

THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

041

BASIC MATHEMATICS
(For School Candidates Only)

TIME: 3 Hours

Monday, 5th October 2009 a.m.

Instructions

1. This paper consists of sections A and B.
2. Answer **all** questions in section A and **four (4)** questions from section B.
3. All necessary working and answers for each question done must be shown clearly.
4. Mathematical tables may be used unless otherwise stated.
5. Electronic calculators and cellular phones are **not** allowed in the examination room.
6. You are advised to spend not more than **two (2)** hours on section A and the remaining time on section B.
7. Write your **Examination Number** on every page of your answer booklet(s).

This paper consists of 6 printed pages.

SECTION A (60 Marks)

Answer **all** questions in this section showing all necessary working and answers.

1. (a) Estimate the value of $\frac{57.2 \times 110}{2.146 \times 46.9}$ correct to one (1) significant figure

(b) Express $1.8\bar{6}$ as an improper fraction in its simplest form. (6 marks)

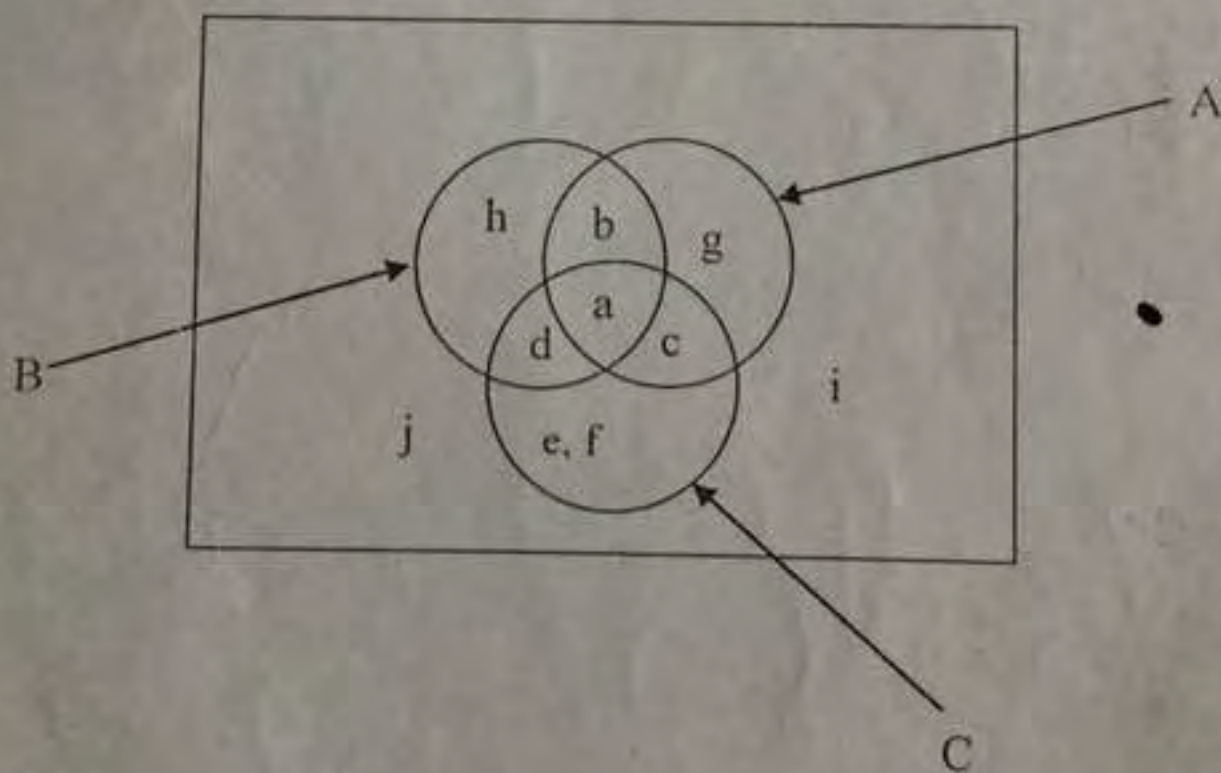
2. (a) Solve for y if $\left(\frac{1}{9}\right)^{2y} \left(\frac{1}{3}\right)^{-y} \div \frac{1}{27} = 3^{(-5y)}$

