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.

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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.

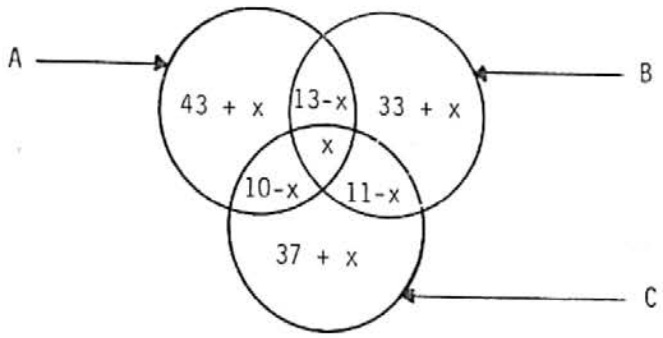
   (a) Evaluate $f(9)$

   (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 $\overline{OR} = a\overline{OP} + b\overline{OQ}$. 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 $x = 6$.

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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 $R^2.a = 2b$.

8. Triangles O and P are similar. A side of triangle O is 8cm long, while the coresponding 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) $(x - 1)^2 - 4y^2$

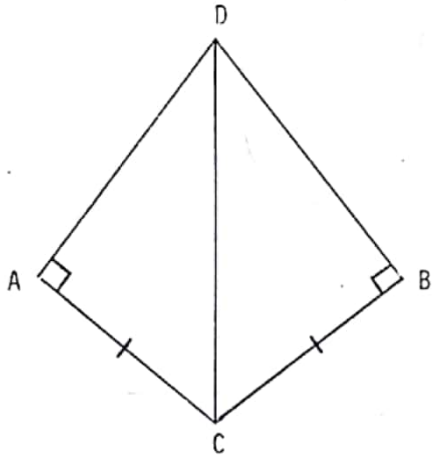
   (b) $6x^2 - 11xy - 10y^2$

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 $\Delta ACD \equiv \Delta CBD$.



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.

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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

(i) AB

(ii) BA

(iii) B^{-1}

(c) Use the matrix method to solve the following simultaneous equations:

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

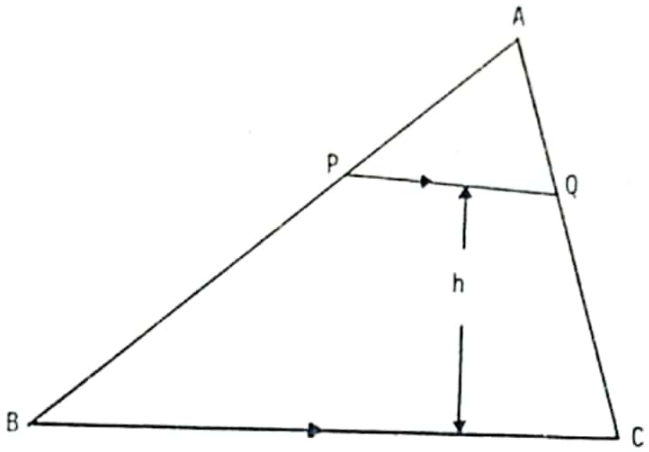
22. Two dice are rolled together. Find the probability of the following:

(a) that both faces show even numbers

(b) that one face shows an even number and the other one an odd number

(c) that the sum of the scores on the two faces is 9.

23.



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

(a) Show that $\triangle APQ$ is similar to $\triangle ABC$.

(b) Find the area of $\triangle ABC$

(c) Calculate the length of (i) $\overline{PQ}$ (ii) $\overline{QC}$

(d) Calculate the height h.

24. (a) Describe the following loci in words:

(i) $L = \{(x,y): x^2 + y^2 = 5\}$

(ii) $M = \{P: \overline{PA} = \overline{PB}\}$

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(b) Draw <u>one</u> diagram for steps (i) - (iv)

(i) Construct a triangle ABC such that:

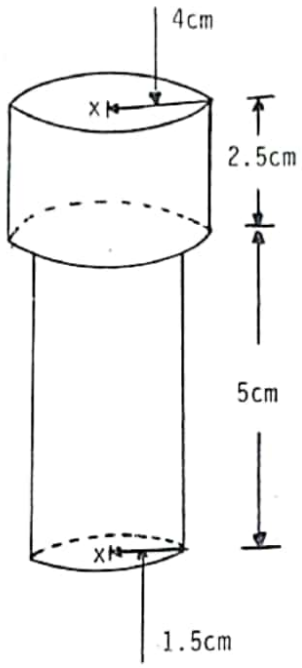
$\overline{AB}$ = 7cm, $\overline{AC}$ = 7cm and $\overline{BC}$ = 4cm.

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

(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 $\pi = 22/7$).

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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.

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