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 **Monday November 01, 2004 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 are **not** allowed in the examination room.
6. You are advised to spend not more than 2 hours on section A
7. Cellular phones are **not** allowed in the examination room.
8. 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.

1. (a) Using mathematical tables, evaluate the expression:
$$\frac{(28.32)^2 \times 0.3574}{\sqrt{8.732}}.$$
Give the answer correct to four decimal places. **(3 marks)**

(b) If $a = 2.432 \times 10^4$, $b = 7.42 \times 10^{-2}$ and $c = 0.0324 \times 10^{-2}$, find the value of R in standard form correct to two decimal places given that $R = \frac{ab}{c}$. **(3 marks)**

2. (a) Given that one of the roots of the equation $2x^2 - k(x + 1) + 3 = 0$ is 4, find k. **(3 marks)**

(b) If $x^2 + ax + 4$ is a perfect square, find the value of a. **(3 marks)**

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

(b) Given that $\sin A = \frac{3}{5}$ find the values of:

(i) cos A.

(ii) $\frac{\tan A - \sin A}{1 + \cos A}$. **(3 marks)**

4. (a) Simplify $2 \log_{10} 25 - 3 \log_{10} 5 + \log_{10} 20$. **(2 marks)**

(b) Find the value of t in the equation $3^{2t}(4^t) = 6$. **(2 marks)**

(c) Use the substitution $y = 2^x$ to solve the equation $2^{2x+1} - 2^{x+1} + 1 = 2^x$. **(2 marks)**

5. (a) In figure 1 below, the area of the shaded part DEA is 15 m^2. If DA = 3 m and AB = 6 m, find the area of the quadrilateral BCDE.

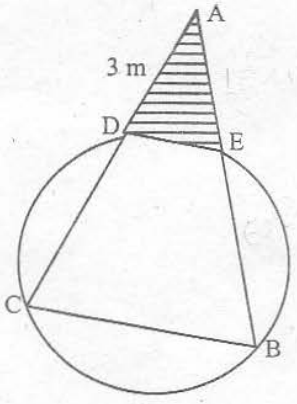
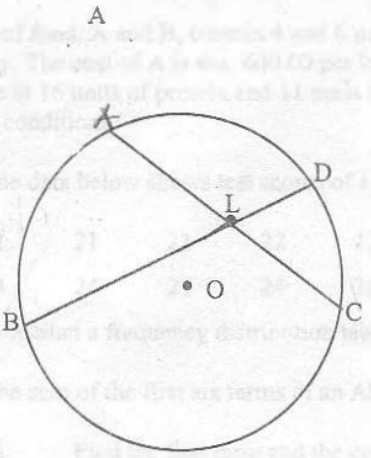


Fig. 1 **(3 marks)**

(b) In the circle ABCD below (figure 2), AB is an arc of 43° and CD is an arc of 25°. O is the centre of the circle. What is the degree measure of ∠DLC?



(3 marks)

Fig. 2

6. (a) The price of a TV set which includes V.A.T. is shs 133,800.00. If the rate of V.A.T. is 30 %, find the price of the TV before V.A.T. was added. **(3 marks)**

(b) The second term of an A.P. is 2 and the sixth term is –14. What is the

(i) first term

(ii) common difference? **(3 marks)**

7. The coordinates of the points A, B and C are (4,3), (3, –2) and (7, –1) respectively. From this information find the:

(a) length of AB. **(3 marks)**

(b) equation of the line BC. (Write your answer in the form $ax + By + C = 0$). **(3 marks)**

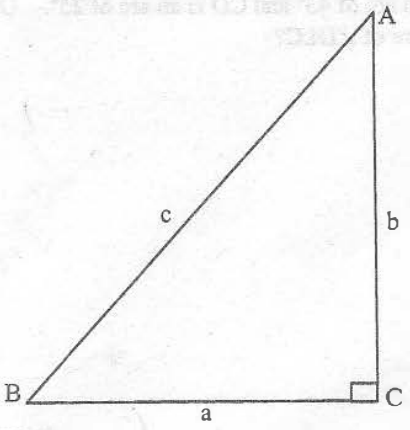
8. (a) The ratio of the areas of two circles is 50:72. If the radius of the smaller circle is 15 cm, find the radius of the larger circle. **(3 marks)**

(b) Find the total surface area of a right circular cone whose height is 24 cm and slant height is 25 cm. **(3 marks)**

9. (a) Given that $\left(a + \frac{1}{a}\right)^2 = 14$, find the value of $a^2 + \frac{1}{a^2}$. **(2 marks)**

(b) Make q the subject of the equation $pqy + x = c(p + q^2)$. **(2 marks)**

(c) Using figure 3 below, show that $\cos^2\theta + \sin^2\theta = 1$



(2 marks)

Fig. 3

10. (a) Solve the equation $3x - 5 = \frac{5x - 3}{x}$ by factorisation. **(3 marks)**

(b) Figure 4 below shows the velocity time graph for a train journey which takes 16 minutes.

