higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

MATHEMATICS

(First paper)

NQF LEVEL 2

(10501042)

16 February 2024 (X-paper)
09:00–12:00

Scientific calculators may be used.

This question paper consists of 8 pages, 1 formula sheet and 1 answer sheet.

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)
MATHEMATICS
NQF LEVEL 2
PAPER 1
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Show all calculations and the intermediary steps. Simplify answers where possible.
5. Questions may be answered in any sequence. Subsections of questions may not be separated.
6. All final answers must be approximated accurately to TWO decimals.
7. The formula sheet is not necessarily complete. Any other applicable formulae may be used.
8. Diagrams are not drawn to scale
9. Use only a black or blue pen.
10. Write neatly and legibly.

QUESTION 1

1.1 Convert the following decimal fraction to the form $\frac{a}{b}$; where a; bϵ Z and $b \neq 0$. Express your answer in its simplest form.

1.1.1 $0{,}032$ (2)

1.1.2 $32.\dot{4}3\dot{5}$ (3)

1.2 Simplify the following using the laws of exponents: (Leave the final answer with positive exponents and in surd form where applicable.)

1.2.1 $$\frac{\sqrt{16p^4} \times (p^4q^4)^0}{(2p)^2}$$

1.2.2 $$\frac{(p^2q^2)^{2r} \times (pq^3)^{3r}}{(p^3q^3)^{2r}}$$

(2 × 3) (6)

1.3 Simplify the following using surd laws:

$$\frac{-\sqrt{125} + 6\sqrt{80} + \sqrt{20}}{21\sqrt{5}}$$ (4)

1.4 Simplify the following expression by rationalising the denominator:

$$\frac{7}{1-\sqrt{8}}$$ (4)

1.5 Given : $S = \frac{r}{2}(a + b)$

1.5.1 For the given equation, make b the subject of the formula. (3)

1.5.2 Calculate the value of 'b' if $S = 10, a = 2$ and $r = 12$. (2)

1.6 Calculate the first term and the 12th term of an arithmetic sequence if the 6th term is 38 and the constant difference is 3. (6)

[30]

QUESTION 2

2.1 Given: $y = 12 - 3x^2$

Determine the following:

2.1.1 The x –intercepts (3)

2.1.2 The y–intercept (2)

2.1.3 The axis of symmetry (2)

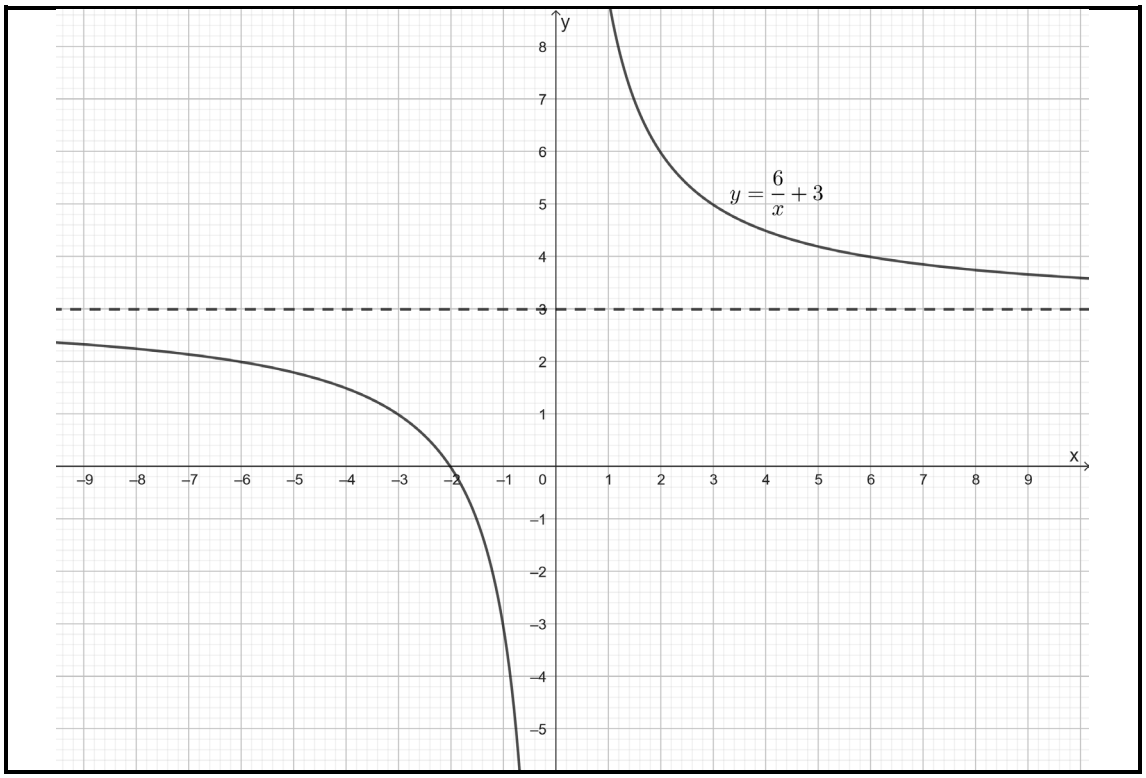
2.1.4 The turning point (2)

