

MATHEMATICS		GRADE	9
	MARK ALLOCATION	75	TOPIC/CONTENT
			Whole Numbers Integers Exponents Numeric and Geometric Patterns Algebraic Expressions Algebraic Equations Functions and Relationships
TIME ALLOCATION	90 minutes	DATE	

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions:

1. This Controlled Test consists of SIX questions. Answer ALL the questions.
2. Clearly show ALL the calculations, diagrams, tables etc. you have used in determining the answers.
3. An approved calculator may be used, unless stated otherwise.
4. If necessary, ALL answers should be rounded off to TWO decimal places, unless stated otherwise.
5. Number the answers EXACTLY as the questions are numbered in the question paper.
6. Answer your questions in BLUE ink.
7. Write legibly and neatly.

SECTION A

QUESTION 1

1. Various possible options are provided as answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1 to 1.5) in the ANSWER BOOK.

1.1 Which of the following is an irrational number?

A $\frac{3}{4}$

B $\sqrt{2}$

C 0,75

D -5

1.2 Calculate: $-3 - (-7) + 4$

A 8

B 4

C -6

D -8

1.3 Which statement best describes the rule of the pattern?

$$\frac{1}{3}; \frac{4}{3}; \frac{7}{3}; \frac{10}{3}; \dots$$

A Add 2 to the previous term to get the next term

B Add 1 to the previous term to get the next term

C Numerators are odd numbers

D Denominators are equal to 3

1.4 What is the expression $(x - 7)^2$ in simplest form?

A $x^2 - 14x + 49$

B $x^2 - 7x + 49$

C $x^2 + 14x$

D $x^2 + 49$



1.5

What is the value of a in the equation $(3a + 2)(a - 6) = 0$?

- A $a = \frac{2}{3}$ or $a = 6$
 B $a = \frac{2}{3}$ or $a = -6$
 C $a = -\frac{2}{3}$ or $a = -6$
 D $a = -\frac{2}{3}$ or $a = 6$

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SECTION B QUESTION 2



- 2.1 Calculate the LCM of 825 and 990 through prime factorization. (3)
 2.2 A food supply lasts 15 days for 20 people. How long will the same food supply last for 30 people? (2)
 2.3 R6 800 is invested for 6 years and grows in value to R12 500. Calculate the interest rate if interest is compounded annually. (3)

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QUESTION 3

- 3.1 Calculate the following without the use of a calculator. Show all calculations.
- 3.1.1 $-(-5)^2$ (1)
 3.1.2 $\frac{5(2)(4) - 5[2 - 4(2)]}{-5 - 2}$ (3)
 3.1.3 $\frac{\sqrt[3]{125} - \sqrt{9} + 1}{\sqrt{121} - \sqrt{64}}$ (2)
 3.1.4 $\frac{(-4)(-2)}{8} + \frac{(-2)^3}{(-1)^2}$ (3)
- 3.2 Simplify the following, without the use of a calculator. Write the final answer with positive exponents.
- 3.2.1 $(-7pq^5)^2$ (1)
 3.2.2 $(x \times 2x)^3$ (2)

3.2.3 $\frac{-3(a^{-1}b^2)^{-3} \times (ab)^{-5}}{(-3b^{-5})^2}$

(4)

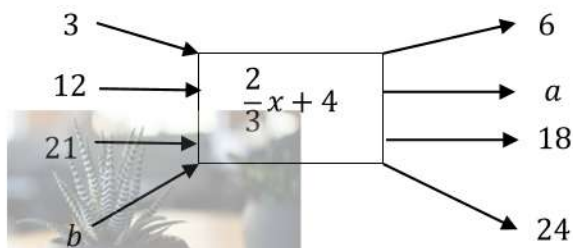
3.2.4 $\left(\frac{x}{y} + \frac{y^2}{x^2}\right)^{-1}$

(3)

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QUESTION 4

4.1 Calculate the value of the unknown numbers in the flow diagram below:



(2)

4.2 Study the following table:

x	-2	-1	0	1	2
y	10	7	4	1	a

Calculate the value of a .

(2)

4.3 Complete the following sequence by filling in the next two terms:

2; 3; 5; 8; 12; 17; ...; ...

(2)

4.4 Consider the following pattern and determine the general rule (n^{th} term).

3; 10; 17; 24; ...; ...