(b) Simplify the expression $\frac{5}{\sqrt{11} - 3} \div \frac{\sqrt{2}}{\sqrt{22} + 3\sqrt{2}}$ (6 marks)

3. In the figure drawn below, find the number of elements in sets:

(a) $A' \cap (B \cup C)$

(b) $(A' \cap B') \cup (B \cup C')$



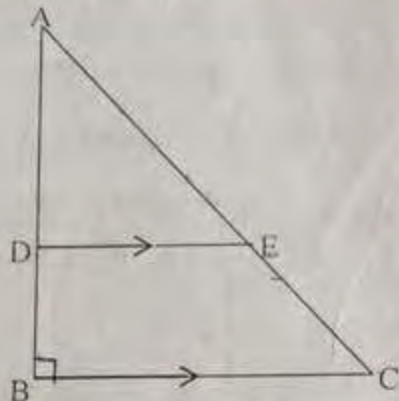
(6 marks)

4. (a) Given vectors $\underline{a} = -i + 3j$, $\underline{b} = 5i - 2j$ and $\underline{c} = 3\underline{a} + 4\underline{b}$, find a unit vector in the direction of vector $\underline{c}$.

- (b) The point A (5, -7) is the vertex of the right angle of a right angled-triangle whose hypotenuse lies along the line $6x - 13y = 39$. A second vertex of the triangle is B (0, -3). Find the remaining vertex C (x, y).
(6 marks)

5. (a) A circle of radius 10 units is circumscribed by a right-angled isosceles triangle. Find the lengths of the sides of the triangle and hence its perimeter (all in 2 decimal places).

- (b) In the figure below DE is parallel to BC, AD = 6 cm, BD = 3 cm, DE = 4 cm, and $\angle ABC = 90^\circ$



Calculate: (i) the length of BC

(ii) the ratio $\frac{AE}{AC}$

(6 marks)

6. (a) The surface area of a sphere, $V \text{ mm}^2$ varies directly as the square of its diameter $d \text{ mm}$. If the surface area is to be doubled, what ratio must the diameter be altered?

- (b) If $a\sqrt{\frac{x^2 - n}{m}} = \frac{a^2}{b}$ write x as a subject of the formula

(6 marks)

7. (a) Express $2\frac{1}{2} : 3$ as integers in a simplified form.

- (b) The sides of a rectangle are in the ratio 3:5. If the perimeter of this rectangle is 800 cm; find the dimensions of the rectangle.

(6 marks)

8. (a) If the third term of a geometric progression is 100 and the sixth term is 800, find the fifth term and the sum of the first two terms.

- (b) A small business sells products worth 1,000,000 (Tshs) during its first year. The owner of the business has set a goal of increasing annual sales by 750,000 (Tshs) each year. Assuming this goal is met; find the total sales during the first 10 years of the business in operation. (6 marks)

9. (a) Given that x is an acute angle and that $\sin x = \frac{p}{q}$, find the value of $\tan x$.

- (b) An observer on the top of a cliff, 25 m above sea level, views a boat on the sea at an angle of depression of 60° . How far is the boat from the top of the cliff? (6 marks)

10. (a) (i) By factorization, find the solution set for $x^2 - x - 6 = 0$
(ii) Solve the simultaneous equations given below by elimination method.

$$\begin{cases} 3x - y = 23 \\ 4x + 3y = 48 \end{cases}$$

- (b) Solve for x if $5 - 2x \geq 7x - 4$

(6 marks)

SECTION B (40 Marks)

Answer four (4) questions from this section. Extra questions will not be marked

11. (a) Find the greatest value of the function $f(x, y) = 7x + 3y$ subject to the Constraints:
 $2x + 3y \leq 12$
 $x + 3y \geq 9$
 $x \geq 0, y \geq 0$

