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

041 BASIC MATHEMATICS

TIME: 3 hours 14 January 1999 A.M.

Instructions

1. This paper consists of sections A and B
2. Answer ALL questions in section A and any FOUR (4) questions from section B in the answer books provided.
3. All necessary working and answers for each question done must be shown clearly.
4. Mathematical tables and graph papers may be used unless otherwise stated.
5. You are advised to spend not more than two (2) hours on section A and not more than one (1) hour on section B.
6. The following constants may be used where necessary:

$\pi = \frac{22}{7}$

Radius of the earth = 6400km

This paper consists of 5 printed pages and 3 blank pages.

SECTION A (60 marks)

Answer ALL questions in this section

1. (a) (i) Express $23.\dot{1}\dot{2}\dot{3}$ as a fraction.

(ii) Evaluate [9876 - 4321] ÷ 55 - 7x6+3

(b) If x + y = 7, evaluate $\frac{y^2+4x^2}{xy}$

2. (a) If A and B are any two disjoint sets, show the region represented by $A' \cap B'$ on a Venn diagram.

(b) There are 30 men at a wedding. Twenty are businessmen, twelve are fishermen and 6 are both businessmen and fishermen.

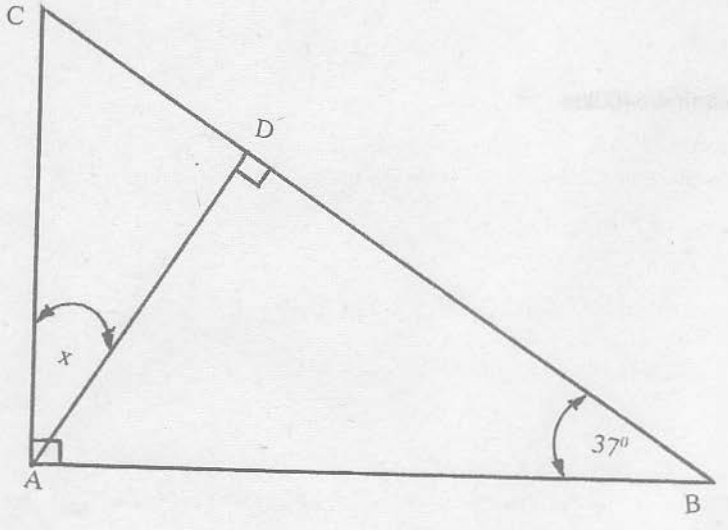
(i) How many are neither businessmen nor fishermen?

(ii) How many are either businessmen or fishermen?

3. (a) (i) What is the sum of the interior angles of an octagon?

(ii) Find the size of the exterior angle of a regular octagon.

(b) In the figure drawn below find the value of x if $\hat{B}=37^0$.



4. (a) In the following equations solve form:-

(i) $m^8 = 3125$

(ii) $\log m = 3 \log 6 - \frac{1}{3} \log 125 - 4 \log 3 - \log \frac{16}{3}$

(b) Using the number line, show the solution set of:

$\frac{1}{2}x - 5 \leq 3 - 3\frac{1}{2}x$

5. Given the vectors; $\underset{\sim}{a} = -\underset{\sim}{i} + 3\underset{\sim}{j}$, $\underset{\sim}{b} = 5\underset{\sim}{i} - 2\underset{\sim}{j}$ and $\underset{\sim}{c} = 4\underset{\sim}{a} + 3\underset{\sim}{b}$.

(a) Find the magnitude of vector $\underset{\sim}{c}$.

(b) Find the unit vector in the direction of vector $\underset{\sim}{d}$, where $\underset{\sim}{d} = 2\underset{\sim}{a} - 3\underset{\sim}{b} + \underset{\sim}{c}$

6. If $f(x) = 5x^2 + 17x - 12$

(a) (i) Evaluate $f(10) - f(5)$

(ii) Factorize $f(x)$

(b) Determine the domain and range of $f(x)$

7. A car moving with an initial velocity of 40m/s accelerates uniformly at $2.5m/s^2$ for 5 seconds. Find

(a) the maximum velocity attained.

(b) the distance travelled during the 4^{th} second.

8. (a) What value of t will make the line passing through the points A(-5,t) and B (1,2) perpendicular to the line passing through points C(-1,-2) and D(5, 1)?

