



# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 11**

**MATHEMATICS P1**

**NOVEMBER 2017**

**MARKS: 150**

**TIME: 3 hours**

**This question paper consists of 7 pages.**



**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. This question paper consists of NINE questions.
2. Answer ALL the questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs et cetera that you have used in determining the answers.
5. Answers only will not necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. Round off answers to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. Write neatly and legibly.



**QUESTION 1**1.1 Solve for  $x$  :

1.1.1  $(2x - 3)(x + 7) = 0$  (2)

1.1.2  $7x^2 + 3x - 2 = 0$  (leave your answer correct to TWO decimal places) (3)

1.1.3  $\sqrt{x-1} + 3 = x$  (6)

1.1.4  $x^2 > 3(x + 6)$  (4)

1.2 Solve for  $x$  and  $y$  simultaneously:

$2y + x = 1$

$x^2 + y^2 + 3xy + y = 0$  (6)

1.3 If  $f(x) = 0$  has roots  $x = \frac{-5 \pm \sqrt{3 - 12k^2}}{4}$ , for which values of  $k$  will the roots be equal? (3)  
[24]**QUESTION 2**

2.1 Simplify fully, WITHOUT using a calculator:

$$\frac{3^{m+4} - 6 \cdot 3^{m+1}}{7 \cdot 3^{m+2}}$$
 (4)

2.2 Solve for  $x$ , WITHOUT using a calculator:

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

2.2.2  $4^x - 2^x = 2$  (4)

2.3 If  $x = \frac{3 - \sqrt{a}}{\sqrt{2}}$  and  $y = \frac{4 + \sqrt{a}}{\sqrt{2}}$ , determine the value of  $(x + y)^2$  (3)2.4 Show, WITHOUT using a calculator, that  $\sqrt[12]{10} \times \sqrt[6]{640} \times \sqrt[4]{810} \times \sqrt{40} = 120$  (4)  
[18]

**QUESTION 3**

- 3.1 Given the finite linear pattern: 12 ; 17 ; 22 ; ... ; 172
- 3.1.1 Determine a formula for the  $n^{\text{th}}$  term of the pattern. (2)
- 3.1.2 Calculate the value of  $T_{12}$  . (2)
- 3.1.3 Determine the number of terms in the pattern. (2)
- 3.2 Given the first four terms of a linear pattern: 3;  $x$ ;  $y$ ; 30
- Calculate the values of  $x$  and  $y$  . (4)
- [10]**

**QUESTION 4**

Given the quadratic pattern: 244 ; 193 ; 148 ; 109 ...

- 4.1 Write down the next term of the pattern. (2)
- 4.2 Determine a formula for the  $n^{\text{th}}$  term of the pattern. (4)
- 4.3 Which term of the pattern will have a value of 508? (4)
- 4.4 Between which TWO consecutive terms of the quadratic pattern will the first difference be 453? (3)
- 4.5 Show that all the terms of the quadratic pattern are positive. (4)
- [17]**

**QUESTION 5**

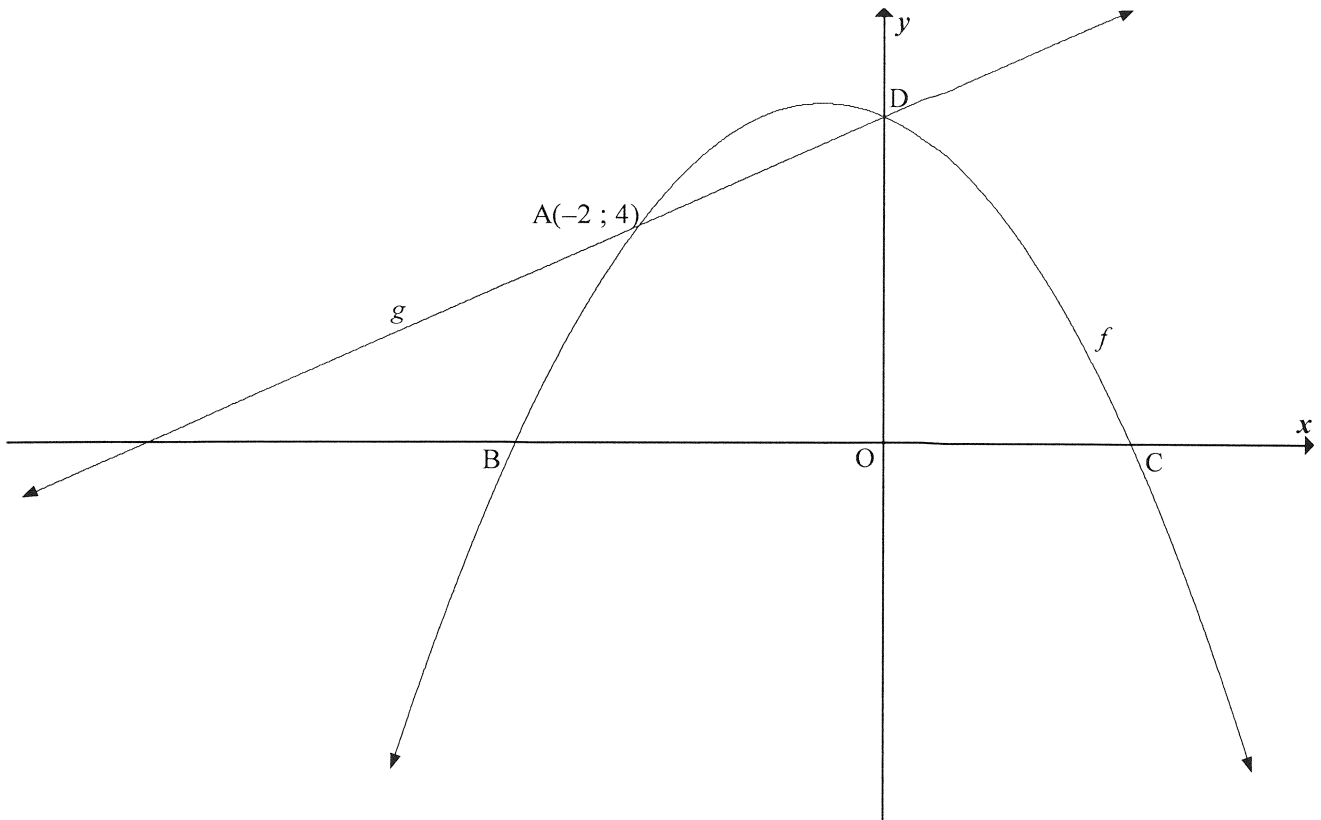
Given:  $f(x) = \frac{-3}{x+2} + 1$  and  $g(x) = 2^{-x} - 4$

