**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** **Tuesday, 04th November 2014 p.m.**

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**Instructions**

1. This paper consists of sections A and B.
2. Answer **all** questions in sections A and **four (4)** questions from section B. Each question in section A carries **six (6)** marks while each question in section B carries **ten (10)** marks..
3. All necessary working and answers for each question must be shown clearly.
4. Mathematical tables may be used.
5. Calculators and cellular phones are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

## SECTION A (60 Marks)

Answer **all** questions in this section.

1. (a) Kisiki and Jembe are riding on a circular path. Kisiki completes a round in 24 minutes whereas Jembe completes a round in 36 minutes. If they both started at the same place and time and go in the same direction, after how many minutes will they meet again at the starting point?

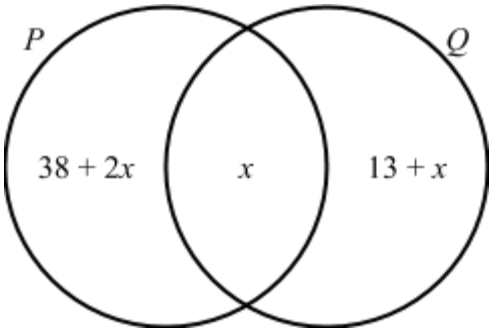
   (b) An empty bottle weighs 115 grams. If 45 tablets each weighing $\frac{3}{5}$ gram are put in the bottle, what is the total weight?

2. (a) (i) Express $(\sqrt{3}+5)^2$ in the form $a+b\sqrt{3}$, where $a$ and $b$ are integers.

   (ii) Express $\frac{(\sqrt{3}+5)^2}{(7\sqrt{3}+2)}$ in the form $p+q\sqrt{3}$, where $p$ and $q$ are rational numbers.

   (b) Solve for $x$ if $\left(\frac{1}{81}\right)^{-6x} \times 81 = \sqrt{9}$.

3. (a) The Venn diagram below shows the number of elements in sets $P$ and $Q$.




   If $n(P \cup Q) = 95$, calculate:

   (i) The value of $x$,

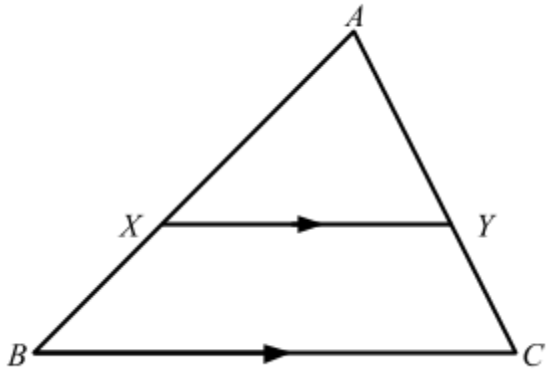
   (ii) $n(P \cap Q)'$.

   (b) The age of Timothy is $\frac{1}{8}$ the age of his father. If the sum of their ages is $54$ years, find the age of the father.

4. (a) Find the equation of the line passing through $(6,4)$ and perpendicular to the line whose equation is $12x+6y=9$.

   (b) If $\underline{a} = 2\underline{i} + 3\underline{j}$, $\underline{b} = 19\underline{i} - 15\underline{j}$ and $\underline{c} = 5\underline{i} - 7\underline{j}$, find the value of $x$ such that $x\underline{a} + y\underline{c} = \underline{b}$.

5. (a) Given that $XY = 2cm$, $BC = 3cm$ and area of $XYCB = 10cm^3$, calculate the area of triangle $AXY$.




(b) Determine the length of one side of a regular quadrilateral inscribed in a circle of radius $10cm$.

6. (a) Juma sells one litre of milk at sh 600. How many litres of milk will Juma sell to get sh 208,800?

(b) The compression $l$ of a spring is directly proportional to the thrust, $T$ newtons exerted on it. If a thrust of 2 newtons produces a compression of $0.4cm$, find:
(i) The compression when the thrust is 5 newtons,
(ii) The thrust when the compression is $0.7cm$.

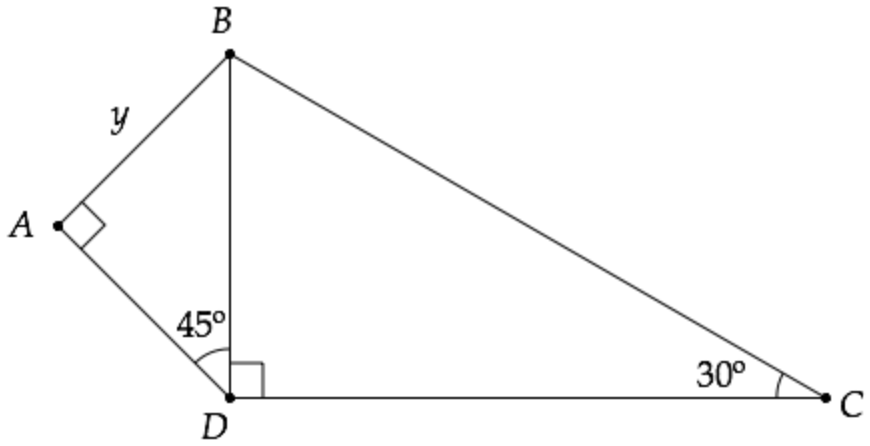
7. (a) Kieku has to share 80 books with his younger sisters Upendo and Okuli. He decided that for every 2 books that Okuli gets, Upendo gets 3 and he gets 5 books. Find the number of books each gets.

