

11



# education

Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL CERTIFICATE (VOCATIONAL)**

**MATHEMATICS  
NQF LEVEL 2**

**NOVEMBER 2007**

**(10501042)**

**12 November (X-Paper)  
09:00 – 12:00**

**This question paper consists of 11 pages, a 2-page formula sheet and a 1-page answer sheet.**



**TIME: 3 HOURS**  
**MARKS: 100**

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### 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. Show ALL calculations and intermediary steps. Simplify 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 formula may be used.
  8. Write neatly and legibly.
  9. Answer QUESTION 3 on the ANSWER SHEET (graphic paper) that is attached to the question paper. Write your name and centre number on the ANSWER SHEET. Detach the page and place it in your ANSWER BOOK.
  10. NOTE: Diagrams are NOT drawn to scale.
  11. 1 mark = 1%
- 



**QUESTION 1**

Various possible options are provided as answers to the following questions. Choose the answer and write only the letter (A - D) next to the question number (1.1 - 1.10) in the ANSWER BOOK.

- 1.1 With the aid of a calculator, determine the value of  $x$  if  $x = \frac{(4,24)^2 + \sqrt{169}}{\sqrt[3]{27}}$
- A  $x = 10,326$   
B  $x = 10,632$   
C  $x = 9,326$   
D  $x = 11,326$  (1)
- 1.2 Which ONE of the following is an example of an irrational number?
- A  $\sqrt{4}$   
B  $\sqrt{2}$   
C  $\sqrt[3]{27}$   
D  $\sqrt{9}$  (1)
- 1.3  $\left(\frac{x^4}{x}\right)^0$  is equal to ...
- A 0  
B  $x^3$   
C  $\frac{1}{x}$   
D 1 (1)
- 1.4 If  $5x^4 = 5$ , solve for  $x$ .
- A  $x = 5$   
B  $x = -1$   
C  $x = 1$   
D  $x = 0$  (1)



1.5 If  $y = 3x$ , then

A  $x = 3y$

B  $x = \frac{1}{3}y$

C

D  $x = 3y - 3$

D

$x = 3(3y)$

(1)

1.6 Which ONE of the following best describes a hexagon?

A A seven-sided figure with the interior angles adding up to  $900^\circ$

B A six-sided figure with the interior angles adding up to  $720^\circ$

C A six-sided figure with the interior angles adding up to  $900^\circ$

D A five-sided figure with the interior angles adding up to  $1080^\circ$

(1)

1.7 During the last seven cricket matches Siphso scored the following runs:

10, 15, 5, 20, 30, 25, 30

What is the mode of the above set of data?

A 25

B 30

C 20

D 5

(1)

1.8 What is the gradient and the y-intercept of the following function:  $y = 2x - 4$

A  $\frac{1}{2}; -4$

B 2; 4

C 2; -4

D  $\frac{2}{1}; 4$

(1)



1.9 From the formula  $A = P(1 + in)$  we can express  $P$  as:

A  $P = \frac{A}{1 + in}$

B  $P = \frac{1 + in}{A}$

C  $P = \frac{A}{1 - in}$

D  $P = \frac{1 - in}{A}$  (1)

1.10 R2 000 is invested over a period of FOUR years at an interest rate of 10% pa. This investment is compounded quarterly. How many payments would the bank make into this investment?

A 4

B 8

C 16

D 10

(1)  
[10]

## QUESTION 2

2.1 Convert  $0,8\dot{8}$  to the form  $\frac{a}{b}$ ;  $a, b \in Z$ ;  $b \neq 0$  (2)

2.2 Simplify the following by using exponential laws. (Leave the answer with positive exponent and in surd form where applicable).

2.2.1  $\frac{3^{3x} \times 3^{2x}}{3^{6x}}$  (3)

2.2.2  $[(-2x^2)^3]^{-2}$  (3)

2.3 Rationalise the denominator in the following fraction:

$\frac{1}{\sqrt{2} - 1}$  (2)



- 2.4 Find the 20<sup>th</sup> term of an arithmetic progression whose 6<sup>th</sup> term is 3 and whose 14<sup>th</sup> term is 19. (4)
- 2.5 Mr Sibisi started working for a company on 1 April 1981 at an annual salary of R85 000. He received a raise of R600 in April of each year. What was Mr Sibisi's salary in March 2007? (4)
- [18]**

### QUESTION 3

- 3.1 Draw the following table in your ANSWER BOOK and complete it if it is given that  $y = 2^{x+1}$

|               |    |   |   |   |   |
|---------------|----|---|---|---|---|
| $x$           | -1 | 0 | 1 | 2 | 3 |
| $y = 2^{x+1}$ |    | 2 |   |   |   |

(2)

- 3.1.1 Use the above table and the attached graph paper to draw the graph of  $y = 2^{x+1}$   
NB: Use the following scale: x-axis: 20 mm = 1 unit  
y-axis: 10 mm = 1 unit (3)

