

THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION NOVEMBER 1994

041/1

BASIC MATHEMATICS

PAPER 1

(For Both School and Private Candidates)

TIME: 3 Hours

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 book provided.
3. ALL THE WORKING for each question in both sections A and B must be shown clearly.
4. Unless otherwise stated, Mathematical tables, squared papers and slide rules may be used.
5. You are advised to spend not more than 2 hours on section A and not more than 1 hour on section B.

This paper consists of 7 printed pages.

SECTION A (60 Marks)

Answer ALL questions in this section. Show clearly ALL THE WORKING for each question.

1. Without using tables, calculate the value of

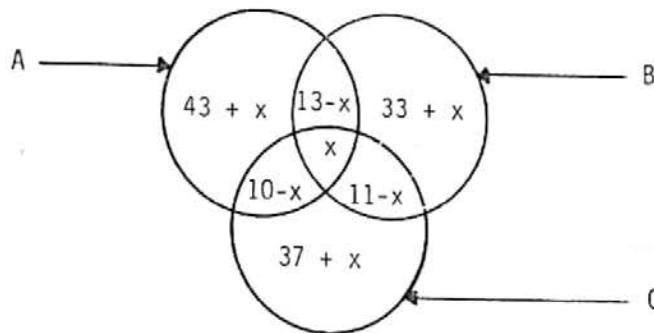
(a) $\log_{10} 6$ (b) $\log_{10} 0.9$
 ($\log_{10} 2 = 0.3010$, $\log_{10} 3 = 0.4771$)

2. A function f is defined by the formula $f(x) = \sqrt{x}$, where x is a whole number.

- (a) Evaluate $f(9)$
 (b) If $f(x) = 16$, find the value of x .
 (c) Find the value of $\frac{f(200)}{f(2)}$

3. If $A = \begin{pmatrix} 2 & 4 \\ 3 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} 6 & 8 \\ 9 & 5 \end{pmatrix}$, find (i) A^{-1} (ii) B^{-1}

4.



In the Venn diagram above, the number of elements in various regions are as indicated. If $n(A \cup B \cup C) = 150$, find the value of x .

5. The coordinates of the points O, P, Q and R are (0,0), (2, -1), (3, 2) and (13, 4) respectively and $\overrightarrow{OR} = a\overrightarrow{OP} + b\overrightarrow{OQ}$. Find the value of each of the scalars a and b .
6. Given that y varies inversely as x^2 and that $y = 4$ when $x = 3$, calculate the value of y when $x = 6$.

7. Points A and B have position vectors a and b relative to an origin O where $a = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$ and $b = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$. If $R = \begin{pmatrix} 1 & -1 \\ 1 & 1 \end{pmatrix}$

show that $R^2 \cdot a = 2b$.

8. Triangles O and P are similar. A side of triangle O is 8cm long, while the corresponding side of triangle P is 16cm long. If the area of triangle O is 40cm^2 , what is the area of triangle P?

9. Factorize

(a) $(x - 1)^2 - 4y^2$

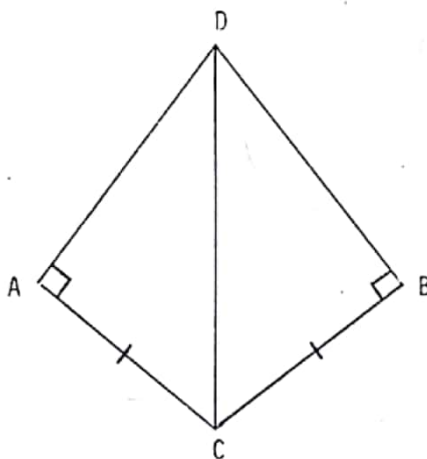
(b) $6x^2 - 11xy - 10y^2$

10. A regular pentagon is inscribed in a circle of radius 10cm.

(a) Draw a diagram to show the regular pentagon inscribed in the circle.

(b) Calculate the area of the region outside the regular pentagon but inside the circle. [use $\pi = 3.14$]

11. In the figure below, $\overline{AC} = \overline{CB}$ and $\hat{DAC}$ and $\hat{DBC}$ are right angles. Prove that $\triangle ACD \cong \triangle CBD$.



