



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2013

MATHEMATICS P1

MARKS: 150

TIME: 3 hours

This question paper consists of 9 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 12 questions.
2. Answer ALL questions.
3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. An approved scientific calculator (non-programmable and non-graphical may be used), unless stated otherwise.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper.
9. A diagram sheet is supplied for QUESTION 8.4 and QUESTION 8.9. Write your name in the space provided and then hand the diagram sheet in with your ANSWER SHEET.
10. Write legibly and present your work neatly.

QUESTION 11.1 Solve for x :

$$x = \frac{5}{3x - 2} \quad (3)$$

1.2 1.2.1 Write down, without any deduction, the roots of:

$$ax^2 + bx + c = 0 \quad (1)$$

1.2.2 Hence solve for x correct to TWO decimal places:

$$x(3x + 13) = 11 \quad (4)$$

1.3 Simplify without using a calculator:

$$1.3.1 \quad (81x^{-4})^{\frac{3}{4}} \quad (2)$$

$$1.3.2 \quad 4(3 - \sqrt{5})(3 + \sqrt{5}) \quad (2)$$

[12]**QUESTION 2**2.1 Consider the equation: $\frac{4x^2+2x+1}{4x^2-2x+1} = k$

2.1.1 Rewrite the equation as a quadratic equation in the form:

$$ax^2 + bx + c = 0 \quad (3)$$

2.1.2 If the roots of the equation in QUESTION 2.1 are real, show that

$$\frac{1}{3} \leq k \leq 3. \quad (5)$$

2.2 If $\sqrt{2} = a$ and $\sqrt{3} = b$, express the following in terms of a and b : $\sqrt{108} - \sqrt{18}$. (2)

2.3 Simplify:

$$\frac{3^{x+3} \cdot 12^{x-3}}{2^{2x-6} \cdot 9^x} \quad (3)$$

2.4 Solve for x :

$$(x + 1)(2x - 3) > 3 \quad (4)$$

2.5 Solve for x and y simultaneously.

$$2x - y = 3 \text{ and } 27^{\frac{x}{3}} = 3^{y-1} \quad (6)$$

[23]

QUESTION 3

3.1 Given the equation $y = \frac{\sqrt{x}}{3-x}$

3.1.1 Determine the value of x for which y is undefined. (2)

3.1.2 For which values of x is y real? (2)

3.2 Given: $\sqrt{5-2x} = \frac{x}{2} + 4$

3.2.1 Without solving the equation, show that the solution to the above equation lies in the interval $-8 \leq x \leq \frac{5}{2}$. (5)

3.2.2 Solve the equation and determine the exact value(s) of x . (5)

[14]

QUESTION 4

4.1 A company bought machinery valued at R15 000. The depreciation is calculated at a rate of 12% per annum on a straight-line basis. Calculate the value of the machinery at the end of six years. (3)

4.2 R2 500 is deposited into a savings account at 15% interest per annum compounded monthly.

4.2.1 What is the monthly nominal interest rate? (1)

4.2.2 Determine the effective yearly interest rate, correct to one decimal place. (4)

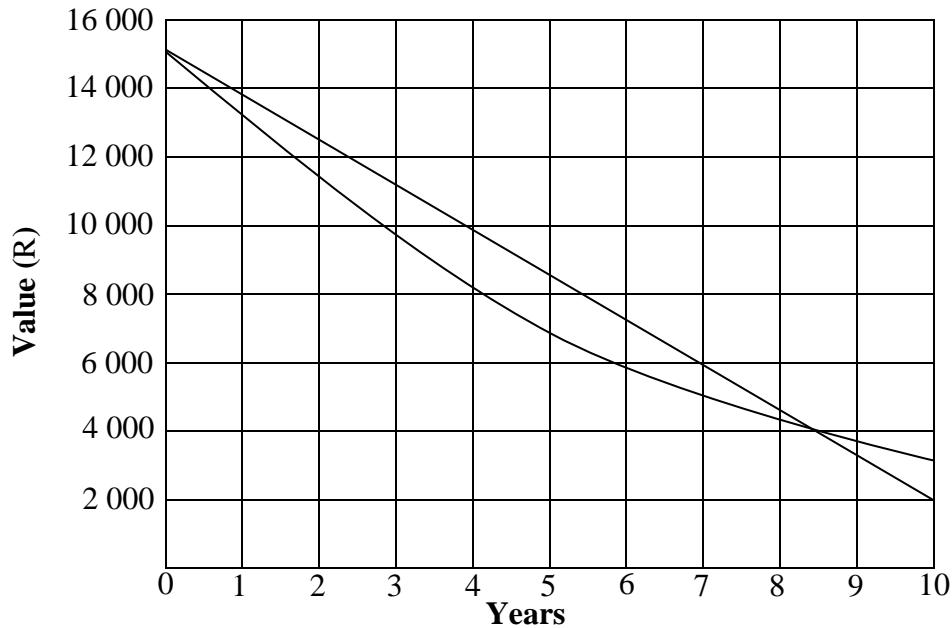
4.2.3 Calculate the amount of money in the savings account at the end of seven years. (3)

