456/2
MATHEMATICS
Paper 2
2 Hours 30 minutes

RESOURCEFUL MOCK EXAM 2

Mathematics Paper 2
2 hours 30 minutes.

Instructions to candidates:

- Answer **all** the questions in **Section A** and **not** more than **five** questions from Section B.
- All necessary calculations **must** be done on the same page as the rest of the answer. Therefore no paper should be given for rough work.
- Mathematical tables with lists of formulae and squared paper are provided.
- Silent, non-programmable scientific calculators may be used.
- State the degree of accuracy at the end of the answer to each question attempted using a calculator or tables; and indicate '**cal**' for calculator, or **'Tab'** for mathematical tables.

SECTION A (40 marks)

1.Given that $\frac{3+\sqrt{2}}{1-\sqrt{2}} = a - b\sqrt{2}$. Find the values of a and b. (04 marks)

2. Evaluate $\frac{8\frac{2}{5} - 3\frac{2}{3} \div 1\frac{5}{6}}{1\frac{1}{5} + 1\frac{1}{2} \times 1\frac{1}{3}}$ (04 marks)

3. Given that $M = \{ \text{the first five multiples of } 3 \}$ and $S = \{ \text{the first five square numbers} \}$,

Find; (a) $M \cap S$

(b) n ($M \cap S$) (04 marks)

4. Without using tables or calculator, evaluate; $\log_{10} 7 - \log_{10} 35 + \log_{10} 5000$. (04 marks)

5. Given that **OB** = $\begin{pmatrix} 5 \\ -8 \end{pmatrix}$ and **OA** = $\begin{pmatrix} -16 \\ -36 \end{pmatrix}$

(a) Determine the column vector of **AB**

(b) Hence, find the length of vector **AB.** (04 marks)

6.If $f(x) = \frac{3x}{2x+1}$ find $f^{-1}(x)$.Hence evaluate $f^{-1}(2)$. (04 marks)

7.A line whose equation is 2x + 3y = 6 passes through the points (0, k).

Find the;

(i) Gradient of the line.

(ii) Value of k. (04 marks)

8. Given that 729km^2 of land on the ground is represented by an area of 9 cm^2 on a map, find the scale of the map. (04 marks)

9. Three warning lights, flash at intervals of 18, 21 and 28 seconds respectively. Given that they all start flashing together after how long will they again flash together? (04 marks)

10. A shopkeeper sells 7kg of rice at shs. 12600. If the cost is then increased by 50%, how much will 3kg of rice cost? (04 marks)

SECTION B(60 marks)

11.a) Given that $f(x)=ax-b$, $f(2)=10$ and $f(1)=7$, find the values of a and b.

b) If $f(x)=\dfrac{2x-1}{x^2-9}$, find the values of x for which the function $f(x)$ is undefined.

c) Given that $f(x)=x^2+7$ and $g(x)=x-2$, find the values of x for which

$fg(x)=\dfrac{38-x^2}{2}$. (12marks)

12. A group of tourists visited Farm gate Limited, a company offering catering services. It was found out that 20 ate Rice (R) , 30 ate Posho(P) and 15 ate Matooke(M). 6 ate Rice and Posho, 4 ate Posho and Matooke, and 5 ate Rice and Matooke. The number of visitors who ate Posho only is equal to twice the number of visitors who ate Rice only. All the visitors ate atleast one of the foods.

a) Represent the information on a Venn diagram. (05marks)

