Instructions:
Answer **only 3** questions in this paper, one from each section
Show your working clearly

SECTION A (Compulsory)

Item one .

Mr. Kapere is one of the prominent world history researchers in Mengo town,but in his recent research on the conflicts between USA and Iran he found a document with maths that interpretation was really hard. It read "During the 1988 operation praying mantis where United States under the presidency of Ronald Reagan attacked Iran under supreme leader Ruhollah Khomeini , the number of US warships (destroyers) and Iran's Boghammar boats used can be represented by w and b respectively. Where $w = 16^x$, x is the positive value in the solution of the equation $\cos^{-1} 2x = \frac{\pi}{6} - \sin^{-1} x$ and $b = 2^n - 2$, n is the number of angles from the solution $\cos 2\theta + \cos 3\theta + \cos \theta = 0$ for $0^0 \le \theta \le 180^0$. The first US warship used to take a straight route passing through the point (1, -2 , 3) and parallel to another straight route represented by the equation $\frac{1-x}{-2} = \frac{y+3}{1} = \frac{z+7}{-1}$ where as the first Iranian Boghammar boat took a straight route passing through the points (- 1 , 3 , 7) and (-3, 4 , 9) .Bombing and shoting from either sides only started when the first US warship met with the first Iranian Boghammar at the strait of Hormuz "

Task: As a mathematics student help Mr.Kapere determine the;

(a) number of US warships and Iranian Boghammar boats that were used in the 1988 operation praying mantis.
(b) angle between the routes taken by the first US warship and the first Iranian Boghammar
(c)coordinate representing the location of the strait of Hormuz

SECTION B (compulsory)

Item two

In this modern era shools widely use electric bells but the time taken for magnetization of the coil in seconds (T) and number of cycle repeats n are related by the equations $7n - T = 6$ and $\log_2 n + 2\log_4 T = 4$. The ranges of quantity of electricity Q In watts required to have a successful day of ringing the bell at different intervals can be obtained from $\frac{Q+1}{2-Q} \ge 1$.

In an attempt to move with this modern era, at Kapiro primary school the election committee invited a parent of each of the 8 students contesting for the post of time keeper to lay down the best strategy concerning purchasing the electric bells and how to manage them. On the long waiting bench ,each parent was requested to sit next to his or her child and during the meeting one parent suggested that the school should save Ugsh200,000 at the

beginning of every month at a compound interest of 5% per month. Another parent suggested that saving should be done every month where money saved the previous month is tripled in the next month and that they should start with Ugshs20,000. The school has a budget of at Ugshs 3000,000 for the electric bell project

Task

You have been invited to guide the school in obtaining the;

(a) time taken for magnetization of the coil and the number of cycle repeats
(b) range of quantity of electricity that can be used in ringing the bell on a day
(c) possible ways in which parents and their children can sit on the long waiting bench
(d) best option of raising the money for the electric bell project as compared to required time

SECTION C (Attempt only one question)

Item three

Curve tracing is greatly applied in engineering and civil design to create safe, stable and smooth roadways, railways and bridges. However a young engineer Mapito who was previously used to linear curve equations has just obtained a contract with a road and bridge construction company and was given a design in a rational function $y=\frac{x(x-3)}{(x-1)(x-4)}$.The company also set a time frame of days in which any design can be completed and this is given by the expression $\frac{64}{\pi}\int_0^{\frac{\pi}{2}}(\cos^4 2x)dx$

Note $\left(\pi \neq \frac{22}{7}\right)$ but rather associated with angles

Task: As a mathematics student without using calculators , show all the details and help engineer Mapito to come up with the sketch of the design and determine the number of days available to complete the design

Item four

A telephone company wants to construct a mast on a hill of Nakapelimoru village in Kotido district to improve their network. Three different spots A, B and C have been identified represented by equations $y=\frac{2^{3x}\ln 2x}{\cos x}$, $p=\frac{e^{2x}\tan^{-1}x}{x}$ and $g=x^3e^{3x}\sin 2x$

The mast is to be constructed in the steepest spot when $x=0.5$

Irrespective of the spot selected, the base of the mast is to be designed as a right circular cone inclined at an angle of 60^0 and whose rate of change of height is 4.5m/s

Task

Help the telephone company to make the right choice of the spot and also determine the rate of change of the volume of the base of the mast if its height is 9m

END

Deutsch.