2.1.5 The range of the graph (1)

2.1.6 The domain of the graph (1)

2.1.7 Sketch the graph of $y = 4 - 3x^2$ in the ANSWER SHEET (attached). (3)

2.2 Given below is the graph of $f(x) = \frac{6}{x} + 3$. Study the graph and answer the questions.



2.2.1 Give the mathematical name of the graph. (1)

2.2.2 Write down the domain and range of this graph. (2)

2.2.3 Is the graph continuous or discontinuous? Substantiate your answer. (2)

2.2.4 Is the graph a function or a relation? Substantiate your answer. (2)

2.3 Use the attached ANSWER SHEET to sketch the graph of $y = 3^x - 5$ (4)
[25]

QUESTION 3

3.1 Factorise the following:

3.1.1 $9a^2 - b^2$ (2)

3.1.2 $-a^2 - a - 2$ (3)

3.1.3 $2ab - 2a^2 + a - b$ (3)

3.2 Simplify the following:

3.2.1 $\dfrac{4p^2 + 4p}{4p} \times \dfrac{p-1}{1}$

3.2.2 $(-2x + 3)(x^2 + 3x - 8)$ (2×3) (6)

3.3 Solve for x in the following equation:

$$4.3^{x-3} = 108$$ (3)

3.4 Solve the following inequality and represent the solution on a number line.

$$4(x + 1) \leq 3x + 8$$ (4)

3.5 Solve the following simultaneous linear equations algebraically:

$$y = -2x + 4 \quad \textit{and} \quad y = 2x + 8$$ (4)
[25]

QUESTION 4

4.1 Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A–H) next to the question number (4.1.1–4.1.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
4.1.1	An account opened at a bank into which money can be paid (e.g. a salary) and withdrawn at a counter or from an automatic teller machine (ATM)	A	unit trust
		B	short-term investment
		C	debit card
4.1.2	Money invested in a bank for a specific period at a fixed rate of interest	D	fixed deposit
		E	bank fees
4.1.3	A form of collective investment constituted under a trust. It is a medium to long-term investment that is aimed at beating inflation. It allows one, along with other investors, to pool funds in different investment options	F	credit card
		G	long-term investment
		H	savings account
4.1.4	An investment where the benefits can be used after a short term, for example one year		
4.1.5	A bank card that is used to regulate transactions from a bank account containing money to spend		

(5 × 1) (5)

4.2 Sipho's family drew up the following monthly budget for 2023:

INCOME		EXPENDITURE	
Father's salary	R7 150	Bond instalment	R2 700
Mother's salary	C	Car instalment	R1 950
Interest on investment	R534	Water and Electricity	A
		Cell phones	R400
		Food/entertainment	R3 000
		Clothes	R1 200
		Petrol and vehicle maintenance	R1500
		Insurance	R392
		School fees	B
		Tithes	R 715
		Total expenditure	R12 184

4.2.1 The family's expenditure on water and electricity was R180 per month, during the previous year, but they want to budget for an increase of 15%. Calculate the new amount after the 15% increase for water and electricity (A) (2)

4.2.2 School fees are R60 per month per learner. The family has two children in school, and they pay school fees monthly. Calculate the total monthly school fees (B). (1)

4.2.3 Calculate Sipho's mother's monthly salary (C) if the family has a surplus of R 1550 at the end of the month. (2)

4.3 Thandi decides to buy a dishwasher based upon the advertisement below:

Thandi decides to buy the dishwasher using the instalment option.

4.3.1 Calculate the balance owing after paying the deposit? (2)

4.3.2 Calculate the total amount that will be paid if Thandi opts for the hire-purchase option. (3)

4.4 Boikgantsho and Bokamoso are the twin sons of Mr Madigoe. Their father gave each of them R2 500 to invest. Boikgantsho decided to invest the money at 12% simple interest per annum for five years and Bokamoso invested the same amount at 10% compound interest per annum for five years.

