

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

**041**

**BASIC MATHEMATICS**  
(For School Candidates Only)

**Time: 3 Hours**

**Tuesday, 9<sup>h</sup> October 2012 a.m.**

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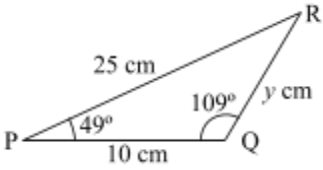
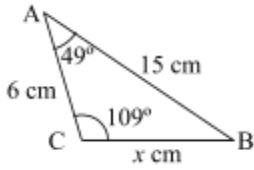
**Instructions**

1. This paper consists of sections A and B.
2. Answer **all** questions in section A and **four (4)** questions from section B. Each question in section A carries 6 marks while each question in section B carries 10 marks.
3. **All** necessary working and answers for each question attempted must be shown clearly.
4. Mathematical tables may be used.
5. Calculators and cellular phones are **not** allowed in the examination room.
6. You are advised to spend not more than **two (2)** hours on section A and the remaining time on section B.
7. Write your **Examination Number** on every page of your answer booklet(s).
8. The following constants may be used:
  - (a) The radius of the earth  $R = 6370km$
  - (b)  $\pi = \frac{22}{7}$

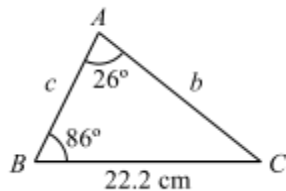
## SECTION A (60 Marks)

Answer **all** questions in this section.

1. (a) By using mathematical tables, evaluate  $\frac{\sqrt[3]{0.0072} \times (81.3)^2}{\sqrt{23140}}$  to three significant figures.
- (b) Rationalize  $\frac{2+\sqrt{3}}{1-\sqrt{3}}$
2. (a) Find the value of  $x$  for which  $2^x \cdot 16 = \frac{1}{8^x}$
- (b) Solve  $\log_a(x^2 + 3) - \log_a x = 2\log_a 2$
3. (a) Mr. Bean lived a quarter of his life as a child, a fifth as a teenager and a third as an adult. He then spent 13 years in his old age. How old was he when he died?
- (b)  $A$  and  $B$  are subsets of the universal set  $U$ . Find  $n(A \cap B)$  given that  $n(A) = 39$ ,  $n(A' \cap B') = 4$ ,  $n(B') = 24$  and  $n(U) = 65$ .
4. Given that  $\underline{a} = (3, 4)$ ,  $\underline{b} = (1, -4)$  and  $\underline{c} = (5, 2)$  determine:
  - (a)  $\underline{d} = \underline{a} + 4\underline{b} - 2\underline{c}$ ;
  - (b) magnitude of vector  $\underline{d}$ , leaving your answer in the form  $m\sqrt{n}$ ;
  - (c) the direction cosines of  $\underline{d}$  and hence show that the sum of the squares of these direction cosines is one.
5. (a) If polygons  $X$  and  $Y$  are similar and their areas are  $16\text{cm}^2$  and  $49\text{cm}^2$  respectively, what is the length of a side of polygon  $Y$  if the corresponding side of polygon  $X$  is  $28\text{cm}$ ?
- (b) (i) Show whether triangles  $PQR$  and  $ABC$  are similar or not
 



- (ii) Find the relationship between  $y$  and  $x$  in the triangles given above.
6. (a) The power ( $P$ ) used in an electric circuit is directly proportional to the square of the current ( $I$ ). When the current is 8 Ampere (A), the power used is 640 Watts (W).
  - (i) write down the equation relating the power ( $P$ ) and the current ( $I$ ).
  - (ii) calculate the current ( $I$ ) when the circuit uses 360 Watts.
- (b) If  $x * y$  is defined as  $\frac{1}{2}(x + y)$ , find  $(5 * 2) * (3 * 4)$ .

