# 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.*

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**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 $\frac{57.2\times110}{2.146\times46.9}$ correct to one (1) significant figure

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

**(6 marks)**

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

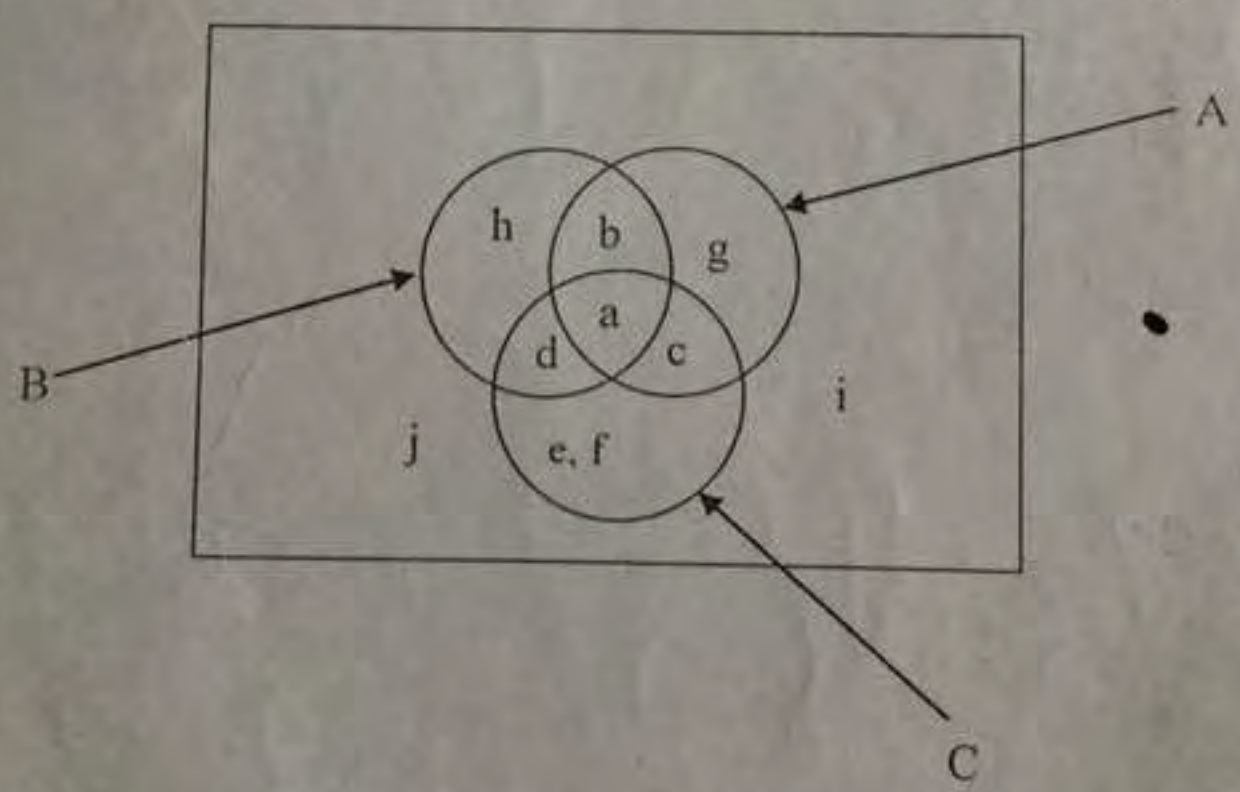
(b) Simplify the expression $\frac{5}{\sqrt{11}-3}\div\frac{\sqrt{2}}{\sqrt{22}+3\sqrt{2}}$

**(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)**

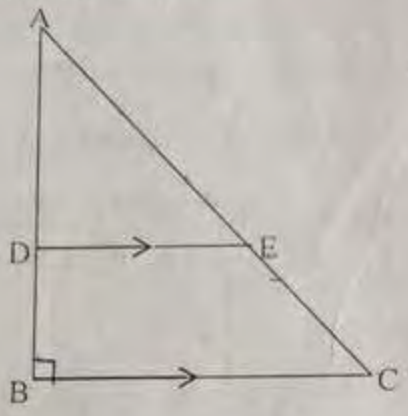
4. (a) Given vectors $\underline{a}=-i+3j$, $\underline{b}=5i-2j$ and $\underline{c}=3\underline{a}+4\underline{b}$, find a unit vector in the direction of vector $\underline{c}$.

(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 $A\hat{B}C = 90^{\circ}$




Calculate: (i) the length of $BC$

(ii) the ratio $\frac{AE}{AC}$ **(6 marks)**

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

(b) If $a\sqrt{\left(\frac{x^2-n}{m}\right)}=\frac{a^2}{b}$ 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:

$2x + 3y \leq 12$

$x + 3y \geq 9$

$x \geq 0, \quad y \geq 0$

(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

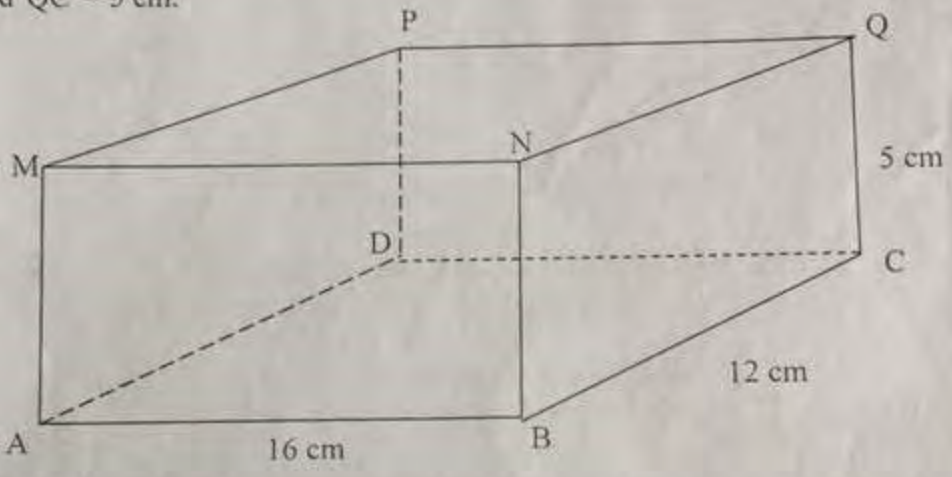
(i) The mean, given the assumed mean is 50.5

(ii) The median

(iii) Modal class and its corresponding class mark.

**(10 marks)**

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




Calculate

(a) its total surface area

(b) the angel between $\overline{PB}$ and the plane ABCD

(c) the volume in litres the prism can hold (1 litre = 1000 $cm^3$) **(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:

(a) Purchases

(b) Cost of sales

(c) Closing stock

(d) Net profit

(e) 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)**