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

041 BASIC MATHEMATICS

(For Both School and Private Candidates)

Time: 3 Hours **1 November 2001 a.m.**

Instructions

1. This paper consists of sections A and B.
2. Answer ALL questions in sections A and any FOUR questions from section B.
3. All workings for each question in both sections must be shown clearly.
4. Mathematical tables, square sheets and slide rules may be used.
5. Write your Examination Number on every page of your answer booklet(s)

This paper consists of 5 printed pages

SECTION A (60 Marks)

Answer ALL questions in this section

1. (a) Find the value of the expression

$$\left(\frac{4.75 + 1.31}{3.13}\right)^2$$

giving your answer in three decimal places.

(b) By rounding each term of the expression in (a) above to one significant figure, obtain a rough estimate of the expression.

(c) Express $1.\dot{2}1\dot{3}$ as a rational number.

2. (a) How many even numbers greater than 2000 can be formed with digits 1, 2, 4 and 8 if each digit may be used only once?

(b) If $n(A) = 8$, $n(B) = 12$ and $(A \cap B) = 5$, find $n(A \cup B)$.

3. (a) Solve the equation $\tan\theta = 2\sin\theta$ for values of θ from 0° to 180°.

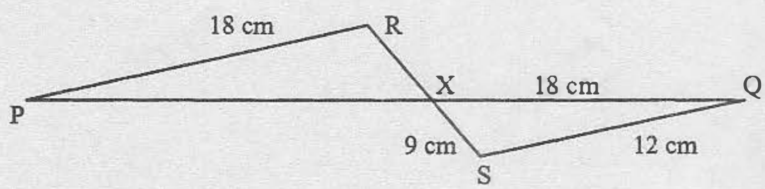
(b) If $\underline{a} = 4\underline{i} + 5\underline{j}$, $\underline{b} = 6\underline{i} + 9\underline{j}$ determine the magnitude and direction of the vector $\underline{V} = \frac{1}{2}\underline{a} + \frac{1}{6}\underline{b}$.

4. (a) Solve for x if $\sqrt[3]{(x-1)} + 3 = 0$.

(b) Using mathematical tables, evaluate

$$\frac{(36.12)^3 \times 750.9}{(113.2)^2 \times \sqrt{92.5}}$$

5. (a) PXQ and RXS are straight lines and PR is parallel to SQ. Calculate PX and RX if PR = XQ = 18 cm, XS = 9 cm and SQ = 12 cm.



(b) An exterior angle of a regular polygon has degree measure of 22½. Find the sum of degree measure of all the interior angles.

6. (a) A variable a varies directly as b and inversely as the square root of c. If a = 0.2 when b = 4 and c = 100, find the value of a when b = 16 and c = 64.

(b) John wants to invest a certain sum of money so that its value after 3 years will be sh. 100,000/=. How much should he invest at 5 % p.a. compound interest?

7. Both lines r and s pass through point (k, 9). Line r has a gradient of $-\frac{4}{3}$ and passes through point (5, -3). Find

(a) the value of k

(b) the equation of line s if it crosses the x axis at (-14, 0)

(c) the equation of a line t perpendicular to line r and passes through point (k, 9).

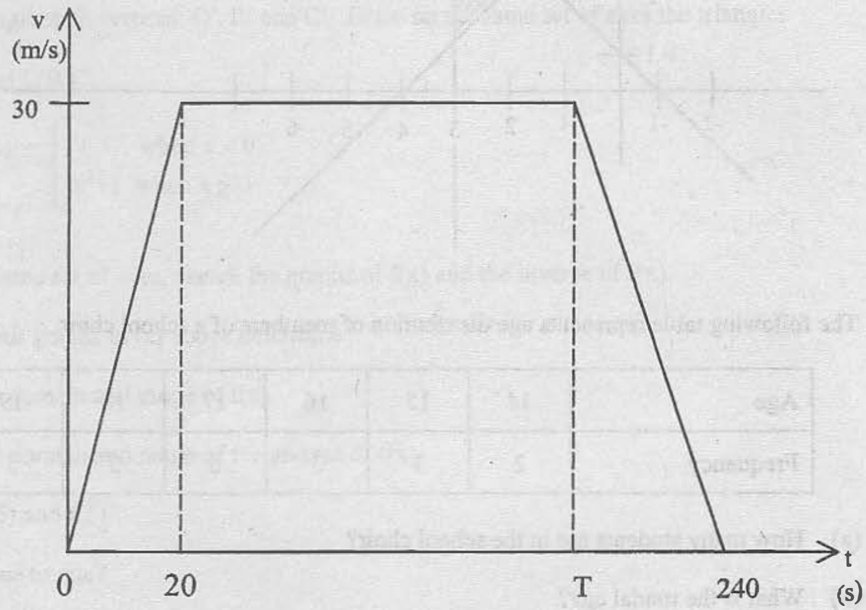
8. (a) Find the perimeter of a sector of a circle of radius 3.5 cm if the angle of the sector is 144°.

(b) Find the area of triangle ABC if $\overline{AB} = 4$ cm, $\overline{BC} = 7$ cm and $m(A\hat{B}C) = 30°$.

9. (a) Make t the subject of the expression $3t^2x - 2xy = 3t^2y$.