(b) Nyaumwa invested a certain amount of money in a bank which pays interest rate of 6 percent after every 6 months. After 5 years, his total savings were sh 9,600,000. Determine the amount of money Nyaumwa invested initially.

8. (a) The $20^{th}$ term of an arithmetic progression is 60 and the $16^{th}$ term is 20. Find the sum of the first 40 terms.

(b) A shopkeeper invested sh 4,800,000 for 5 years. If the amount of money accumulated is sh 7,730,450, calculate the compound interest rate.

9. (a) Find the length marked $y$ in four significant figures.




(b) A $4m$ ladder rests against a vertical wall with its foot $2m$ from the wall. How far up the wall does the ladder reach? Give your answer in two decimal places.

10. (a) Use the quadratic formula to solve $x^2 + 4x - 12 = 0$

(b) A garden measuring 12 by 16 metres is to have a pedestrian pathway of equal width constructed all around it, increasing the total area to 285 square metres. What will be the width of the pathway?

**SECTION B (40 Marks)**

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

11. A farmer has 20 hectares for growing tomatoes and cabbages. The cost per hectare for tomatoes is sh 48,000 and for cabbages is sh 32,000. The farmer has budgeted sh 768,000. Tomatoes require one man-day per hectare and cabbages require two man-days per hectare. There are 36 man-days available. The profit on tomatoes is sh 160,000 per hectare and on cabbages is sh 192,000 per hectare. Find the number of hectares of each crop the farmer should plant to maximize the profit.

12. The heights of some plants grown in a laboratory were recorded after 5 weeks. The results are shown in the following table:

| Height (cm) | 11 - 15 | 16 - 20 | 21 - 25 | 26 - 30 | 31 - 35 | 36 - 40 |
|---|---|---|---|---|---|---|
| Frequency | 4 | 8 | 20 | 21 | 12 | 3 |

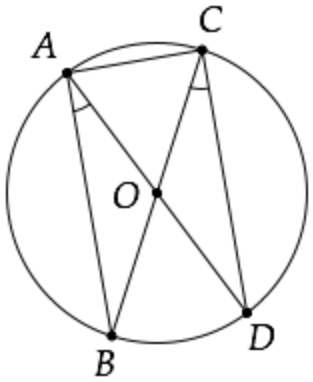
(a) Calculate the mean and mode.

(b) Draw a cumulative frequency curve for the data.

(c) Estimate the median from the graph.

13. (a) Prove that the sizes of the angles in the same segment of a circle are equal.

(b) In the figure below, $O$ is the centre of the circle and $\overline{AD}$ bisects angle $BAC$. Find angle $BCD$.




(c) Kicheko and Mtakuja are two villages on latitude $60°S$. The distance between Kicheko and Mtakuja measured along the parallel of latitude is $1111km$. Find the difference between their longitudes in two significant figures.

14. Mr. Kijembe started business on 16th March, 2011 with capital in cash 2,066,000/=
March 17 bought goods for Cash 1,000,000/=
19 bought shelves for Cash 1,100,000/=
20 sold goods for Cash 900,000/=
21 purchases for Cash 800,000/=
22 sold for Cash 1,400,000/=
26 paid Rent 300,000/=
Record the above transactions in a cash account ledger and extract a trial balance. State two uses of the trial balance you have prepared.

15. (a) (i) Determine a matrix $M$ which represents a reflection in the line $y-x=0$
(ii) Find the image of the line $x+2y-4=0$ after a reflection in the line $y-x=0$.

(b) (i) If $A=\begin{pmatrix}3 & 2\\ 4 & -1\end{pmatrix}$ find $|A|$ and $A^{-1}$.

(ii) Use the inverse matrix obtained in (b)(i) to solve $3x+2y=12$ and $4x-y=5$.

16. (a) A bag contains 6 white balls and 3 yellow balls. A ball is selected at random and not replaced. Another ball is then selected. Find the probability of selecting one white ball and one yellow ball.

(b) Given $f(x)=\begin{cases}-4 & \text{when} \quad x<-1\\ x^2+1 & \text{when} \quad -1\le x\le 2\\ 5 & \text{when} \quad x\ge 2\end{cases}$

(i) Sketch the graph of $f(x)$.
(ii) State the domain and range of $f(x)$.
(iii) Is $f(x)$ a one-to-one function? Give reason(s).