



# basic education

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

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 10**

**TECHNICAL MATHEMATICS P1**

**EXEMPLAR 2016**

**MARKS: 100**

**TIME: 2 hours**

**This question paper consists of 7 pages and 1 diagram sheet.**

**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. This question paper consists of 7 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 your 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. If necessary, round off answers to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. Answer QUESTIONS 6.1 and 6.2 on the DIAGRAM SHEET provided. Write your name on the DIAGRAM SHEET and hand it in with the ANSWER BOOK.
10. Write neatly and legibly.

**QUESTION 1**

- 1.1 Between which two integers does  $\sqrt{97}$  lie? (2)
- 1.2 Given the following binary numbers:  $111_2$  and  $100_2$ .
- 1.2.1 Add the binary numbers. (Leave the answer in binary form.) (2)
- 1.2.2 Hence, write your answer at QUESTION 1.2.1 in decimal form. (1)
- 1.3 Determine the product and simplify:
- 1.3.1  $a(x^2 + 3y) + ax + 4ay$  (2)
- 1.3.2  $(p - 2)(p^2 + 2p + 4)$  (3)
- 1.4 Simplify:
- $$\frac{10^{x+1}}{2^{-1+x} \cdot 25^x} \quad (4)$$
- [14]**

**QUESTION 2**

- 2.1 Factorise the following expressions fully:
- 2.1.1  $2x^2 - 32$  (2)
- 2.1.2  $5x + 10y - ax - 2ay$  (3)
- 2.1.3  $6 - 17m - 3m^2$  (2)
- 2.1.4  $a^3(a - 1) - (1 - a)$  (3)
- 2.2 What is the value of  $d$  if  $(2x - 3)$  is a factor of  $6x^2 + dx - 12$ ? (3)
- 2.3 Given the expression:
- $$\left(\frac{1}{x} + \frac{1}{y}\right) \div \left(\frac{1}{x} - \frac{1}{y}\right)$$
- 2.3.1 Simplify the expression fully. (4)
- 2.3.2 Use the result at QUESTION 2.3.1 to determine, without the use of a calculator, the value of:
- $$\left(\frac{1}{100001} + \frac{1}{99999}\right) \div \left(\frac{1}{100001} - \frac{1}{99999}\right) \quad (2)$$
- [19]**

**QUESTION 3**

3.1 Determine, without the use of a calculator, the value of  $x$  in the following:

3.1.1  $(x - 5)(x + 3) = 0$  (2)

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

3.1.3  $2^{2x-1} = 64$  (3)

3.1.4  $-5 < 1 - 3x \leq 10$  and represent your answer graphically. (5)  
**[15]**

**QUESTION 4**

4.1 The formula  $E = mc^2$  describes the relationship between mass ( $m$ ) measured in kilograms and energy ( $E$ ) measured in joules. How much energy (in scientific notation) could be created in a 3-kilogram bowling ball, if  $c$ , the speed of light, is  $3 \times 10^8$  metres per second? (2)