- 3.1.2 Refer to the graph and write the co-ordinates of the y-intercept of  $y = 2^{x+1}$ . (1)

- 3.1.3 Is the graph a function? Give a reason for the answer. (1)

- 3.2 Simplify the following:

$$(x^2 - x + 1)(x + 1) \quad (2)$$

- 3.3 Factorise the following:

3.3.1  $x^3 - 4x^2 - 3x + 12$  (3)

3.3.2  $12b^3 + 14b^2 - 40b$  (2)

- 3.4 Solve for  $x$ , correct to 1 decimal place, by using the trial and error method. Show ALL the necessary steps.

$$2^x = 39 \quad (2)$$

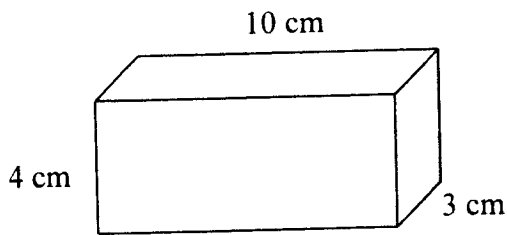
- 3.5 Solve the following inequality and give your solutions in interval notation.

$$2x + 3 \geq 7 \quad (2)$$

**[18]**

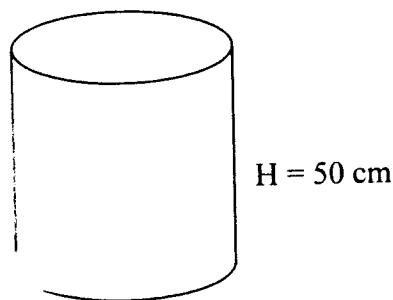
**QUESTION 4**

- 4.1 Calculate the total surface area of the following building block.



(3)

- 4.2 Determine the volume of the following cylinder which has one open end and one closed end. The diameter of the cylinder is 24 cm and the height is 50 cm.

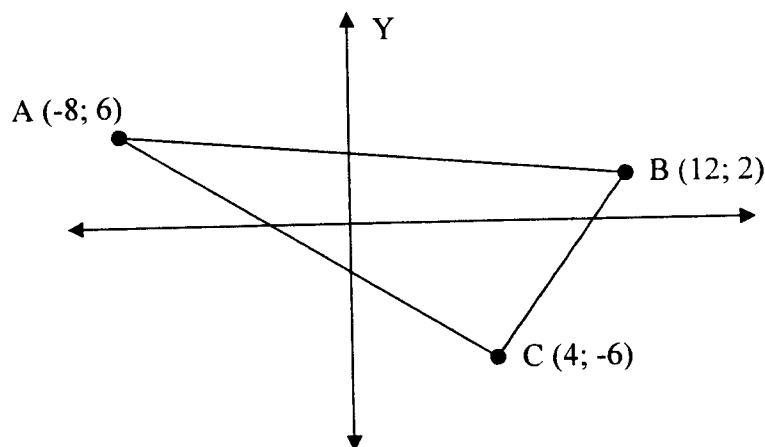


(2)

- 4.3 The length of the sides of a cube of lead is 7,5 cm. The cube is melted and into several right regular hexagonal prisms, each with a height of 2 cm and a side length of the base, 1,5 cm. Determine the number of hexagonal prisms that can be produced.

(4)

- 4.4 Given:



- 4.4.1 Prove that  $\Delta ABC$  is a right angle triangle by using the gradients of the lines.

(3)

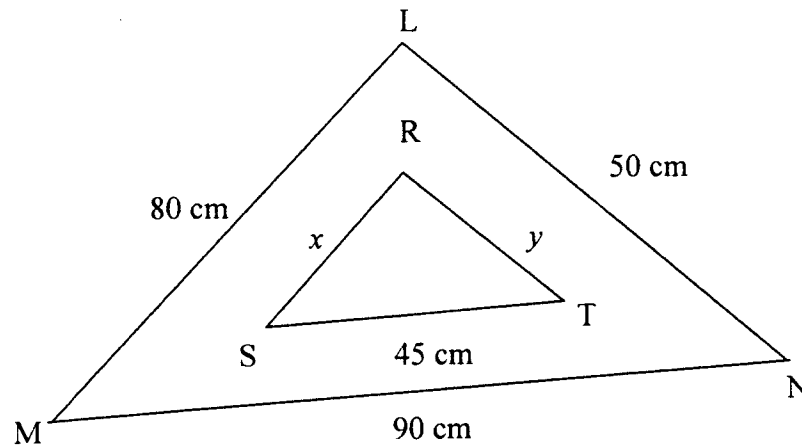
- 4.4.2 Calculate the length of line segment AB.

(2)

- 4.4.3 Determine the co-ordinates of the midpoint of line AC.

