higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE (VOCATIONAL)

MATHEMATICS
(First Paper)
NQF LEVEL 2

NOVEMBER 2011

(10501042)

7 November (X-Paper)
09:00 – 12:00

REQUIREMENTS: **Scientific calculator**
Graph paper

This question paper consists of 7 pages, a 1 page formula sheet and 1 annexure.

TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etc, which you have used in determining the answers.
5. If necessary, answers should be rounded off to THREE decimal places, unless stated otherwise.
6. Diagrams are NOT drawn to scale

QUESTION 1

1.1 Convert the following decimal fractions to the form $\frac{a}{b}$; $a;b \in Z$; $b \neq 0$. Leave answers in their simplest form.

1.1.1 $0,22$ (1)

1.1.2 $0,2\dot{6}$ (3)

1.2 Rationalize the denominator of the following:

$$\frac{3}{\sqrt{7}-2}$$ (3)

1.3 Simplify the following. (Leave answers with positive exponents and in surd form where applicable).

1.3.1 $4x^3y^2 \times 2x^2y^2 \times \frac{1}{4}xy$ (3)

1.3.2 $$\frac{(2xy^2)^3 \times (4x^3y)^2}{4^2x^{10}y^2 \times 2x^4y^4}$$ (3)

1.3.3 $$\frac{x^{\frac{1}{2}} \times \sqrt[4]{y^3} \times (xy)^{\frac{1}{4}}}{(x^3)^{\frac{1}{4}}}$$ (4)

1.4 Prove that $\sqrt{\frac{\sqrt{27}+\sqrt{48}+\sqrt{75}}{3\sqrt{3}}} = 2$ (3)

1.5 The formula for the area of a ring is given as $A = \pi(R^2 - r^2)$.

1.5.1 Make R the subject of the formula for the given equation. (3)

1.5.2 Determine the value of R if $A = 120\,mm^2$ and $r = 10\,mm$ (2)

1.6 During her June holidays Karen plays a Playstation game. She has no memory card and has to start the game from the beginning each time she plays. At the end of the first day she reaches stage 5 of the game. After restarting the game on the second day she reaches stage 9. At the end of the third day she reaches stage 13 and at the end of the fourth day she reaches stage 17.

1.6.1 If she continues in this sequence what stage would she reach at the end of the 22^{nd} day? (2)

1.6.2 If the game has 102 stages, on which day will she complete the game? (3)

1.6.3 If Karen spends 5 minutes of the first day reading and increases her reading time by 3 minutes each day. How many minutes would she spend on reading if her holidays add up to 36 days. (3)

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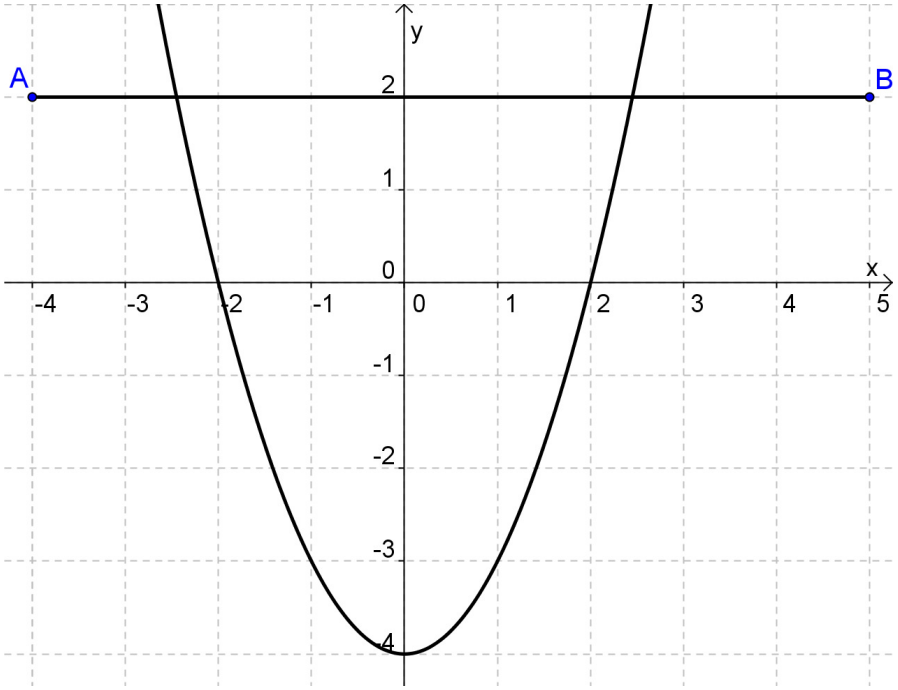
QUESTION 2