7. (a) By selling an article at shs. 22,500/= a shopkeeper makes a loss of 10%. At what price must the shopkeeper sell the article in order to get a profit of 10% ?
- (b) An alloy consists of three metals  $A$ ,  $B$  and  $C$  in the proportion  $A : B = 3 : 5$  and  $B : C = 7 : 6$ . Calculate the proportion  $A : C$ .
8. (a) If the 5<sup>th</sup> term of an arithmetic progression is 23 and the 12<sup>th</sup> term is 37, find the first term and the common difference.
- (b) Find the sum of the first four terms of a geometric progression which has a first term of 1 and a common ratio of  $\frac{1}{4}$ .
9. (a) Find the length  $AC$  from the figure below:



- (b) A ladder reaches the top of a wall 18m high when the other end on the ground is 8m from the wall. Find the length of the ladder.
10. (a) Solve for  $x$  if  $\frac{6}{x-4} = 1 + \frac{4}{x}$
- (b) If the sum of two numbers is 3 and the sum of their squares is 29, find the numbers.

### SECTION B (40 Marks)

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

11. Anna and Mary are tailors. They make  $x$  blouses and  $y$  skirts each week. Anna does all the cutting and Mary does all the sewing. To make a blouse it takes 5 hours of cutting and 4 hours of sewing. To make a skirt it takes 6 hours of cutting and 10 hours of sewing. Neither tailor works for more than 60 hours a week.
- (a) For sewing show that  $2x + 5y \leq 30$
- (b) Write down another inequality in  $x$  and  $y$  for the cutting.
- (c) If they make at least 8 blouses each week, write down another inequality.
- (d) Using 1cm to represent 1 unit on each axis, show the information in parts (a), (b) and (c) graphically. Shade only the required region.
- (e) If the profit on a blouse is shs. 3,000/= and on a skirt is shs. 10,000/=, calculate the maximum profit that Anna and Mary can make in a week.

12. In a survey of the number of children in 12 houses, the following data resulted: 1, 2, 3, 4, 2, 2, 1, 3, 4, 3, 5, 3
- Show this data in a frequency distribution table.
  - Draw a histogram and a frequency polygon to represent this data.
  - Calculate the mean and mode number of children per house.
13. (a) An open rectangular box measures externally  $32\text{cm}$  long,  $27\text{cm}$  wide and  $15\text{cm}$  deep. If the box is made of wood  $1\text{cm}$  thick, find the volume of wood used.
- (b) Find the distance (in km) between towns  $P(12.4^\circ\text{S}, 30.5^\circ\text{E})$  and  $Q(12.4^\circ\text{S}, 39.8^\circ\text{E})$  along a line of latitude, correctly to 4 decimal places.
14. (a) The following balances were extracted from the ledgers of Mr. and Mrs. Mkomo business on 31st January. Prepare a trial balance.
- |               |          |                   |          |
|---------------|----------|-------------------|----------|
| Capital       | 30,000/= | Insurance         | 3,000/=  |
| Furniture     | 25,000/= | Cash              | 18,000/= |
| Motor vehicle | 45,000/= | Discount received | 7,000/=  |
| Sales         | 68,000/= | Discount allowed  | 4,000/=  |
| Purchases     | 54,000/= | Drawing           | 12,000/= |
| Creditors     | 76,000/= | Electricity       | 5,000/=  |
| Debtors       | 15,000/= |                   |          |
- (b) Determine the gross profit and the net profit from the information given below.
- |                  |          |
|------------------|----------|
| Sales            | 38,000/= |
| Opening stock    | 8,000/=  |
| Purchases        | 25,000/= |
| Electricity      | 4,000/=  |
| Discount allowed | 2,000/=  |
| Closing stock    | 5,000/=  |
15. (a) Find the value of  $k$  such that the matrix  $\begin{pmatrix} 2k + 2 & k \\ 4k - 3 & k + 3 \end{pmatrix}$  is singular.
- (b) The vertices of  $ABC$  are  $A(1, 2)$ ,  $B(3, 1)$  and  $C(-2, 1)$ . If triangle  $ABC$  is reflected on the x-axis, find the coordinates of the vertices of its image.
- (c) Solve the following simultaneous equations by matrix method.
- $$\begin{cases} 2x + 3y - 2 = 0 \\ -9y + 8x - 1 = 0 \end{cases}$$
16. A box contains 7 red balls and 14 black balls. Two balls are drawn at random without replacement.
- Draw a tree diagram to show the results of the drawing.
  - Find the probability that both are black.
  - Find the probability that they are of the same colour.
  - Find the probability that the first is black and the second is red.

(e) Verify the probability rule  $P(A) + P(A') = 1$  by using the results in part (b).