Calculate:

4.4.1 The total amount Boikgantsho will receive after five years (2)

4.4.2 The total amount Bokamoso will receive after five years (2)

4.4.3 Explain which is the better investment and give a reason why. (1)
[20]

TOTAL: 100

FORMULA SHEET

1. $a^m \times a^n = a^{m+n}$
2. $a^m \div a^n = a^{m-n}$
3. $(a^m)^n = a^{m \times n}$
4. $(a^m b^n)^p = a^{mp}.b^{np}$
5. $\left(\frac{a^m}{b^n}\right)^p = \frac{a^{mp}}{b^{np}}$
6. $a^{-n} = \frac{1}{a^n}$
7. $a^{\,0} = 1$
8. $\sqrt[n]{a^m} = a^{\frac{m}{n}}$
9. $T_n = a + (n-1)d$
10. $S_n = \frac{n}{2}[2a + (n-1)d]$
11. $S_n = \frac{n}{2}[2a + (n-1)d]$
12. $I = \frac{Prt}{100} \quad or \quad A_t = P(1 + in)$
13. $A_t = Ao(1 + \frac{r}{100 \times m})^{tm} \quad or \quad A_t = P(1+i)^n$
14. $i = \frac{r}{100}$

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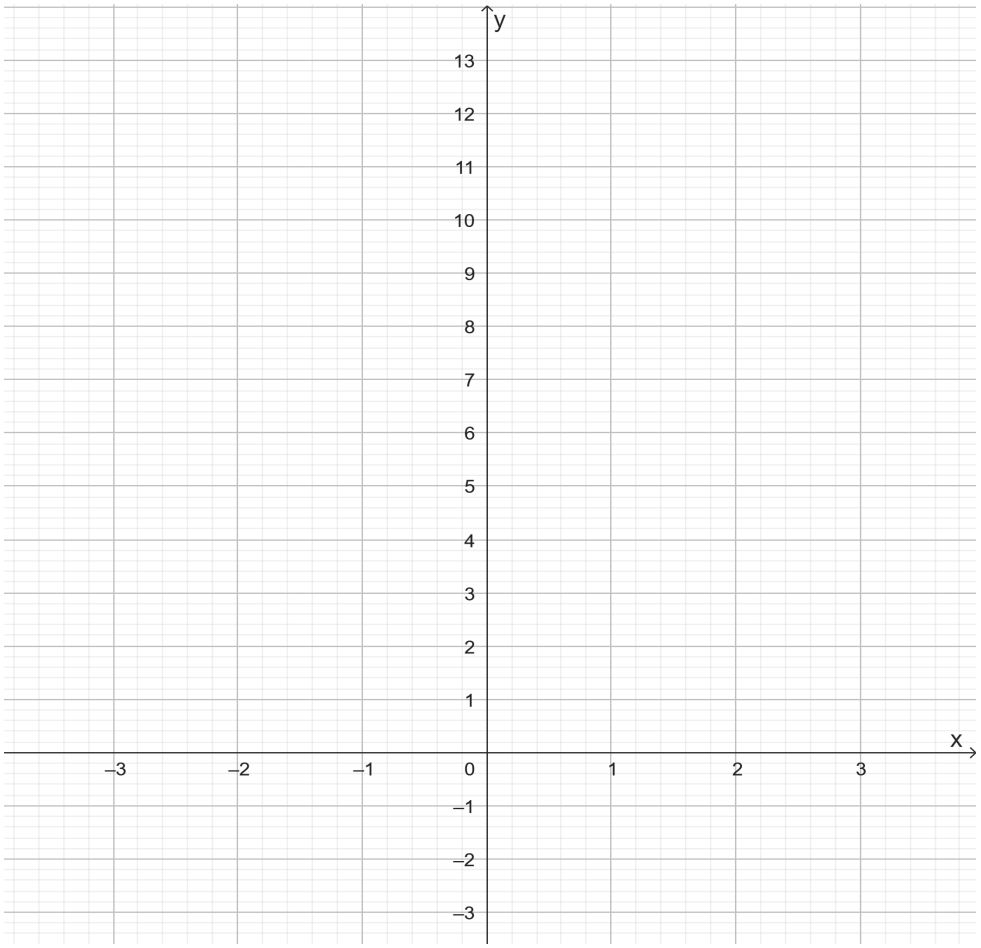
ANSWER SHEET

2.1.7



2.3