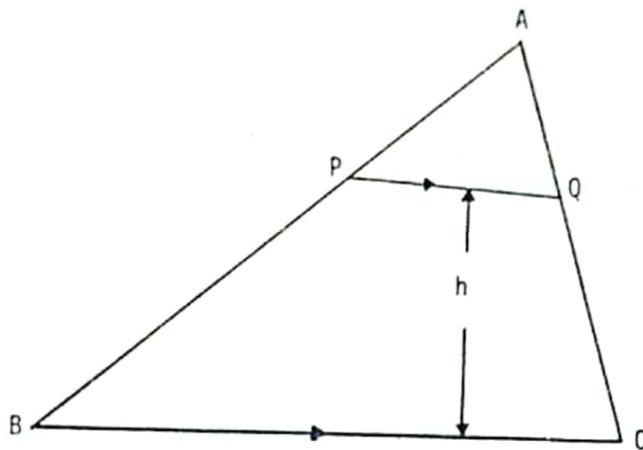
12. Find the equation of the perpendicular bisector of the line joining a line segment whose end-points have coordinates (0,2) and (3, 6). Put it in the form $y = ax + b$.
13. The common ratio of a geometrical progression is 2 and the sum of the first eight terms is 1020. Find the first term of the progression.
14. Calculate, to the nearest degree, the direction of the resultant velocity of a man who walks at 1.5m/sec eastwards across the deck of a ship which is moving at 4.5m/sec. due north.

21. (a) State a matrix T which represents a reflection on the line $y + x = 0$.
- (b) Given that $A = \begin{pmatrix} 6 & -1 \\ -3 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 2 \\ -5 & -1 \end{pmatrix}$ calculate
- AB
 - BA
 - B^{-1}
- (c) Use the matrix method to solve the following simultaneous equations:

$$\begin{cases} 2x - 2y = 7 \\ 4x - 5y = 2 \end{cases}$$

22. Two dice are rolled together. Find the probability of the following:
- that both faces show even numbers
 - that one face shows an even number and the other one an odd number
 - that the sum of the scores on the two faces is 9.

23.



In the above figure, $\overline{PQ} \parallel \overline{BC}$, $\overline{AP} = 3\text{cm}$, $\overline{AQ} = 2\text{cm}$ and the area of $\triangle APQ = 8\text{cm}^2$.

- Show that $\triangle APQ$ is similar to $\triangle ABC$.
 - Find the area of $\triangle ABC$
 - Calculate the length of (i) $\overline{PQ}$ (ii) $\overline{QC}$
 - Calculate the height h .
24. (a) Describe the following loci in words:

- $L = \left\{ (x,y): x^2 + y^2 = 5 \right\}$
- $M = \left\{ P: \overline{PA} = \overline{PB} \right\}$

(b) Draw one diagram for steps (i) - (iv)

(i) Construct a triangle ABC such that:

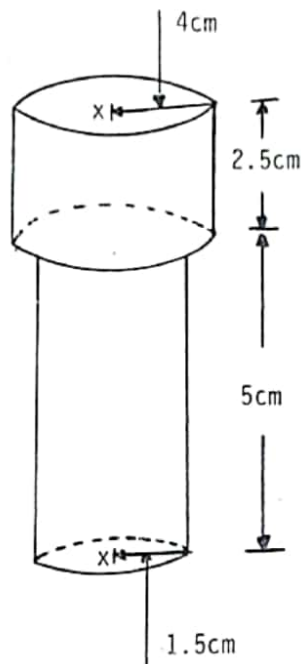
$$\overline{AB} = 7\text{cm}, \overline{AC} = 7\text{cm} \text{ and } \overline{BC} = 4\text{cm}.$$

(ii) Construct the locus L of a point P such that $\overline{AP} = 3\text{cm}$

(iii) Construct the locus M of a point P such that P is equidistant from $\overline{AB}$ and $\overline{AC}$.

(iv) Clearly indicate $L \cap M$.

25.



The above diagram shows a metal stud in the shape of a cylinder of a larger diameter on top of another cylinder of a smaller diameter.

(a) Use a scale to draw the plan, front elevation and one side (end) elevation of the metal stud.

(b) Calculate the volume of the metal stud (use $\pi = 22/7$).

26. The scores of a Physics test taken by 60 students were recorded as follows:

30	56	21	49	34	58	22	38	27	31	35	41	53
25	34	48	33	58	20	34	30	50	26	52	32	63
25	50	36	29	34	21	61	33	51	20	41	30	57
26	28	45	36	59	26	60	42	21	63	56	36	54
43	24	30	27	26	56	35	32					

- (a) Arrange these scores into grouped frequency distribution table starting with the classes 20-24, 25-29, 30-34, ...
- (b) Calculate the mean score.
- (c) Draw the histogram and use it to estimate the mode.
- (d) Draw the ogive and use it to estimate the median.