$\qquad$
$\qquad$
c) Use the graph drawn above in (b) to determine the maximum possible profit that can be made. (2 marks)

121/2
MATHEMATICS
PAPER 2
July/August 2015
$21 / 2$ Hours

## NAROK SOUTH SECONDARY SCHOOLS JOINT EXAMINATION <br> Kenya Certificate of Secondary Education (K.C.S.E) <br> MATHEMATICS <br> Paper 2 <br> $21 / 2$

## INSTRUCTIONS TO CANDIDATE

- Write your name and index number in the spaces provided at the top of this page.
- This paper contains two sections: Section $A$ and $B$.
- Answer all the questions in Section $A$ and any five questions from Section B.
- Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- Marks may be given for correct working even if the answer is wrong
- Non-programmable silent electronic calculators and KNEC Mathematical tables may be used.


## FOR EXAMINER'S USE ONLY

SECTION A

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | TOTAL |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

SECTION B

| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | TOTAL |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |  |  |

GRAND
TOTAL

## SECTION A

Answer all the questions in this section.

1. The length and breadth of a rectangular paper were measured to the nearest centimeter and found out to be 18 cm and 12 cm respectively. Find the relative percentage error of its area.
(2 marks)
2. A private college offers two types of courses: Technical course and business course. The college has a capacity of less than 20 students. There must be more technical students than busines students. The number of business students must be more than three and the number of technical students must not be more than 12 in order for the college to operate. The college makes a profit of Kshs 6,000 per business student and Kshs 4,000 per technical student.
a) Form all the linear inequalities which represent the above information.
b) On the grid, draw all the inequalities and shade the unwanted region.
(4 marks)

3. Data collected from an experiment involving two variable x and y was created as shown in the table below.

| x | 11 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| y | -0.3 | 0.5 | 1.4 | 2.5 | 3.8 | 5.2 |

The variables are known to satisfy a relation of the form $y=a x^{3}+b$ where a and b are constants. a) For each value of $x$ in table above, write down the value of $x 3$ correct to 2 d.p.( 2 marks)
4. Given that $\sqrt{2}=1.471$ and $\sqrt{2}=1.743$, evaluate without using a calculator $\frac{3}{\sqrt{3}-\sqrt{2}}$ (3 marks)
correct to 3 s.f. correct to 3 s.f.
5. Solve for x in $\log (3 x+4)-\log (3-x)=1$

7. The area of triangle ABC is $4.2 \mathrm{~cm}^{2}$. The triangle ABC is transformed using the matrix $\left(\begin{array}{cc}-3 & -4 \\ 2 & 2\end{array}\right) \quad$ Calculate the area of the image of triangle ABC . (3 marks)
8. A plot of land was valued at Kshs 600,000 at the start of 2005. It appreciated by $24 \%$ during 2005. Thereafter every year, it appreciated by $8 \%$ of its previous year's value, find a) the value of the land at the start of 2006
b) the value of the land at the end of 2008 .
22. a) Complete the table below, giving your values correct to 2 decimal place.
(2 marks)

| x | $0^{0}$ | $15^{\circ}$ | $30^{\circ}$ | $45^{\circ}$ | $60^{\circ}$ | $75^{\circ}$ | $90^{\circ}$ | $105^{\circ}$ | $120^{\circ}$ | $135^{\circ}$ | $150^{\circ}$ | $165^{\circ}$ | $180^{\circ}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $\cos 2 \mathrm{x}$ | 1.00 | 0.87 |  | 0.00 | -0.50 |  | -1.00 | -0.87 | -0.50 |  | 0.50 | 0.87 | 1.00 |
| $\sin (\mathrm{x}+30)$ | 0.50 | 0.71 |  | 0.97 | 0.10 |  | 0.87 | 0.71 | 0.42 |  | 0.00 |  |  |

b) On the grid below and using same axes, the graphs of $y=\cos 2 x$ and $y=\sin \left(x-30^{\circ}\right)$ for $0^{\circ} \leq \mathrm{x} \leq 180^{\circ}$
Take scale, 1 cm for 150 on x - axis

c) Find the period of the curve $y=\cos 2 x$
(1 mark)
d) Using the graph n part (b) above, estimate the solutions to the question. $\sin (\mathrm{x}+30)=\cos 2 \mathrm{x}$
21. The table below shows marks scored by students in Maths end term exam.

