higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

MATHEMATICS
(First Paper)
NQF LEVEL 2

NOVEMBER EXAMINATION

(10501042)

28 October 2013 (X-Paper)
09:00–12:00

A non-programmable scientific calculator may be used.
Requirements: Graph Paper

This question paper consists of 6 pages, 1 formula sheet and 1 annexure.

Please turn over

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 the calculations, diagrams, GRAPHS, etc which you have used in determining the answers. 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 THREE decimal places.
7. The list on the FORMULA SHEET is NOT necessarily complete. Any other applicable formulae may be used.
8. Diagrams are NOT drawn to scale.
9. Write neatly and legibly.

Please turn over

QUESTION 1

1.1 Convert the following decimal fractions to the form $\frac{a}{b}$; a, b ε z and b ≠ 0, and express the answers in their simplest form:

1.1.1 $0,1\dot{2}$ (Show all calculations) (3)

1.1.2 3,54 (1)

1.2 Simplify the following by using the laws of exponents (Leave answers with positive exponents and in surds form where applicable.):

1.2.1 $\sqrt[4]{x^{-2}y^{-4}}$ (3)

1.2.2 $\frac{15^{n+1} \times 75^{-n}}{25^{1-n} \times 3}$ (4)

1.2.3 $\frac{\sqrt{75}+\sqrt{3}+\sqrt{12}}{\sqrt{27}}$ (3)

1.3 Rationalise the denominator of the following:

$\frac{4\sqrt{7}}{3\sqrt{5}}$ (3)

1.4 The formula $R = \sqrt{\frac{3h}{2}}$ is given:

1.4.1 Make h the subject of the formula. (3)

1.4.2 Determine the value of h if $R = 9$. (1)

1.5 Given the series: 5; -3; -11; …

1.5.1 Determine the 11^{th} term of the arithmetic progression. (2)

1.5.2 Determine the sum of the first NINE terms. (3)

1.6 The 10^{th} term and 22^{nd} term of an arithmetic sequence are 24 and 96 respectively. Calculate the first THREE terms. (5)

[31]

QUESTION 2

2.1 Given: $xy = -4$

2.1.1 Give the mathematical name of the GRAPH. (1)

2.1.2 In which quadrant(s) will the above graph lie? (2)

2.1.3 Is the above graph continuous at $x = 0$? (1)

2.1.4 Determine the domain of the graph. (1)

2.1.5 Determine the range of the graph. (1)

2.1.6 Draw the graph. (3)

2.2 Copy and complete the following TABLE in the ANSWER BOOK for the function: $y = 3^{-x}$:

x	-2	-1	0	1	2
$y = 3^{-x}$	(i)	(ii)	1	(iii)	(iv)

(2)

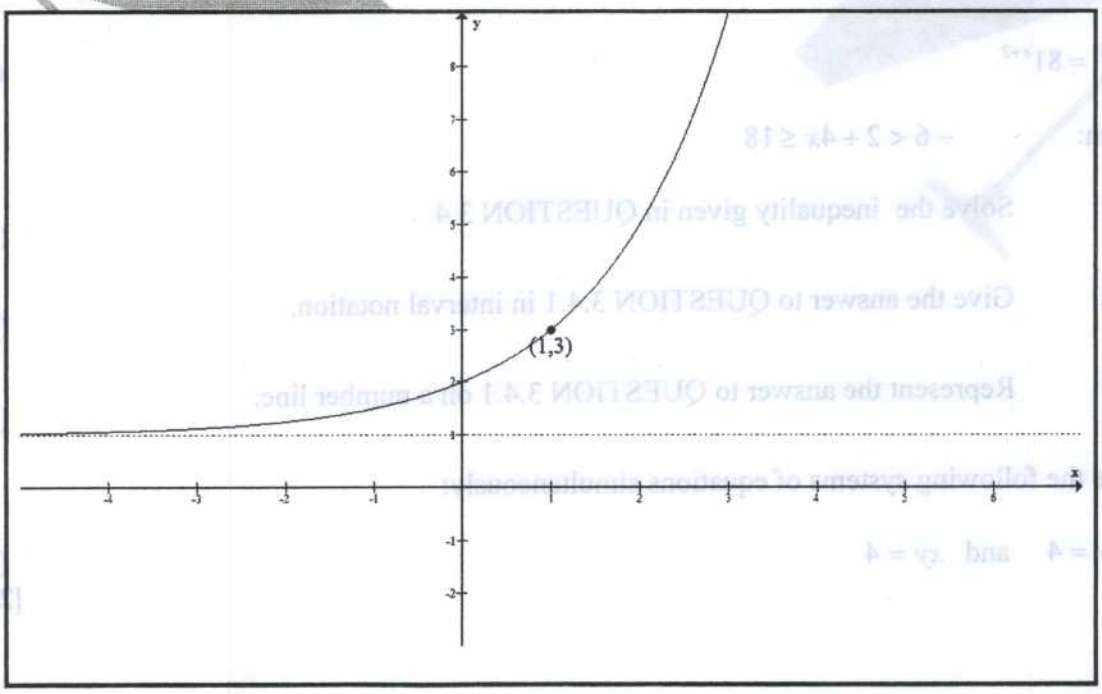
2.3 2.3.1 Use the above TABLE in QUESTION 2.2 to sketch the graph of $y = 3^{-x}$

