GHANA NATIONAL COLLEGE, CAPE COAST

Mock Examination, March 2024

GENERAL MATHEMATICS 2

DURATION: 2 ½ Hours

Name: ……..……..

Class: ……..…

Index Number: ….……

GHANA NATIONAL COLLEGE, CAPE COAST

Mock Examination, March 2024.

GENERAL MATHEMATICS / MATHEMATICS (CORE) 2

[100 marks]

Instructions:

- *Write your* **name** *and* **index number** *in* **ink** *in the spaces provided above.*
- *Answer* **ten** *questions in all:* **all** *the* ***five*** *questions in Section* A *and any* **five** *questions from Section* B.
- *In each question, all the necessary details of working, including rough work,* **must** *be shown with the answer.*
- *Give answers as accurately as data and tables allow.*
- *Graph papers are provided for your use in the examination.*
- *The use of non-programmable, silent and cordless calculator is allowed.*

Paper 2

Section A

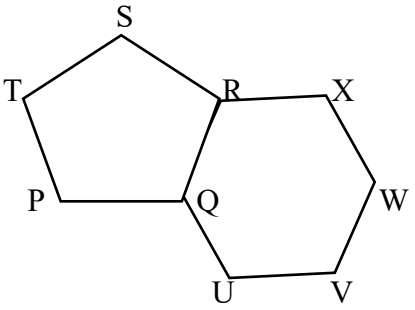
[40 marks]

Answer **All** Questions in this section. **All** questions carry **equal** marks

1. In a talent hunt competition of 35 artistes, they indicated their interest in playing Piano, Guitar and Trumpet. Out of the number, 24 performed Piano, 16 Guitar and 18 Trumpet. 8 performed Piano only, 2 performed Guitar only and 6 performed Trumpet only. 4 played all the three instruments while 7 performed Piano and Guitar only.
    a. illustrate the information in a Venn diagram
    b. Find the number of artistes who preferred
        i. only two types of instruments
        ii. only one type of instrument.

2. In the frustum of a cone, the bottom diameter is thrice the top diameter.
    a. If the height of the frustrum is 12 cm, calculate the height of the whole cone.
    b. Given that the volume of the whole cone is 39,600 cm^3, find correct to four significant figures, the radius. [Take $\pi = \frac{22}{7}$]

3. Clara walked $2x$ km from a village Q to visit a friend in another village, R on a bearing of 065°. After spending some time with her friend, she continued to a nearby town, S, $3x$ km on a bearing of 155°. If the distance between Q and S is $6\sqrt{13}$ km:
   a. illustrate the information in a diagram
   b. calculate, correct to the nearest whole number, the
      i. the value of x
      ii. the bearing of S from Q

4. 

In the diagram above, PQRST is a regular pentagon and QUVWXR is a regular hexagon. Find:
   a. < PTS
   b. < QUV
   c. < SRX

5. The mean age of a second-year class of a school is $18\frac{2}{5}$ years. At the end of the promotion examination, 3 students aged 20, 19 and 19 years were repeated. the new mean age of the class became $18\frac{1}{3}$. Calculate the number of students who were in the class before the promotion examination.

Section B

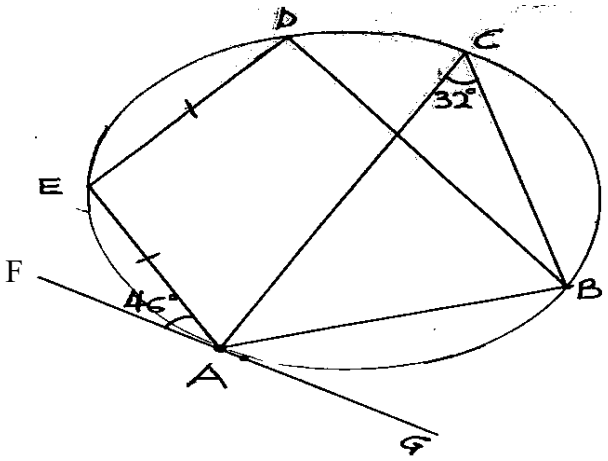
[60 marks]

Answer any **five** *questions* **only** *from this section.* **All** *questions carry* **equal** *marks.*

6. a. In a certain spider web, the length of the shortest and longest threads are 3.4 mm and 50.2 mm respectively. The successive equally spaced threads are 1.2 mm apart. If the length of the cross threads form an Arithmetic Progression (A.P.), find the number of cross threads.

   b. At noon, a cargo plane leaves Accra airport and heads towards Kumasi 500 km away at 180 km/h. At 1:00 pm, a jet takes off from Accra and flies on the same course at 450 km/h. What time will the jet overtake the cargo plane?

