyking (1)* ✓ LCD/*KGV* ✓ Substitute/*Vervang* ✓ y value/*y-waarde* ✓ x value/*x-waarde* ✓ Make y the subject of the equation (1)/*Maak y die onderwerp van die vergelyking (1)* ✓ Substitute/*Vervang* ✓ Simplify/*Vereenvoudig* ✓ x value/*x-waarde* ✓ y value/*y-waarde*	(5)
			[14]

QUESTION/*VRAAG* 3				
3.1	3.1.1	Zain's formula/*Zain se formule*: $T_n = 4(n-1)+2$ $= 4n-4+2$ $= 4n-2$ This is the same as Letti's formula. They are both correct./ *Dit is dieselfde as Lettie se formule. Hulle is albei korrek.*	✓ Method/*Metode* ✓ Answer/*Antwoord* ✓ Reason/*Rede*	(3)
	3.1.2	$T_{27} = 4(27) - 2$ ✓ $= 106$ ✓	✓ Substitution/ *Vervanging* ✓ Answer/*Antwoord*	(2)
3.2	3.2.1	$T_n = 5n - 8$ ✓✓	✓ 5n ✓ – 8	(2)
	3.2.2	The 52th number to end in a 7 will be T_{105}/*Die 52ste getal wat op 'n 7 ending sal* T_{105} *wees.* $T_{105} = 5(105) - 8$ $= 517$ **OR/*OF*** 7 ; 17 ; 27 ; 37 $T_n = 10n - 3$ $T_{52} = 10(52) - 3$ $= 517$ **OR/*OF*** 7 ; 17 ; 27 ; 37 By inspection the 52nd term will be 517 *Deur inspeksie is die* 52ste *term gelyk aan* 517	✓ n=105 ✓ Substitute/*Vervang* ✓ 517 ✓ Tn ✓ Substitute/*Vervang* ✓ 517 ✓ Pattern/*Patroon* ✓✓ 517	(3)
				[10]

QUESTION/*VRAAG* 4				
4.1	4.1.1	$x \in R$	✓ Answer/*Antwoord*	(1)
	4.1.2	$y > -4$ **OR/*OF*** $y \in (-4;\infty)$	✓ Answer/*Antwoord*	(1)
	4.1.3	$y = -3$	✓ Answer/*Antwoord*	(1)
4.2		$f(x) = a^x - 3$ subst/*vervang* $(-2;6)$ $6 = a^{-2} - 3$ $a^{-2} = 9$ $a^{-2} = \frac{1}{9}$ $a = \frac{1}{3} = 3^{-1}$	✓ Substitution/*Vervanging* ✓ $\frac{1}{3} = 3^{-1}$	(2)
4.3		*x*-intercept exponential graph:/*x-afsnit eksponensiële grafiek*: $3^{-x} - 3 = 0$ $3^{-x} = 3$ $x = -1$ **∴ C(− 1 ; 0)** **OR/*OF*** *x*-intercept hyperbola:/*x-afsnit hiperbool*: $\frac{-4}{x} - 4 = 0$ $\frac{-4}{x} = \frac{4}{1}$ **∴ C(− 1 ; 0)** $x = -1$	✓ Let/*Stel* $x = 0$ ✓ *x* value/*x-waarde* ✓ co-ordinate/*koördinaat*	(3)
4.4		$-1 < x < 0$ **OR/*OF*** $x \in (-1;0)$	✓ $x > -1$ ✓ $x < 0$	(2)
4.5	4.5.1	A(–2 ; 6) C(–1 ; 0) $m = \frac{6-0}{-2+1}$ $m = -6$ $y = -6x + c$ subst/*vervang* (–1;0) **OR/*OF*** subst/*vervang* (–2;6) $0 = -6(-1) + c$ $6 = -6(-2) + c$ $c = -6$ $\therefore y = -6x - 6$	✓ subst *into* $m = \frac{y_2 - y_1}{x_2 - x_1}$ *vervang in* $m = \frac{y_2 - y_1}{x_2 - x_1}$ ✓ $m = -6$ ✓ subst *m* and co-ordinate/ *vervang m en koördinaat* ✓ equation/*vergelyking*	(4)
	4.5.2	$y = -x - 4$	✓ $-x$ ✓ -4	(2)