2.1 Given:



2.1.1 Write down the co-ordinates of point A. (1)

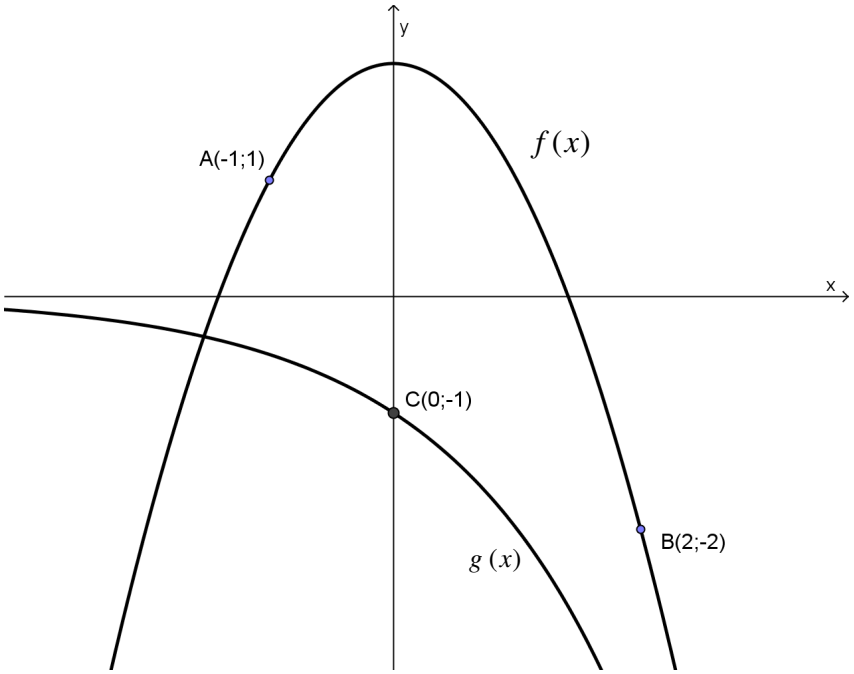
2.1.2 Determine the equation of line AB. (1)

2.1.3 Write down the domain of line AB. (1)

2.1.4 Determine the range for the parabola $f(x)$. (1)

2.1.5 Determine the domain for the parabola $f(x)$. (1)

2.2 Given below are the graphs of $f(x)$ and $g(x)$ drawn on one set of axes. Study the graphs and answer the questions that follow.



2.2.1 Write down the mathematical names given to the graphs of $f(x)$ and $g(x)$. (2)

2.2.2 Is the graph $f(x)$ a function or a non function? (1)

2.2.3 Is the graph $g(x)$ continuous or discontinuous? (1)

2.2.4 Write down the equation for the asymptote for the graph of $g(x)$. (1)

2.2.5 Determine the equation of the graph of $f(x)$. (5)

2.3 Use ANNEXURE A to answer the following:

2.3.1 Sketch the graphs of $f(x) = x^2 + 1$ and $g(x) = x + 3$ on the same system of axes showing all intercepts with the axes. (3)

2.3.2 Determine algebraically the intersections of the graphs of $f(x) = x^2 + 1$ and $g(x) = x + 3$. (3)

2.3.3 Use the graph in QUESTION 2.3.1 to read off the value(s) of x for which $g(x) > f(x)$ (2)

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QUESTION 3

3.1 Simplify the following:

3.1.1 $(x+2)(x-3)$ (2)

3.1.2 $(2x-4)^2+2(3x+3)$ (3)

3.2 Factorise the following:

3.2.1 $6x^2yz+78x^2y^2z-36x^2yz^2$ (4)

3.2.2 $20x^2y^3+15xy^3-6p^2-8xp^2$ (3)