4.2 Solve for  $x$  and  $y$  in the following simultaneous equations:

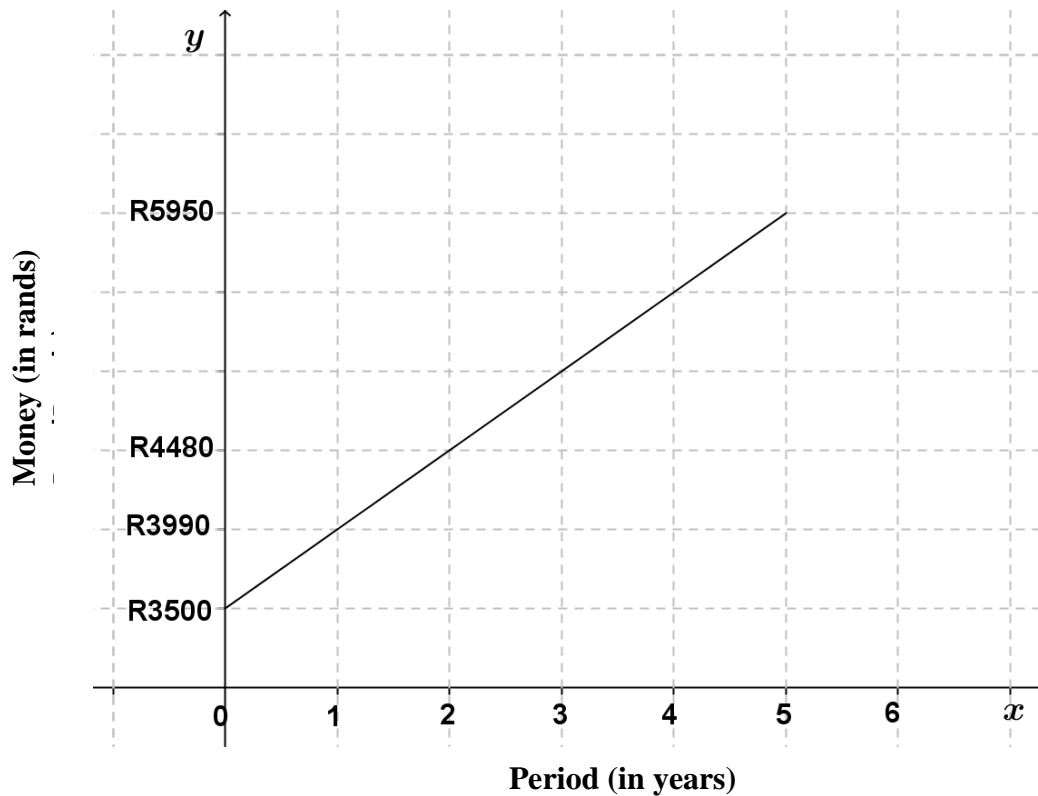
$$2x + y = 5 \quad \text{and} \quad 6x + 7y = 3 \quad (5)$$

4.3 Two cross-country runners, Thabo and Lesley, start running from the same point at 05:00, in exactly opposite directions. Thabo runs at 18 km/h and Lesley runs at 6 km/h.

At what time will they be 168 km apart? (5)  
**[12]**

**QUESTION 5**

5.1 The sketch below represents money invested by Lesego at a financial institution over a period of five years. The amount accumulates interest at a constant rate yearly. The  $x$ -axis represents the period in years and the  $y$ -axis represents the money in rands.



- 5.1.1 What is the initial amount invested by Lesego? (1)
- 5.1.2 How much money will be in Lesego's account after 4 years? (2)
- 5.1.3 Is the interest earned, simple or compound? Explain your answer. (2)
- 5.1.4 Hence, calculate the interest rate per annum. (4)

5.2 A person buys a music system for R24 000. A deposit of 15% is required in cash. The balance is paid through hire-purchase loan agreement. The interest paid on the loan is 18% per annum, simple interest, on the full amount of the loan over the repayment period. The loan is repaid over 3 years by means of equal monthly payments.

- 5.2.1 Calculate the total amount of money that must be repaid on the loan, including the interest over 3 years. (4)
- 5.2.2 Calculate the monthly payments on the loan. (2)
- 5.2.3 Calculate the total amount of money that will be paid for the music system over 3 years. (3)

**[18]**

**QUESTION 6**

Given the functions:  $f(x) = x^2 - 9$  and  $g(x) = 2x - 6$

6.1 Complete the table on the DIAGRAM SHEET provided.

$x$	-4	-3	-2	-1	0	1	2	3	4
$f(x)$									
$g(x)$									

(4)

6.2 Draw the graphs of  $f(x)$  and  $g(x)$  on the same system of axes. (Use the DIAGRAM SHEET provided.)

(4)

6.3 Use your sketch/table to find the value(s) of  $x$  for which:

6.3.1  $f(x) = g(x)$  (2)

6.3.2  $f(x) - g(x) = -3$  (2)