- (b) The curve $y = ax^2 + bx + c$ passes through the points (1, 8), (0, 5) and (3, 20). Find the values of a , b and c and hence the equation of the curve. (10 marks)

12. Carefully study the frequency distribution table which shows marks for 40 students in History examination.

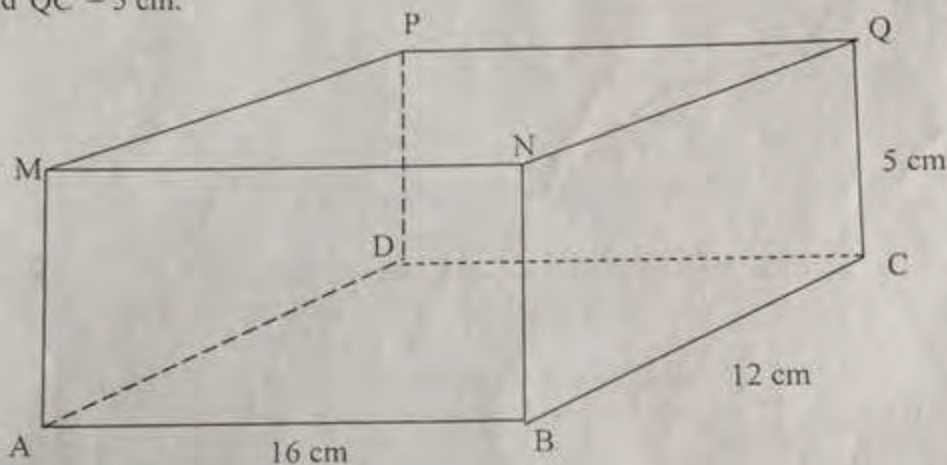
Marks	1 - 20	21 - 40	41 - 60	61 - 80	81 - 100
Number of students	3	11	12	8	6

Determine

- The mean, given the assumed mean is 50.5
- The median
- Modal class and its corresponding class mark.

(10 marks)

13. The figure below shows a rectangular prism in which $\overline{AB} = 16$ cm, $\overline{BC} = 12$ cm and $\overline{QC} = 5$ cm.



Calculate

- its total surface area
- the angle between $\overline{PB}$ and the plane ABCD
- the volume in litres the prism can hold (1 litre = 1000 cm³)

(10 marks)

14. The following information relates to Mr. Kazimoto, a trader, as at 30th July 2004:

Sales	shs. 340,000.00
Cost of sales	75% of sales
Opening stock	shs. 90,000.00
Net profit	20% of sales
Closing stock	20% of cost of goods sold

Calculate:

- Purchases
- Cost of sales
- Closing stock
- Net profit
- Expenses

(10 marks)

15. (a) A translation takes the point $(8, 5)$ to $(12, -4)$. Find where it will take the point $(5, 4)$.

(b) A linear transformation T maps (x, y) onto (x', y') such that

$$\begin{pmatrix} x' \\ y' \end{pmatrix} = \begin{pmatrix} 2 & -4 \\ -1 & 3 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 8 \\ -4 \end{pmatrix}$$

Find the image of $(2, -3)$ under T .

(c) A point (x, y) is reflected on the line $y = x$ followed by a rotation through an angle of 180° clockwise about the origin. Find the image of $(2, 3)$ under this double transformation.

(10 marks)

16. (a) If $f(x) = x^2 - 4x + 3$

Find (i) $f^{-1}(x)$

(ii) the domain and range of $f(x)$

(b) If the probability that Ali will pass Mathematics is 0.3 and the probability that he will pass Biology is 0.6, find the probability that:

(i) He will pass both subjects.

(ii) He will fail both subjects.

(c) If A is the event 'Ali will pass Mathematics' and B is the event 'Ali will pass Biology' show whether or not A and B are independent events. [use the information given in part (b) above]

(10 marks)