(2)

4.5 Consider the following designs made up of hexagons:



1



2



3

4.5.1 How many hexagons are there in design 5?

(1)

4.5.2 Determine the general term $T_n = \dots$ where, T_n is the number of hexagons in the n^{th} figure.

(2)

4.5.3 Which design will have 450 hexagons?

(2)

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QUESTION 5

5.1 Given the expression $2x^2 - 8xy - 9y^2 - 7$

5.1.1 How many terms are there in the expression? (1)

5.1.2 What is the coefficient of the 3rd term? (1)

5.1.3 Determine the value of the expression if $x = 2$ and $y = -1$. (2)

5.2 Expand and simplify the following expression:

$$\frac{1}{2}(2x + 4)(2x - 4) - (x - 3)^2 \quad (3)$$

5.3 Factorise the following expressions fully.

5.3.1 $x(x - 3) - y(3 - x)$ (2)

5.3.2 $16x^2 - \frac{1}{9}$ (2)

5.3.3 $126 + 36x - 2x^2$ (3)

5.4 Simplify the algebraic fraction.

$$\frac{x^2 - 3x - 18}{x^2 - 6x} \div \frac{6x^2 + 18x}{(-2x)^2} \quad (4)$$

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QUESTION 6

6.1 Solve for x .

6.1.1 $5^x = \frac{1}{125}$ (2)

6.1.2 $3x^3 = 27x$ (4)

6.2 The perimeter of a triangle is 36 cm. The second side is twice the first side, and the third side is 3 cm more than the first side. Find the lengths of the sides. (6)

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MARKING GUIDELINE/ NASIENRIGLYNE	
KWARTAAL/TERM 2	WISKUNDE/MATHEMATICS
GRAAD /GRADE : 9	
MID-YEAR CONTROLLED TEST/ HALFJAARLIKSE KONTROLE TOETS	
ASSESSERINGSTAAK: 4 ASSESSMENT TASK: 4	INHOUD: Telgetalle, Heelgetalle, Eksponente, Numeriese en Meetkundige Patrone, Algebraïese Uitdrukkings, Algebraïese Vergelykings, Funksies en Verwantskappe TOPIC: Whole Numbers, Integers, Exponents, Numeric and Geometric Patterns, Algebraic Expressions Algebraic Equations, Functions and Relationships
PUNTETOEKENNING/ TOTAL MARKS:75	TYDSDUUR/ TIME ALLOCATION: 90 minutes

SOLUTIONS/ANSWERS/ OPLOSSING/ANTWOORD		MARK ALLOCATION/ PUNTE TOEKENNING	Levels /Vlak
QUESTION/VRAAG 1			
1.1	B ✓	✓ answer/ antwoord (1)	K
1.2	A ✓	✓ answer/ antwoord (1)	K
1.3	B ✓	✓ answer/ antwoord (1)	K
1.4	A ✓	✓ answer/ antwoord (1)	K
1.5	D ✓	✓ answer/ antwoord (1)	K
			[5]
QUESTION/VRAAG 2			
2.1	$825 = 3 \times 5^2 \times 11$ $990 = 2 \times 3^2 \times 5 \times 11$ ✓ $LCM/KGV = 2 \times 3^2 \times 5^2 \times 11$ ✓ $= 4\,950$ ✓	✓ prime factorization/ priefaktoriserings ✓ method/ metode ✓ answer/ antwoord (3)	RP
2.2	Let x be the number of days for 30 people/ Laat x die aantal dae vir 30 mense wees $20 \times 15 = 30 \times x$ ✓ $300 = 30x$ $10 = x$ ✓	✓ equation/ vergelyking ✓ answer/ antwoord (2)	RP
2.3	$A = P(1 + i)^n$ $12\,500 = 6\,800 \left(1 + \frac{r}{100}\right)^6$ ✓ $\sqrt[6]{\frac{12\,500}{6\,800}} - 1 = \frac{r}{100}$ ✓	✓ formula + substitution / formule + vervanging	RP