7. a.



Not drawn to scale

In the diagram above, < ACB = 32°, <EAF = 46°, FAG is a tangent to the circle at A, and |AE| = |ED|. Find:

i. < BDE

ii. < AED

b. Construct a multiplication ⊗ table in modulo 5 and use it to:

i. evaluate (3 ⊗ 4) ⊗ (2 ⊗ 4).

ii. solve the equation: m ⊗ m = m + m

8. a. Using a ruler and pair of compasses only,

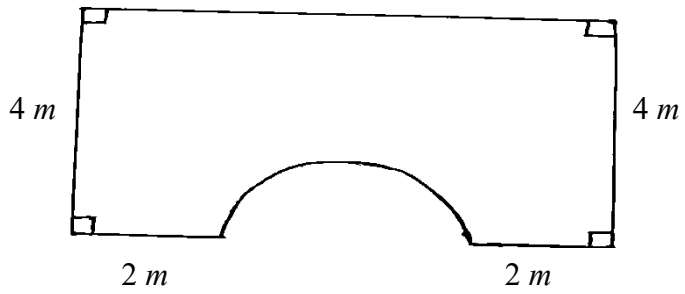
i. Construct ΔWXZ such that |WX| = 8 cm, < ZWX = 45°, < WZX = 60°.

ii. Locate a point Y such that WXYZ form parallelogram.

iii. Find the perimeter of the parallelogram.

b. ***p*** varies directly as ***q*** and inversely as twice the square of ***r***. When $p = 1\frac{1}{2}$, $q = \frac{2}{3}$ and $r = \frac{1}{2}$, express ***r*** in terms of p and q.

9. a.



Not drawn to scale

The diagram is the side view of the London Bridge. The perimeter of the side view is 34 *m*. find the area of the side view.

b. P (3, -1), Q (-1, 2) and R (3, 4) are points in the cartesian plane, where O is the origin. Find the constants ***m*** and ***n*** if : $m\overrightarrow{OP} + n\overrightarrow{OQ} = \overrightarrow{OR}$

10. The cumulative frequency distribution table below shows the heights of trees (in *cm*) in GNC forest.

Heights less than (*cm*)	Cumulative frequency
50.5	5
60.5	12
70.5	22
80.5	30
90.5	37
100.5	42
110.5	48
120.5	50

a. Use this information to generate a frequency distribution table of equal class intervals.

b. Draw a histogram to represent the information.

c. Use your histogram to estimate the modal height of the trees.

11. a. Given that the function $f : x \rightarrow \frac{2x}{(1-x)(1+x)}$

Find the possible values of x if $f(x) = \frac{3}{4}$

b. Solve the equation: $2\log_{16}(3x+1) = \log_3 9$

c. If $1 - \sin x = \frac{2}{5}$ and $0^o < x < 90^o$, evaluate: $2\cos x - \tan x$

12. a. Using a scale of 2cm: 2 units on both axes, draw:

i. Δ ABC with $\overrightarrow{OA} = \begin{pmatrix}2\\2\end{pmatrix}$, $\overrightarrow{AB} = \begin{pmatrix}4\\2\end{pmatrix}$ and $\overrightarrow{BC} = \begin{pmatrix}-2\\3\end{pmatrix}$

ii. the image triangle $A_1B_1C_1$ of Δ ABC under a rotation through 90^o anticlockwise about the origin where $A \rightarrow A_1$, $B \rightarrow B_1$ and $C \rightarrow C_1$.

iii. the image triangle $A_2B_2C_2$ of $\Delta A_1B_1C_1$ under a translation by the vector $\begin{pmatrix}8\\-8\end{pmatrix}$ origin where $A_1 \rightarrow A_2$, $B_1 \rightarrow B_2$ and $C_1 \rightarrow C_2$.

b. Find the equation of the line joining A_2 to C_1.

c. Express $\overrightarrow{AC}_2$ in the form (K, θ^o), where K is the magnitude and θ^o is the bearing.

13. a. Two vehicles **A** and **B,** 450 *km* apart on the same horizontal road, starts to move towards each other at the same time and meet after 2 *hours*. If vehicle **B** travels $1\frac{1}{2}$ times as fast as vehicle **A**, find the speed of each vehicle.

b. Bola sold his car for \$6,900.00 and made a profit of 15%. Calculate his percentage profit if he had sold it for \$6,600.00.

End of Paper