| Marks scores | $20-29$ | $30-39$ | $40-49$ | $50-59$ | $60-69$ |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Number of students | 5 | 11 | 20 | 14 | 10 |

a) Draw a cumulative frequency curve on the grid provided. (5 marks)

b) Using the curve drawn in (a) above, determine;
i) The quartile deviation range.
(2 marks)
ii) The percentage of students who passed the test if a student had to score more than 46 marks in order to pass the test.. ( 3 marks)
10. Factorize and simplify the expression.
(3 marks)

$$
\frac{12 x^{2}+a x-6 a}{9 x^{2}-4 a^{2}}
$$

11. A solid metal sphere of radius 8.4 cm was melted material used to make a cube. Find to 3 significant figures the length of the side of the cube.
12. A point of $\mathrm{P}\left(30^{\circ} \mathrm{S}, 45^{\circ} \mathrm{E}\right)$ and point $\mathrm{Q}\left(30^{\circ} \mathrm{S}, 55^{\circ} \mathrm{W}\right)$ are on the surface of the earth. Calculate the shortest distance along a circle of latitude between the two points. (Radius of earth $=6370$ ) (3 marks)
13. 

State the inequalities which define the region R in the figure
(3 marks)

20. The figure below represents a cuboid ABCDEFGH in which $\mathrm{FG}=4 \mathrm{~cm}, \mathrm{GH}=6 \mathrm{~cm}$ and $\mathrm{HC}=$ 8 cm .


Calculate
a) the length of PC.
(3 marks)
b) i) the size of the angle between the lines FC and FH.
ii) the size of the angle between the line AB and FH .
(2 marks)
c) the size of the angle between the planes ABHE and the plane FGHE.
(3 marks)
19. Use a ruler and a pair of compass only for all the construction in this question. A triangular plot of land ABC is such at that $\mathrm{AB}=280 \mathrm{~cm}, \mathrm{AC}=300 \mathrm{~m}$ and angle $\mathrm{BAC}=75^{\circ}$.
a) Construct this plot of land using the scale 1 cm rep 50 m .
(4 marks)
b) $\quad \mathrm{A}$ borehole P is equidistant from side BA and BC and lies on the perpendicular from point C to side AB . Locate the position of P . (4 marks)
15. A man deposited his money in a saving bank on a monthly basis. Each deposit is exceeds the previous one by Ksh. 800. If he started by depositing Ksh 4,000, how much will he have deposited in 16 months.
16. The points which coordinates $(5,5)$ and $(-3,-1)$ are the ends of a diameter of a circle centre A. Determine;
a) the coordinates of A .
(1 mark)
b) the radius of the circle
(1 mark)
c) the question of the circle in the form $x 2+y 2+a x+b y=0$ where $\mathrm{a}, \mathrm{b}$ and c are constants.

## SECTION II

## (Answer any five questions

17. A coffee merchant mixes two blend of coffee;
a) priced at sh. 50 and sh. 75 per kg in the ratio $3: 2$ by weight
i) Find the profit if he sells the mixture at shs. 80 per kg. (3 marks)

The price of the sh. 50 coffee goes up by $110 \%$. If by selling the mixture by shs. 90 per kg., the merchant intends to make the same percentage profit as before, find the ratio in which he has to mix the two blends.
(3 marks)
18. M is the mid-point of the side AB of a triangle $O A B$. P lies on $\overrightarrow{O M}$ such that $\overrightarrow{O P}=\frac{2}{3} \mathrm{OM}$ and AP produces cuts OB at Q . If $\overrightarrow{O A}=\underline{\mathrm{a}} . \overrightarrow{O B}=\underline{\mathrm{b}}=$ and also $\overrightarrow{O Q}=\overrightarrow{K O B}$, express in terms of $\mathfrak{a}$ and $\underline{\mathrm{b}}$;
i) $\overrightarrow{A B}$
ii) $\overrightarrow{Q M}$
iii) $\overrightarrow{O P}$
iv) $\overrightarrow{A P}$
v) Use the fact that $Q P=r A P$ to find $r$ and $K$
(4 marks)