(2)

4.5

Find the length of the unknown sides ( $x$  and  $y$ ) if  $\triangle LMN \sim \triangle RST$ (2)  
[18]**QUESTION 5**

- 5.1 The following set of data was obtained from 10 lecturers, based on the contact time (in hours) they have with their learners.

|  |
|--|
| 15; 19; 20; 26; 15; 28; 32; 36; 40; 19 |
|--|

- 5.1.1 Determine the lower (first) quartile. (2)
- 5.1.2 Determine the median (second) quartile. (2)
- 5.1.3 Determine the upper (third) quartile. (2)
- 5.1.4 Calculate the inter-quartile range. (2)
- 5.2 A recent survey was carried out on the smoking habits of 50 employees at a local college. The following data was gathered, based on the number of cigarettes smoked in one working week

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 23 | 61 | 35 | 58 | 27 | 20 | 32 | 52 | 38 | 37 |
| 43 | 27 | 28 | 51 | 33 | 30 | 25 | 37 | 42 | 32 |
| 46 | 23 | 40 | 44 | 47 | 40 | 37 | 34 | 34 | 41 |
| 44 | 33 | 39 | 30 | 34 | 46 | 34 | 51 | 40 | 39 |
| 59 | 48 | 37 | 47 | 33 | 37 | 44 | 48 | 46 | 44 |

- 5.2.1 Construct a stem-and-leaf plot for the above data. (3)
- 5.2.2 Calculate the mean value. (3)
- 5.2.3 Calculate the median value for the data. (2)




- 5.2.4 Determine the mode for the data. (1)
  - 5.2.5 Calculate the range for the data. (1)
- [18]**

**QUESTION 6**

- 6.1 Define the following terms:
- 6.1.1 Fixed expense (1)
  - 6.1.2 Budget (1)
  - 6.1.3 Income (1)
  - 6.1.4 Simple interest (1)
  - 6.1.5 Compound interest (1)
  - 6.1.6 Principle amount (1)
  - 6.1.7 Stokvel (1)
- 6.2 Zola and Sindiswa each received an inheritance of R10 000. They had seen the following advertisements in the local newspaper:

BIZ BANK

INVEST YOUR  
MONEY AT 11 % p.a  
SIMPLE INTEREST



NOVA BANK

NEVER DONE BEFORE:  
COMPOUND INTEREST AT  
10 % PER YEAR

\$

Zola invested her R10 000 in BIZ BANK for FOUR years. Sindiswa invested her inheritance at NOVA BANK for the same time period. Determine the interest gained by each investment. Which option is better? Substantiate your claim. (Show all steps of the calculations)

- 6.3 What amount would an initial sum of R1 400 accumulate to in EIGHT years if it were invested at a compound interest rate of 10% pa compounded quarterly? (3)
- [18]**

**TOTAL:**

**100**



**FORMULA SHEET**

1.  $A_{\text{square}} = l \times l = l^2$
2.  $A_{\text{rectangle}} = l \times w$
3.  $A_{\text{triangle}} = \frac{1}{2} b \times h$
4.  $A_{\text{circle}} = \pi r^2$
5.  $C = 2\pi r$
6. Area of parallelogram = base  $\times$  perpendicular height
7.  $A_{\text{hexagon}} = \frac{3\sqrt{3}}{2} L^2$
8.  $A_{\text{hexagon}} = \frac{\sqrt{3}}{2} W^2$
9.  $A_{\text{cylinder}} = 2\pi r(h + r)$
10. Volume = Area of base  $\times$  perpendicular height
11. Total surface area of a triangular prism = (height of prism  $\times$  perimeter of base) + 2 (area of base)
12.  $T_n = a + (n-1)d$
13.  $S_n = \frac{n}{2} [2a + (n-1)d]$
14.  $S_n = \frac{n}{2} (a + l)$
15.  $m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$
16.  $D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
17.  $M = \left( \frac{x_1 + x_2}{2} ; \frac{y_1 + y_2}{2} \right)$



18.  $\theta = \tan^{-1} m$

19.  $\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$  or Mean =  $\frac{\text{total or sum of all items}}{\text{number of items}}$

20.  $2^k \geq n$

21.  $R = X_{\max} - X_{\min}$

22.  $c = \frac{R}{I}$

23.  $\frac{c}{I}$

24.  $\frac{c(f)}{f_{m-1} - f_{m+1}}$

25.  $M_e = U - \frac{c(f - I)}{f}$

26. Inter-quartile range = upper quartile - lower quartile =  $(Q_3 - Q_1)$

27. Semi inter-quartile range =  $\frac{1}{2}$  (upper quartile - lower quartile) =  $\frac{Q_3 - Q_1}{2}$

28.  $I = A_0 \times \frac{r}{100} \times t$  or  $I = \frac{Prt}{100}$

29.  $A_t = A_0 \left(1 + \frac{r}{100 \times m}\right)^{tm}$  or  $A_t = P(1+r)^n$



**EXAMINATION NUMBER:**

**CENTRE NUMBER:**