4.3 Deneo takes out a loan of R550 000 in order to finance her new business. After four years she expands and borrows a further R560 000. Three years after this she pays off the total debt in one payment. The interest rate of the loan was 18% per annum compounded quarterly. Determine how much she owed. (5)

[16]

QUESTION 5

The graph shows the depreciated value of a laptop using the straight-line and the reducing balance methods of depreciation.



- 5.1 What is the depreciated value of the laptop when the straight-line depreciated value equals the reducing balance depreciated value? (1)
 - 5.2 Use the graph to estimate the annual straight-line depreciation interest rate that has been used. (2)
 - 5.3 Use the graph to estimate the annual reducing depreciation interest rate that has been used. (2)
- [5]

QUESTION 6

Consider the following shapes created with black and white tiles:



FIGURE 1

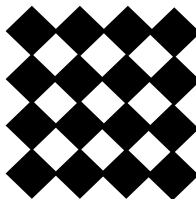


FIGURE 2

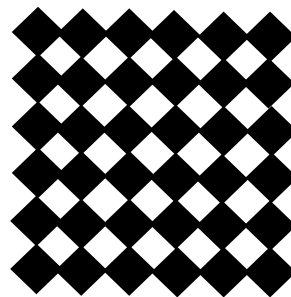


FIGURE 3

- 6.1 Complete the table:

Figure number	1	2	3	4		11
Number of shaded tiles	4		36		144	
No of white tiles	1	9		49		
Total number of tiles	5		61	113		

(5)

- 6.2 Hence determine a formula for the total number of tiles in the n^{th} figure. (3)

[8]

QUESTION 7

The number pattern 1, 5, 11, 19, ... is such that the second difference is constant.

- 7.1 Determine the 5th number in the pattern. (1)
- 7.2 Derive a formula for the n^{th} number in the pattern. (7)
- 7.3 What is the 100th number in the pattern? (3)
- [11]**

QUESTION 8

Given $f(x) = 2 \cdot 3^x - 1$ and $g(x) = \frac{4}{x+3}$

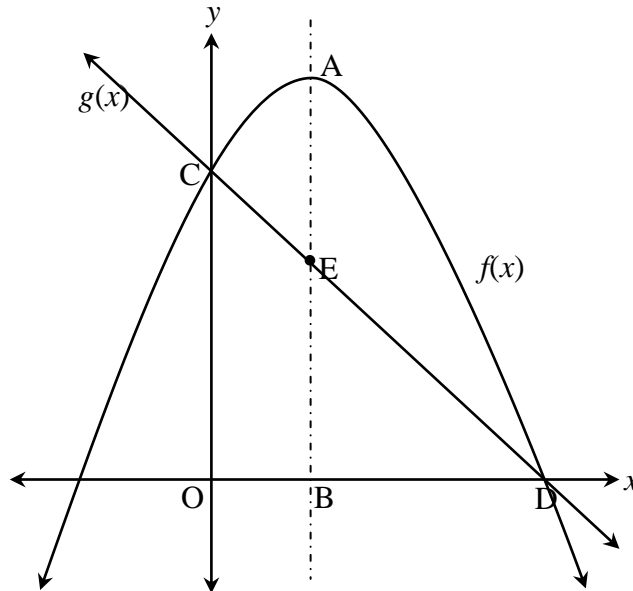
- 8.1 Write down the equation of the asymptote of f . (1)
- 8.2 Determine the y -intercept of f . (Give your answer in co-ordinate form) (2)
- 8.3 Find ONE other point on the graph of f . (2)
- 8.4 Sketch the graph of f . (3)
- 8.5 What is the range of f ? (1)
- 8.6 Write down the equations of the asymptotes of g . (2)
- 8.7 Determine the y -intercept of g . (2)
- 8.8 Write down the equation of the axis of symmetry of g . (2)
- 8.9 Sketch the graph of g on its own set of axes. (4)
- 8.10 Determine the average gradient of g between the points $x = -2$ and $x = 1$. (3)
- [22]**