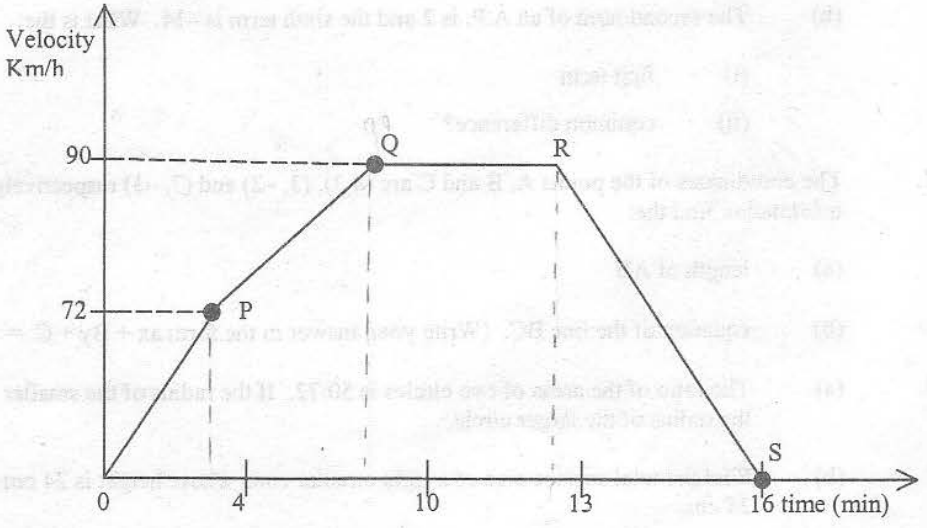


Fig. 4

Calculate the:

(i) acceleration in m/s^2 during those parts of the journey corresponding to OP and PQ.

(ii) total length of the journey in metres. **(3 marks)**

SECTION B (40 marks)

Answer **four (4)** questions from this section.

11. Two types of food, A and B, contain 4 and 6 units of protein, and 5 and 3 units of starch per kg respectively. The cost of A is shs. 400.00 per kg. The cost of B is shs. 500.00 per kg. If the minimum daily intake is 16 units of protein and 11 units of starch, how much food should be bought in order to meet these conditions? **(10 marks)**

12. (a) The data below shows test scores of a certain class in mathematics:

21	21	21	22	22	22	22	23	23	24
24	24	21	24	24	25	26	27	27	27

Construct a frequency distribution table showing scores x and frequency f. **(3 marks)**

(b) The sum of the first six terms of an AP is 72 and the second term is seven times the fifth term.

(i) Find the first term and the common difference.

(ii) Find the sum of the first ten terms. **(7 marks)**

13. In the diagram below, (figure 5), VABCD is a pyramid whose base ABCD is a square with sides 6 cm. The vertex V is vertically above N, the centre of the base and VN = 3 cm.

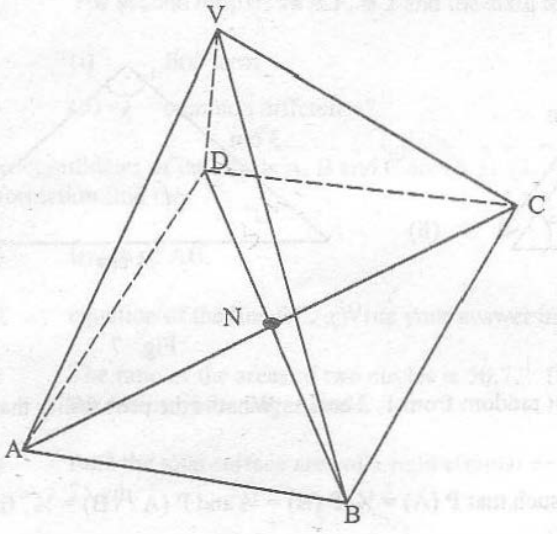


Fig. 5

Calculate the:

(a) length VA.

(b) angle between the line VA and the plane ABCD.

(c) volume of the pyramid. **(4 marks)**

14. (a) Find the image of a line $5x + 10y + 9 = 0$ under a reflection in the line $y = x$. **(4 marks)**

(b) Find the matrix which enlarges the vector $\mathbf{r} = (3, 4)$ to $\mathbf{r}' = (18, 24)$. **(3 marks)**

(c) If $M = \begin{bmatrix} \cos 2\alpha & \sin 2\alpha \\ \sin 2\alpha & -\cos 2\alpha \end{bmatrix}$

is the matrix of reflection in a line inclined at α, where $\alpha = 135°$, $\mathbf{u} = (6,1)$ and $t = 4$, find M (tu). **(3 marks)**

15. (a) The function f is defined by

$$f(x) = \begin{cases} x^2 & \text{for} \quad x \leq 0 \\ x & \text{for} \quad x > 0 \end{cases}$$

(i) Find $f(-4)$.

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

(iii) Sketch the graph of $f(x)$. **(7 marks)**

(b) Find the values of length y and angle x in figures 6 and 7 below:

(i)

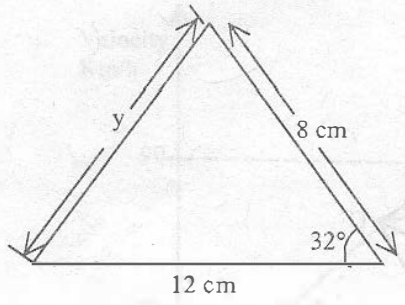


Fig. 6

(ii)

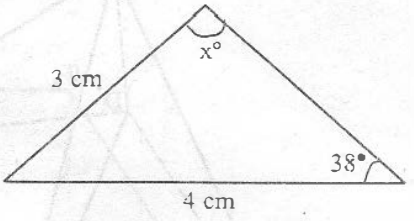


Fig. 7 **(4 marks)**

16. (a) Two numbers are chosen at random from 1, 2 and 3. What is the probability that their sum is odd? **(2 marks)**

(b) If A and B are two events such that $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{8}$, find:

(i) $P(A \cup B)$.

(ii) $P(A \cup B)'$. **(4 marks)**

(c) At a second-hand car show room, 20 % of the cars have no engine, 40 % have bad tyres and 15 % have no engine and have bad tyres. What is the probability that a car chosen at random has good tyres and an engine? **(4 marks)**