3.2.3 x^4-1 (3)

3.2.4 $2y^2-y-21$ (2)

3.3 Solve for x in the following equations:

3.3.1 $2x+4=-3(x+2)$ (4)

3.3.2 $x^{\frac{3}{4}}=8$ (3)

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QUESTION 4

4.1 Define the following terms:

4.1.1 Variance (2)

4.1.2 Stokvels (2)

4.1.3 Mashonisa (2)

4.1.4 Fixed deposits (2)

4.1.5 Budget (2)

4.2 Constance want to buy the following television set from her local furniture shop. Constance does not have the cash to buy this television set but she has three options available to her.

OPTION A: She can choose to enter into a hire purchase agreement with the furniture shop and pay R 500 for 24 months with no deposit required.

OPTION B: She can borrow the money from her local bank which charges her 16 % simple interest per annum for a period of 2 years

OPTION C : She can borrow the money from a micro lender and pay back 18% compound interest per annum for a period of 2 years .

4.2.1 What is the cash price for the television (1)

4.2.2 How much would Constance pay after 24 months if she chooses Option A. (2)

4.2.3 How much would she pay back per month if she chooses Option B? (3)

4.2.4 How much would she pay back per month if she chooses Option C? (3)

4.2.5 Which of the three options would be the best one for Constance? (1)
[20]

TOTAL: 100

Formulae 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 $I = \frac{P\,r\,t}{100}$ or $A_t = P(1 + i\,n)$

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

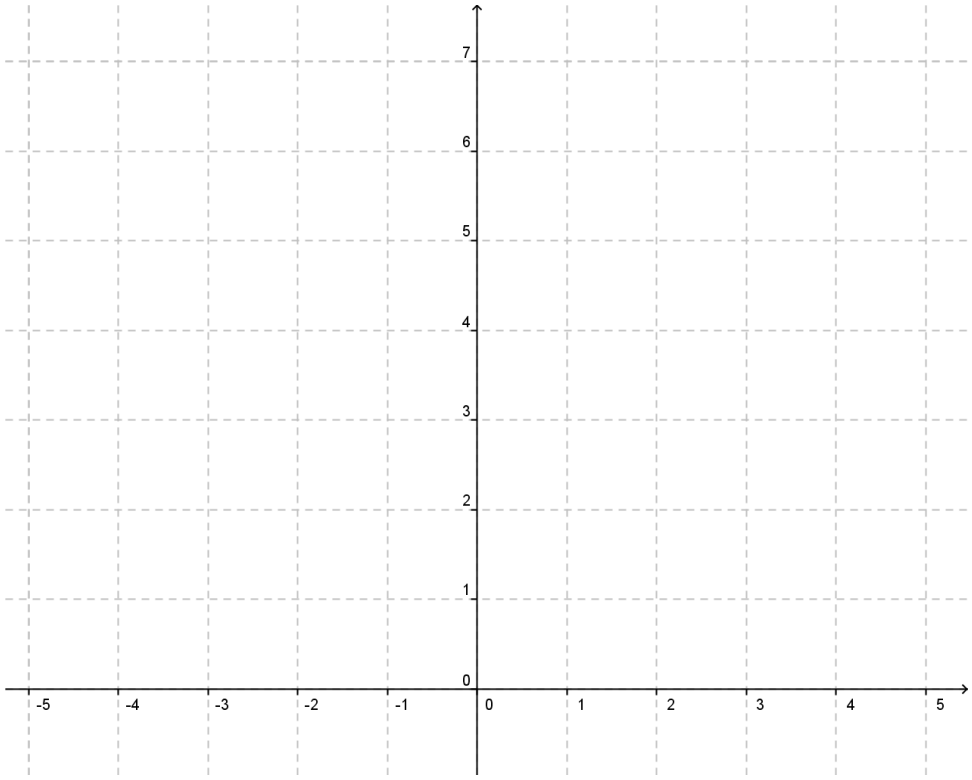
14) $i = \frac{r}{100}$

ANSWER SHEET **EXAMINATION NUMBER:**

ANNEXURE A

Detach Annexure A and hand it in with your answer booklet.

2.3 2.3.1



(3)

2.3.2

(3)

2.3.3

(2)