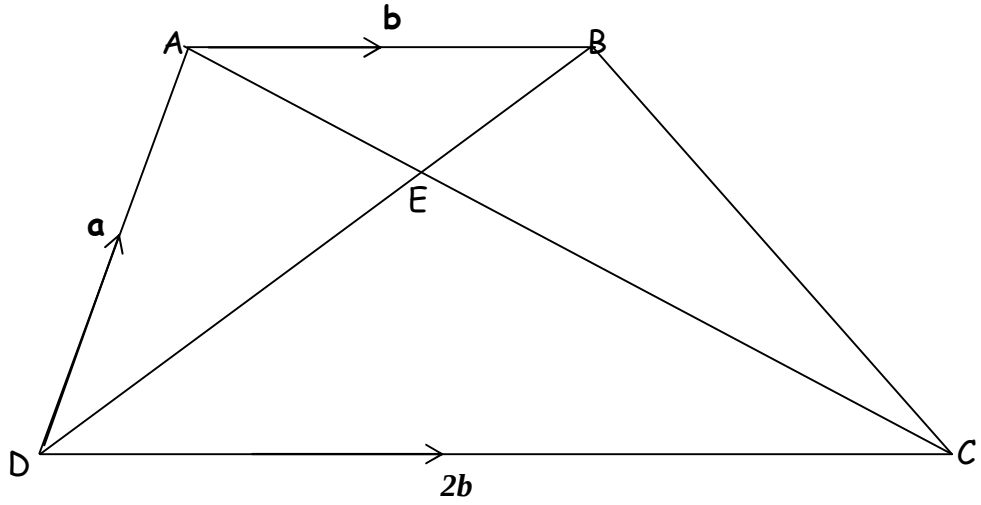
b) Find the number of visitors

i) who ate all the three foods.

ii) in the group (05marks)

c) If a visitor is chosen at random from the group, find the probability that the visitor ate atleast two foods. (02marks)

13.The diagram below shows a quadrilateral ABCD with $DE = 2EB$, $\overrightarrow{AB}=\mathbf{b}$, $\overrightarrow{DC}=2\mathbf{b}$ and $\overrightarrow{DA}=\mathbf{a}$.



(a) Express in terms of a and b the vectors;
(i) **DB** (ii) **BE** (iii) **AE** (iv) **AC** (8marks)

(b) Show that the points C, E and A are collinear. (4marks)

14. A cyclist P leaves town B at 1.06pm for village A riding non stop at a steady speed of 15kmh^{-1} and arrives in village A at 3.06 pm. Another cyclist Q leaves village A at noon for town B. From town A cyclist Q ride at a steady speed of 20km for 45 minutes. He then rests for 30 minutes and then continues with a steady speed of 15km/hr and reaches town B at 2.15 pm.

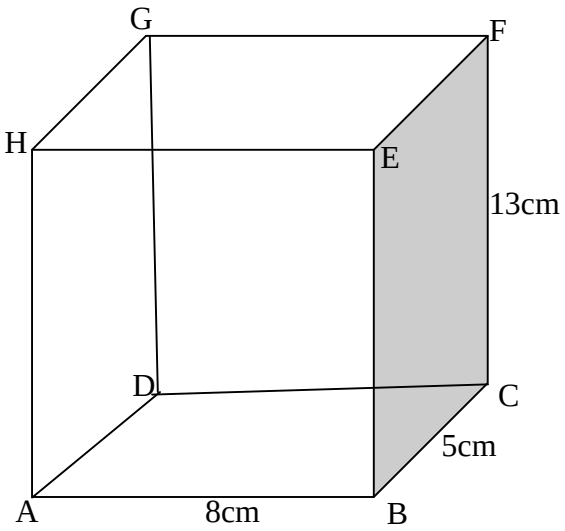
(a) Represent the motion of cyclists P and Q on a distance time graph. (Use a scale of 1cm: 15minutes on the X-axis, 2cm: 5km on the y-axis)

(b) Use your graph to find;

(i) When did the two cyclists pass each other and how far from B were they at this time.

(ii) How far apart were the two cyclists at 2:00 pm? (*12 marks)*

15. The figure below shows a cuboid ABCDEFGH with the dimensions as shown.



Calculate the;

(i) length $\overline{BF}$ and $\overline{BG}$.

(ii) angle between the line $\overline{BG}$ and the base ABCD.

(iii) angle between the plane BDF and the base ABCD. (12marks)

16. A quantity *A* is partly constant and partly varies as the square of B. when B = 2, A = 40.

When B = 3, A = 65.

(a) Form an equation relating A and B. (08 marks)

(b) Determine the values of B when A = 100. (04 marks)

17. A certain employee earns a gross monthly income of shs. 910,000, the allowances accruing to him include;

Housing	240,000/= per month
Head of department	300,000/= per month
Class teacher	10, 000/= per month
Water and electricity	180,000/= per month
House master	`5,000/= per month

He has also three children aged 8 years, 15 years and 18 years and the company gives child allowance for only two children according to the age brackets below.

Age (years)	**Allowance per child (shs)**
1 – 10	150,000
11 – 13	100,000
14 – 19	35,000

His monthly salary is subjected to taxation after deducing the allowances as shown below;

Taxable income (shs)	**Tax rate (shs)**
180,001 – 280,000	10
230,001 – 380,000	15
380,001 – 430,000	25
430,001 – 480,000	30
480,001 – and above	45

(a) Help the employee to calculate his;
   (i) Monthly allowances
   (ii) Taxable income
   (iii) Monthly income tax

(b) What percentage of his income goes to tax? *(12 marks)*

END