N.B. Use the following scale: 1 cm = 1 unit on both axes. (3)

2.3.2 Refer to the GRAPH and write down the y-intercept. (1)

2.3.3 Is the graph a function? (1)

2.4 Given below is the GRAPH of $f(x)$:



2.4.1 Determine the equation of the graph shown in QUESTION 2.4 (3)

2.4.2 Give the name of the graph. (1)

2.5 2.5.1 Sketch the GRAPH of $f(x): \frac{x}{2}+\frac{y}{3}=1$ and $g(x)=-x^2$ on the same system of axes showing ALL intercepts with the axes (4)

2.5.2 Give the mathematical name of the graph of $f(x)$. (1)

2.5.3 Are the TWO graphs continuous or discontinuous? (1)

[26]

QUESTION 3

3.1 Factorise the following:

3.1.1 $y-2+4x-2xy$ (3)

3.1.2 $12y^3+14y^2-40y$ (3)

3.1.3 $4x^2-9$ (2)

3.2 Simplify the following:

3.2.1 $3xy-3x-2yx+6xy-xy+2x$ (2)

3.2.2 $(1-x)(x^2-x-2)$ (3)

3.3 Solve for x:

$9^{3x+2}=81^{x+2}$ (3)

3.4 Given: $-6<2+4x\leq 18$

3.4.1 Solve the inequality given in QUESTION 3.4 (2)

3.4.2 Give the answer to QUESTION 3.4.1 in interval notation. (1)

3.4.3 Represent the answer to QUESTION 3.4.1 on a number line. (1)

3.5 Solve the following systems of equations simultaneously:

$x+y=4$ and $xy=4$ (4)

[24]

ANNEXURE 1: ANSWER SHEET TO QUESTION 4.3

EXAMINATION NUMBER

Detach ANNEXURE 1 and hand it in with your ANSWER BOOK.

PRETTY'S INCOME AND EXPENDITURE STATEMENT	
INCOME	**AMOUNT**
Total income	
EXPENDITURE	**AMOUNT**
Total expenditure	
SURPLUS/DEFICIT	

(9)

QUESTION 4

4.1 Define the following terms:

4.1.1 Principal amount (1)

4.1.2 Variance (1)

4.1.3 Fixed expense (1)

4.1.4 Income (1)

4.1.5 Short-term investment (1)

4.2 A Sony PS2 which normally costs R1 799 can be bought through hire purchase with a deposit of R250 at 15% simple interest p.a. The balance is to be paid in 24 monthly instalments.

4.2.1 Calculate the amount of each monthly instalment. (3)

4.2.2 Calculate the extra cost of buying the SONY on a hire purchase agreement. (2)

4.3 Pretty is part of a netball team. The team is planning to go on a tour. Each person who wants to go on the tour must pay R500,00. This is to pay for petrol, food and accommodation. Pretty knows that her parents will not be able to give her R500,00 at such short notice. She sits down to draw up an income and expenditure statement.

Use the information below to complete her income and expenditure sheet:

Refer to ANNEXURE 1 to answer QUESTION 4.3

Pocket money = R75,00
Part-time work at the supermarket = R50 per day × 8 days
Prepaid airtime = R110,00
Shampoo = R28,00
Deodorant = R15,00
Sweets and movies = R100,00
Donation at the church = R40,00 (9)

[19]

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) $S_n = \frac{n}{2}(a + l)$

12) $I = A_0 \times \frac{r}{100} \times t$ or $I = \frac{Prt}{100}$ or $A_t = P(1 + in)$

13) $A_t = A_o(1 + \frac{r}{100 \times m})^{t \times m}$ or $A_t = P(1 + i)^n$

14) $i = \frac{r}{100}$