4.6	$g(x) = -\frac{4}{x} - 4$ and/*en* B(x ; 6) $-\frac{4}{x} - 4 = 6$ $-\frac{4}{x} = 10$ $x = -0,4$ AB = 2 − 0,4 = 1,6 units/*eenhede*	✓ Subst y = 6/V*ervang* y = 6 ✓ x value/ *x-waarde* ✓ 1,6	(3)
			[19]
QUESTION/*VRAAG* 5			
5.1		✓ Shape/*Vorm* ✓ x intercepts/ *x-afsnitte* ✓ Turning point/ *Draaipunt*	(3)
5.2	q = –8 Substitute (–4;0) or (4;0) to calculate a *Vervang (–4;0) of (4;0) om a te bereken* $y = ax^2 - 8$ $0 = a(4)^2 - 8$ $16a = 8$ $a = \frac{1}{2}$ $\therefore y = \frac{1}{2}x^2 - 8$	✓Subst coordinate and q = –8/ *Vervang koördinaat en q* = –8 ✓ $a = \frac{1}{2}$ ✓ Equation/ *Vergelyking*	(3)
5.3	$-4 \le x \le 4$ **OR/*OF*** $x \in [-4;4]$	✓ $x \ge -4$ ✓ $x \le 4$	(2)
5.4	$k(x) = -\frac{1}{2}x^2 + 2$	✓ $-\frac{1}{2}x^2$ ✓ +2	(2)
			[10]

QUESTION/*VRAAG* 6			
6.1	A = (1 + *in*) = 7 990(1 + (0,15 × 4)) ✓✓ = 7 990(1,60) = R12 784,00✓ = R12 784,00 ÷ 48 = R 266,33 ✓ Monthly payment including fees/*Maandelikse betalings insluitend fooie* = R266,33 + R13,50 = R 279,83 ✓	✓ Substitution in correct formula/*Vervanging in korrekte formule* ✓ Converting 48 months to 4 years/ *Omskakeling 48 maande tot 4 jaar* ✓ Total amount including interest/ *Totale bedrag insluitend rente* ✓ Monthly repayment/ *Maandelikse terugbetaling* ✓ Total monthly repayment/ *Totale maandeliks terugbetaling*	(5)
6.2	A= P(1+ *i*)^n ✓ = 5000(1 + 0,2)^{31} ✓✓✓ = R 1 424 257,88 ✓	✓ Correct formula/ *Korrekte formule* ✓ 20% to/*na* 0,2 ✓ 60 – 29, n=31 ✓ Substitution/ *Vervanging* ✓ Answer/*Antwoord*	(5)
			[10]

QUESTION/*VRAAG 7*				
7.1	7.1.1	P(A or/*of* B) = 1 – P(A or/*of* B)' = 1 – 0,05 = 0,95	✓ 1 – P(A or/*of* B)' ✓ Answer/*Antwoord*	(2)
	7.1.2	NO/NEE P(A) + P(B) ≠ P(A or/*of* B)	✓ no/*nee* ✓ Justification/ *Regverdiging*	(2)
	7.1.3	P(A or/*of* B) = P(A) + P(B) – P(A and/*en* B) P(A and/*en* B) = 0,25 + 0,89 – 0,95 = 0,19	✓ Formula/*formule* ✓ Answer/*Antwoord*	(2)
	7.1.4	P(B) = 0,89 – 0,19 = 0,6	✓ 0,89 – 0,19 ✓ Answer/*Antwoord*	(2)
7.2	7.2.1	 600 + 950 + 235 – 1 500 = 285	✓ 600 – 285 = 315(ADD) ✓ 950 – 285 = 665 (MULTIPLIER) ✓ 600 + 950 + 235 – 1 500 = 285 ✓ Correct diagram used/ *Korrekte diagram gebruik*	(4)
	7.2.2	$\frac{285}{1500} = \frac{19}{100}$	✓ Answer only/ *Slegs antwoord*	(1)
	7.2.3	$\frac{1500-950}{1500} = \frac{550}{1500}$ $= \frac{11}{30}$ **OR/*OF*** $\frac{315 + 235}{1500} = \frac{550}{1500} = \frac{11}{30}$	✓ $\frac{1500-950}{1500}$ ✓ $\frac{11}{30}$ **OR/*OF*** $\frac{315 + 235}{1500}$	(2)
				[15]
				TOTAL/*TOTAAL* : 100