	$r = 10,7\% \text{ p.a/ per jaar } \checkmark$	✓ simplification/ vereenvoudiging ✓ answer/ antwoord (3)	
QUESTION/VRAAG 3			
3.1.1	$\begin{aligned} & -(-5)^2 \\ & = -25 \checkmark \end{aligned}$	✓ answer/ antwoord (1)	K
3.1.2	$\begin{aligned} & \frac{5(2)(4)-5[2-4(2)]}{40-5(-6)} \checkmark \\ & = \frac{-5-2}{-7} \checkmark \\ & = \frac{70}{7} \checkmark \\ & = -10 \checkmark \end{aligned}$	✓✓ simplification/ vereenvoudiging ✓ answer/ antwoord (3)	RP
3.1.3	$\begin{aligned} & \frac{\sqrt[3]{125}-\sqrt{9}+1}{\sqrt{121}-\sqrt{64}} \\ & = \frac{5-3+1}{11-8} \checkmark \\ & = \frac{3}{3} \\ & = 1 \checkmark \end{aligned}$	✓ simplification/ vereenvoudiging ✓ answer/ antwoord (2)	RP
3.1.4	$\begin{aligned} & \frac{(-4)(-2)}{8} + \frac{(-2)^3}{(-1)^2} \\ & = \frac{8}{8} + \frac{-8}{1} \checkmark \\ & = \frac{8+(-64)}{8} \checkmark \\ & = \frac{-56}{8} \\ & = -7 \checkmark \end{aligned}$	✓ simplification/ vereenvoudiging ✓ numerator + denominator/ teller + noemer ✓ answer/ antwoord (3)	RP
3.2.1	$\begin{aligned} & (-7pq^5)^2 \\ & = 49p^2q^{10} \checkmark \end{aligned}$	✓ answer/ antwoord (1)	K
3.2.2	$\begin{aligned} & (x \times 2x)^3 \\ & = (x^3 \times 8x^3) \checkmark \\ & = 8x^6 \checkmark \end{aligned}$ OR/OF $\begin{aligned} & (x \times 2x)^3 \\ & = (2x^2)^3 \checkmark \\ & = 8x^6 \checkmark \end{aligned}$	✓ simplification/ vereenvoudiging ✓ answer/ antwoord (2)	K
3.2.3	$\begin{aligned} & \frac{-3(a^{-1}b^2)^{-3} \times (ab)^{-5}}{(-3b^{-5})^2} \\ & = \frac{-3a^3b^{-6} \times a^{-5}b^{-5}}{9b^{-10}} \checkmark \checkmark \\ & = \frac{-3a^{-2}b^{-11}}{9b^{-10}} \\ & = \frac{-3b^{10}}{9a^2b^{11}} \checkmark \\ & = -\frac{1}{3a^2b} \checkmark \end{aligned}$	✓ numerator/ teller ✓ denominator/ noemer ✓ simplification/ vereenvoudiging ✓ answer/ antwoord (4)	CP