(b) Without using tables, evaluate $\sin 75^0$

(c) An observer on top of a cliff, 25m above sea level views a boat on the sea at an angle of depression of 75^0. How far is the boat from the foot of the cliff?

SECTION B [40 marks]

Answer any **four** (4) questions from this section. Show ALL your necessary steps and answers clearly.

9. (a) By shading the unrequired part, show the region represented by the following set of inequalities:

$y \leq 4$
$x \leq 5$
$5x + 4y \leq 20$
$x \geq 0$ and $y \geq 0$

(b) A bread dealer can buy up to 150 loaves of bread. Premium bread costs 200/= per loaf and Royal bread costs 250/= per loaf. The dealer can spend not more than 36,000/= in the business. Premium bread sells at a profit of 40/= per loaf while, Royal bread sells at a profit of 50% per loaf. How many loaves of bread of each type should the dealer buy in order to generate a maximum profit?

10 (a) Find the image of the point (2,5) after rotation by 90^0 anticlockwise about the origin.

(b) A translation T maps the origin onto the point (-2,3)
A second translation S maps the origin onto the point (1,-2)
Find where T followed by S will take the point (4,-5).

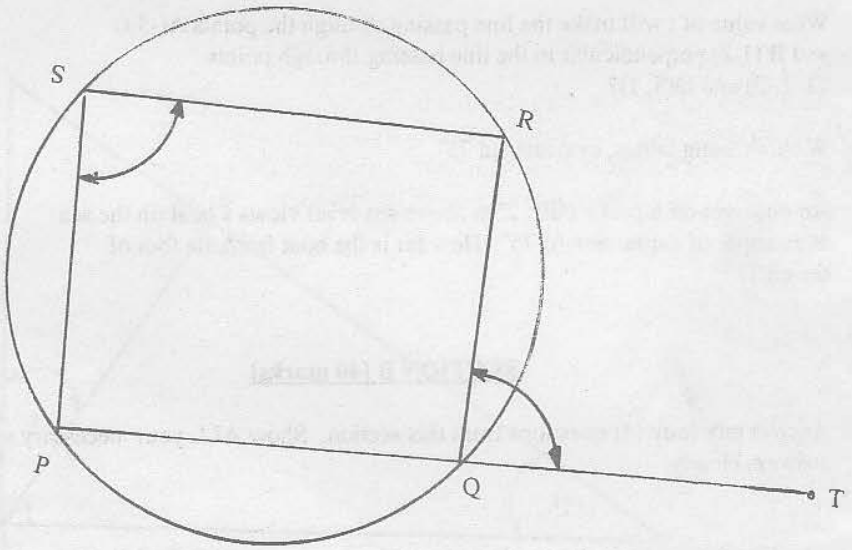
(c) A linear transformation M maps the point (x,y) onto (x',y') where

$x' = x - y$
$y' = 2x + y$

(i) Write the matrix M of this transformation.
(ii) What is the matrix M^{-1} or the inverse of M?
(iii) Compute the product matrix MM^{-1}.

11. (a) PQRS is a cyclic quadrilateral and PQ is produced to T. Prove that:

$R\hat{Q}T = P\hat{S}R$



(b) Calculate the surface distance along latitude 30^0 N covered between longitudes 60^0 E and 65^0 W.

(c) Calculate the volume of the earth.

12. (a) (i) Find the kth term of the series

$$10 + 5 + \frac{5}{2} + \frac{5}{4} + \frac{5}{8} + \ldots, \text{ where } k = 1,2,3,\ldots$$

(ii) The arithmetic mean and geometric mean of two numbers m and n are 17 and 15 respectively. Find the two numbers.

(b) Find the difference between the sums of the first ten terms of the geometric progressions whose first terms are 7 and 9 and common ratios are 3 and 2 respectively.

13. (a) Draw the plan, front and side elevation of a circular cone with its base on the horizontal plane (in first angle projection) given that the height of the cone is 3 cm and its base radius is 2 cm.

(b) Find the surface area of the cone described in 13 (a) above.

14. The heights in centimetres of 100 students of a certain school were recorded as follows:-

Height in Centimetres	150	155	160	165	170	175	180	185	190
Frequency	4	9	12	16	25	20	8	4	2

From the above information answer the following questions:

(a) Draw a frequency polygon
(b) Determine the mean, median and mode
(c) Compute the variance and standard deviation.
(d) A student is chosen at random from this school. What is the probability that his height is greater than 160 cm?