QUESTION 9

9.1 9.1.1 Find the equation of the parabola that cuts the x-axis at -2 and 3, and the y-axis at the point, (0 ; -12). (4)

9.1.2 Write your answer in QUESTION 9.1.1 in the form $y = a(x - p)^2 + q$. (3)

9.2 In the diagram below, $f(x) = -x^2 + x + 12$ and $g(x) = mx + c$



9.2.1 Determine the coordinates of C and D. (3)

9.2.2 Determine the values of m and c and hence determine the equation of $g(x)$. (2)

9.2.3 If $OB = \frac{1}{2}$, find the length of AE. (3)

9.2.4 For which values of x is $f(x)$ decreasing? (1)

9.2.5 Write down the range of $f(x)$. (1)

[17]

QUESTION 10

10.1 Give the equation of the quadratic function if it is given that:

- The range of f is: $y \geq -4$
- Domain: $x \in \mathbb{R}$
- Zero points are (3 ; 0), (-1 ; 0) and (0 ; -3)

(3)

[3]

QUESTION 11

- 11.1 The *Titanic* sank in 1912 without enough life boats for the passengers and crew. The contingency table below provides data on the passengers who were on board during the disaster. Use the information and determine, with reasons, whether the events $M = \{\text{a passenger was male}\}$ and $N = \{\text{a passenger did not survive}\}$ are dependent or independent.

Titanic survival data

Gender			
	Male	Female	Total
Yes	367	344	711
No	1 364	126	1 490
Total	1 731	470	2 201

(4)
[4]

QUESTION 12

- 12.1 It is given that A and B are independent events. $P(A) = 0,4$ and $P(B) = 0,5$.

Use a Venn diagram and calculate:

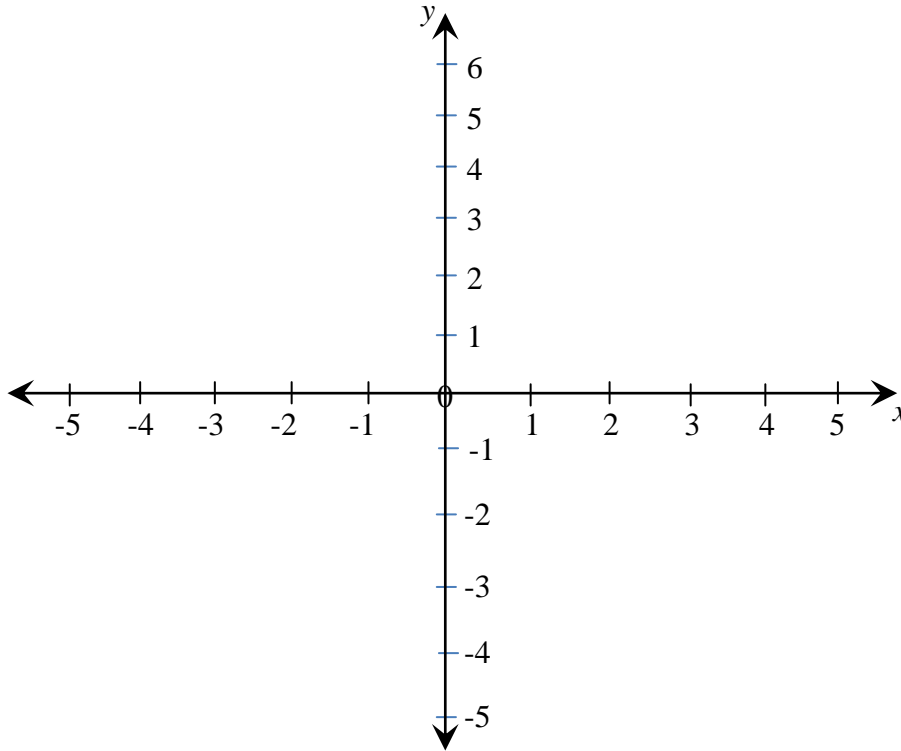
- 12.1.1 $P(A \text{ or } B)$ (4)
- 12.1.2 $P(\text{neither } A \text{ or } B)$ (1)
- 12.2 During a survey, 25 out of the 40 learners in a class indicated that they own a cellphone. Two learners are selected at random from the class, the first not being replaced before the second one is selected.
- 12.2.1 Draw a tree diagram that shows the possible outcomes of the situation. Write the probabilities on the relevant branches. (7)
- 12.2.2 What is the probability that of the two learners selected, one will own a cellphone and the other one not? (3)

[15]

TOTAL: 150

NAME/NAAM:

QUESTION/VRAAG 8.4



QUESTION/VRAAG 8.9