3.2.4	$\left(\frac{x}{y} + \frac{y^2}{x^2}\right)^{-1}$ $= \left(\frac{x^3+y^3}{x^2y}\right)^{-1} \checkmark \checkmark$ $= \frac{x^2y}{x^3+y^3} \checkmark$	$\checkmark x^3 + y^3$ $\checkmark x^2y$ $\checkmark$ answer/ antwoord (3)	CP
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QUESTION/VRAAG 4			
4.1	$a = 12 \checkmark$	$\checkmark$ answer/ antwoord (1)	K
4.1	$b = 30 \checkmark$	$\checkmark$ answer/ antwoord (1)	K
4.2	Constant difference/ Konstante verskil = -3 $T_1 = -3(-2) + 4 = 10$ $T_2 = -3(-1) + 4 = 7$ $T_3 = -3(0) + 4 = 4$ $y = -3x + 4 \checkmark$ $a = -3(2) + 4$ $a = -2 \checkmark$	$\checkmark$ method/ metode $\checkmark -2$ (2)	RP
4.3	2; 3; 5; 8; 12; 17; 23; 30	$\checkmark 23$ $\checkmark 30$ (2)	K
4.4	Constant difference/ Konstante verskil = 7 $T_1 = 7(1) - 4 = 3$ $T_2 = 7(2) - 4 = 10$ $T_3 = 7(3) - 4 = 17$ $T_n = 7n - 4 \checkmark \checkmark$	$\checkmark 7n$ $\checkmark -4$ (2)	RP
4.5.1	15 hexagons/ heksagone (seshoeke) $\checkmark$	$\checkmark$ answer/ antwoord (1)	K
4.5.2	Constant difference/ Konstante verskil = $3 \checkmark$ $\therefore T_n = 3n \checkmark$	$\checkmark$ constant difference/ konstante verskil $\checkmark$ rule/ reël (2)	RP
4.5.3	$3n = 450 \checkmark$ $n = 150 \checkmark$	$\checkmark$ method/ metode $\checkmark$ answer/ antwoord (2)	RP
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QUESTION/ VRAAG 5			
5.1.1	4 ✓	✓ answer/ antwoord (1)	K
5.1.2	-9 ✓	✓ answer/ antwoord (1)	K
5.1.3	$2x^2 - 8xy - 9y^2 - 7$ $= 2(2)^2 - 8(2)(-1) - 9(-1)^2 - 7$ $= 8 + 16 - 9 - 7$ ✓ $= 8$ ✓	✓ substitution + simplification/ vervanging + vereenvoudiging ✓ answer/ antwoord (2)	RP
5.2	$\frac{1}{2}(2x+4)(2x-4) - (x-3)^2$ $= \frac{1}{2}(4x^2 - 16) - (x^2 - 6x + 9)$ ✓ $= 2x^2 - 8 - x^2 + 6x - 9$ ✓ $= x^2 + 6x - 17$ ✓	✓ ✓ simplification/ vereenvoudiging ✓ answer/ antwoord (3)	RP
5.3.1	$x(x-3) - y(3-x)$ $= x(x-3) + y(x-3)$ $= (x-3)(x+y)$ ✓✓	✓ (x-3) ✓ (x+y) (2)	RP
5.3.2	$16x^2 - \frac{1}{9}$ $= (4x - \frac{1}{3})(4x + \frac{1}{3})$ ✓✓	✓✓ one mark for each factor/ een punt vir elke factor (2)	RP
5.3.3	$126 + 36x - 2x^2$ $= -2(x^2 - 18x - 63)$ $= -2(x-21)(x+3)$ ✓✓✓	✓✓ ✓ one mark for each factor/ een punt vir elke factor (3)	RP
5.4	$\frac{x^2-3x-18}{x^2-6x} \div \frac{6x^2+18x}{(-2x)^2}$ $= \frac{x^2-3x-18}{x^2-6x} \times \frac{(-2x)^2}{6x^2+18x}$ ✓ $= \frac{(x-6)(x+3)}{x(x-6)} \times \frac{4x^2}{6x(x+3)}$ ✓ $= \frac{4x^2}{6x^2}$ $= \frac{2}{3}$ ✓	✓ reciprocal/ resiprook ✓✓ simplification/ vereenvoudiging ✓ answer/ antwoord (4)	CP
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QUESTION/ VRAAG 6			
6.1.1	$5^x = \frac{1}{125}$ $5^x = \frac{1}{5^3}$ $5^x = 5^{-3}$ ✓	✓ method/ metode ✓ answer/ antwoord (2)	RP

	$x = -3 \checkmark$		
6.1.2	$3x^3 = 27x$ $x^3 = 9x$ $x^3 - 9x = 0$ $x(x^2 - 9) = 0 \checkmark$ $x(x - 3)(x + 3) = 0$ $x = 0$ or/of $x = 3$ or/of $x = -3 \checkmark \checkmark \checkmark$	$\checkmark$ method/ metode $\checkmark x = 0$ $\checkmark x = 3$ $\checkmark x = -3 \quad (4)$	CP
6.2	Let the length of the first side/ Laat die lengte van die eerste sy = x wees $\therefore 2^{\text{nd/de}}$ side/sy = $2x$ $3^{\text{rd/rde}}$ side/sy = $x + 3 \checkmark$ $x + 2x + x + 3 = 36 \checkmark \checkmark$ $4x = 33$ $x = 8,25$ $1^{\text{st/ste}}$ side/sy = $8,25 \text{ cm} \checkmark$ $2^{\text{nd/de}}$ side/sy = $2(8,25) = 16,5 \text{ cm} \checkmark$ $3^{\text{rd/rde}}$ side/sy = $(8,25) + 3 = 11,25 \text{ cm} \checkmark$	$\checkmark$ method/ metode $\checkmark \checkmark$ equation/ vergelyking $\checkmark$ side/sy 1 $\checkmark$ side/sy 2 $\checkmark$ side/sy 3 (6)	PS
			[12]