(b) Find the remainder when $2x^3 + 3x^2 - 5x - 6$ is divided by $x + 1$ and hence solve the equation $2x^3 + 3x^2 - 5x - 6 = 0$.

10. Below is the velocity – time graph for a certain car journey.



(a) Calculate the acceleration of the car during the first 20 seconds.

(b) Find the value of T if the final retardation is 0.5 m/s^2.

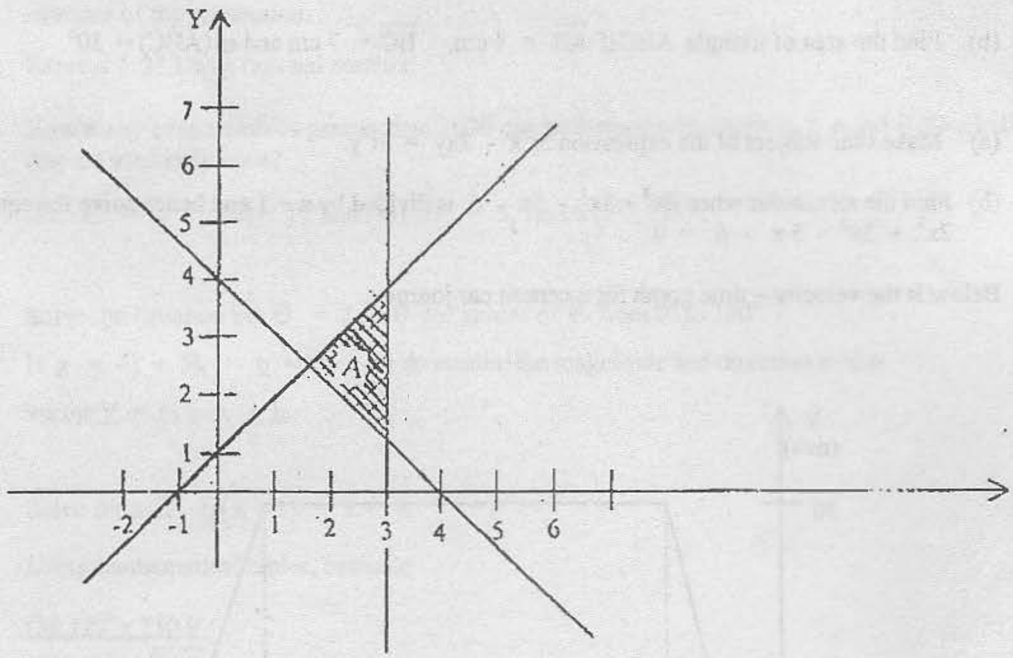
(c) Calculate the total distance travelled by the car.

SECTION B (40 marks)

Answer FOUR (4) questions from this section.

11. (a) If $B_1 = \{(x, y): x + y < 6, \quad x, y \in R\}$ and $B_2 = \{(x, y): \quad x - y < 2, \quad x, y \in R\}$ draw the graphs of B_1 and B_2 and shade the area represented by $B_1 \cap B_2$.

(b) Write down three inequalities which define the shaded area labelled A in the diagram below.



12. The following table represents age distribution of members of a school choir.

Age	14	15	16	17	18	19
Frequency	2	1	3	6	5	3

(a) How many students are in the school choir?

(b) What is the modal age?

(c) Calculate the mean age of the members of the school choir.

(d) What is the probability that a member chosen at random from the choir is

(i) 17 years old?

(ii) over or equal to 17 years?

(e) Draw a pie chart to show the age distribution of the members of the school choir.

13. (a) Find the capacity in litres of a bucket 24 cm in diameter at the top, 16 cm in diameter at the bottom and 18 cm deep.

(b) Given that the radius of the earth is 6400 km, find

(i) the length of the parallel latitude 30°N

(ii) the shortest distance along the surface of the earth from town Q whose position is (30°N, 10°E) to town P whose position is (30°N, 50°W).

14. (a) Find the image of the point (2, 4) when it is

(i) reflected about the line $y + x = 0$

(ii) rotated through 180° about the origin

(iii) translated by the vector $\underline{a} = (2, 4)$.

(b) A triangle with vertices O(0, 0), B(2, 0) and C(2, 3) is enlarged by the matrix

$$\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$$

to a triangle with vertices O′, B′ and C′. Draw on the same set of axes the triangles

OBC and O′B′C′.

15. Given that $f(x) = \begin{cases} 1 & \text{when } x < 0 \\ x^2+1 & \text{when } x \geq 0 \end{cases}$

(a) On the same set of axes, sketch the graphs of f(x) and the inverse of f(x).

(b) From your graphs in (a) above determine

(i) the domain and range of f(x)

(ii) the domain and range of the inverse of f(x).

(c) Find f(-5) and f(5)

(d) Is f(x) one to one?

(e) Is the inverse of f(x) a function?

16. (a) Find the probability that a number chosen at random from a set of integers between 10 and 20 inclusive is either a prime number or a multiple of five.

(b) Three defective transistors and two good transistors are mixed in a box. Two transistors are randomly selected. Find the probability that they are both defective if the selections are made

(i) with replacement

(ii) without replacement.