- 5.1 Determine  $f(-3)$ . (1)
- 5.2 Determine  $x$  if  $g(x) = 4$  . (2)
- 5.3 Write down the asymptotes of  $f$ . (2)
- 5.4 Write down the range of  $g$  . (1)
- 5.5 Determine the coordinates of the  $x$ - and  $y$ - intercepts of  $f$  . (5)
- 5.6 Determine the equation of the axis of symmetry of  $f$  which has a negative gradient. Leave your answer in the form  $y = mx + c$  . (2)
- 5.7 Sketch the graphs of  $f$  and  $g$  on the same system of axes. Clearly show ALL intercepts with the axes and any asymptotes. (6)
- 5.8 If it is given that  $f(-1) = g(-1)$ , determine the values of  $x$  for which  $g(x) \geq f(x)$ . (2)
- [21]**



**QUESTION 6**

The diagram below shows the graphs of  $f(x) = -x^2 - x + 6$  and  $g(x) = mx + c$ .  $A(-2 ; 4)$  is the point of intersection of the graphs.



- 6.1 Determine the  $x$ -intercepts  $f$ . (4)
- 6.2 Write down the equation of the axis of symmetry of  $f$ . (2)
- 6.3 Determine the range of  $f$ . (3)
- 6.4 Write down the equation of  $g$  in the form  $g(x) = mx + c$ . (3)
- 6.5 Write down the average gradient between points  $A$  and  $D$ . (1)
- 6.6 Determine the equation of  $h$ , if  $h$  is the reflection of  $f$  about the  $x$ -axis and then translated 3 units to the right. Leave your answer in the form  $h(x) = a(x + p)^2 + q$ . (3)
- 6.7 Write down the values of  $x$  for which  $f(x) > 0$ . (2)
- 6.8 If  $f(p) = f(r) = 4$ , calculate the value of  $p - r$  if  $r < 0$ . (4)

**[22]**



**QUESTION 7**

- 7.1 A company bought machinery costing R80 000. Using the reducing balance method, the machinery had a book value of R20 000 after 5 years.  
Calculate the rate of depreciation. (3)
- 7.2 Calculate the effective interest rate if interest is compounded at 5% p.a., compounded quarterly. (3)
- 7.3 Sipho invested R30 000 for 6 years. The investment earned interest at 12% p.a., compounded monthly for the first two years. Thereafter the interest rate changed to 10,8% p.a., compounded semi-annually for the rest of the period.  
Calculate the value of the investment at the end of 6 years. (No other transactions were made on the account.) (4)
- 7.4 Mary deposited R25 000 into a savings account with an interest rate of 18% p.a., compounded monthly. Mary withdrew R8 000 from the account 2 years after depositing the initial amount. She deposited another R4 000 into this account 3½ years after the initial deposit. What amount will Mary have 5 years after making the initial deposit in this account? (6)  
**[16]**

**QUESTION 8**

- 8.1 A bag contains 3 blue marbles and 2 red marbles. A marble is taken from the bag, the colour is recorded and the marble is put aside. A second marble is taken from the bag, the colour is recorded and then put aside.
- 8.1.1 Draw a tree diagram to represent the information above. Show the probabilities associated with EACH branch, as well as the possible outcomes. (3)
- 8.1.2 Determine the probability of first taking a red marble and then taking a blue marble, in that order. (2)
- 8.2 A and B are two events. The probability that event A will occur is 0,4 and the probability that event B will occur is 0,3. The probability that either event A or event B will occur is 0,58.
- 8.2.1 Are events A and B mutually exclusive?  
Justify your answer with appropriate calculations. (3)
- 8.2.2 Are events A and B independent?  
Justify your answer with appropriate calculations. (3)  
**[11]**



**QUESTION 9**

A survey was done among 80 learners on their favourite sport.  
The results are shown below.

- 52 learners like rugby (R)
- 42 learners like volleyball (V)
- 5 learners like chess (C) only
- 14 learners like rugby and volleyball but not chess
- 12 learners like rugby and chess but not volleyball
- 15 learners like volleyball and chess but not rugby
- $x$  learners like all 3 types of sport
- 3 learners did not like any sport

- 9.1 Draw a Venn diagram to represent the information above. (5)
- 9.2 Show that  $x = 8$ . (2)
- 9.3 How many learners like only rugby? (1)
- 9.4 Calculate the probability that a learner, chosen randomly, likes at least TWO different types of sport. (3)

**[11]****TOTAL: 150**