6.4 Write down:

6.4.1 The minimum value of  $f$  (1)

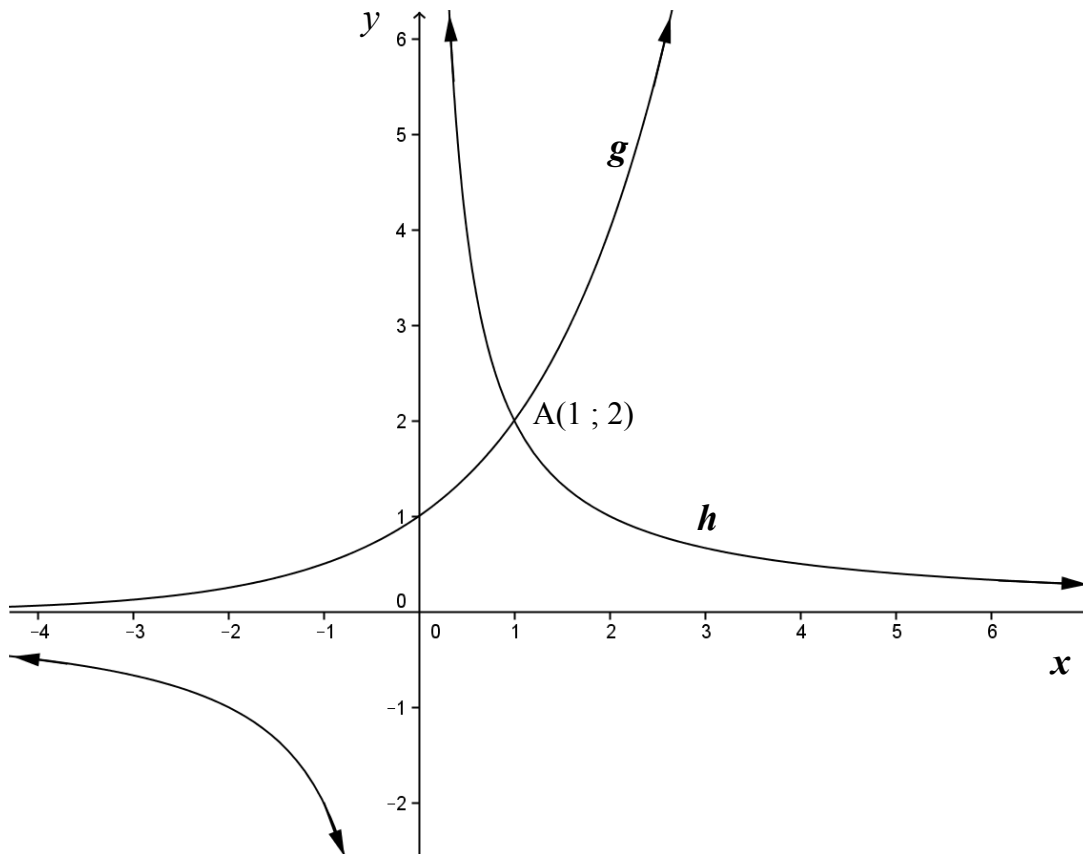
6.4.2 The equation of  $h$  if  $h(x) = f(x) + 2$  (2)

**[15]**

**QUESTION 7**

Sketched below are the graphs of the functions  $g(x) = 2^x$  and  $h(x) = \frac{k}{x}$ .

Point  $A(1 ; 2)$  is the point of intersection of  $h$  and  $g$ .



Determine:

- 7.1 The value of  $k$  (2)
  - 7.2 The equation of the asymptote of  $g$  (1)
  - 7.3 The range of  $h$  (2)
  - 7.4 The equation of the line of symmetry of  $h$  with  $m < 0$  (1)
  - 7.5 The value(s) of  $x$  for which  $h(x) < 0$  (1)
- [7]**

**TOTAL: 100**

NAME:.....

**DIAGRAM SHEET**

**QUESTION 6**

6.1 Complete the table:

$x$	-4	-3	-2	-1	0	1	2	3	4
$f(x)$									
$g(x)$									

6.2

