SECTION A (40 MARKS)

Attempt **all** *questions from this section*

1. Work out $\frac{1\frac{5}{8}\div 3\frac{1}{4}}{2\frac{3}{4}-1\frac{7}{8}}$ (*04 marks*)

2. Given that P $=\{$all multiples of 3 less than 15$\}$.
   Q $=\{$the first five triangle numbers$\}$
   Find $n(P \cap Q)$. (*04 marks*)

3. A line passing through the points A $(2,-4)$ and B $(8,h)$ is perpendicular to the line whose gradient is $-\frac{2}{3}$, find the value of h. (*04 marks*)

4. Express $\frac{4\sqrt{3}}{2\sqrt{3}-\sqrt{6}}$ in the form $a+b\sqrt{3}$, where a, b and c are real numbers. (*04 marks*)

5. Opio deposited shs.2.42 million on his savings account at a compound interest rate of 8.5% per annum. Determine the number of years his money will take to accumulate to shs.2.85 million. (*04 marks*)

6. Without using tables or a calculator, evaluate $1-\frac{1}{3}\log_{10} 64+2\log_{10} 20$. (*04 marks*)

7. A cone of base radius $5cm$ has a vertical height of $12\ cm$. Find the curved surface area of the cone, use $\pi = 3.142$. (*04 marks*)

8. Given a point A$(2,8)$ and a vector AB $=\begin{pmatrix}7\\-4\end{pmatrix}$. Draw the vector **AB** and hence state the coordinates of B. (*04 marks*)

9. Two similar cylinders have volumes $250\ cm^3$ and $54\ cm^3$. The height of the bigger cylinder is $10cm$. Find the height of the smaller one. (*04 marks*)

10. A cyclist travels a distance of $102\ km$ for $1\frac{2}{3}$ hours. He cycles at an average speed of $54\ kmhr^{-1}$ for a further $2\frac{1}{3}$ hours. Calculate the average speed for the whole journey. (*04 marks*)

SECTION B (60 MARKS)

Answer any five questions from this section.

11. (a) The function $\boldsymbol{f}$ is defined as $f(x) = \frac{5x+1}{4}$, find

    i) $f(-5)$

    ii) $f^{-1}(4)$ (*06 marks*)

    (b) Given that $g(x) = \frac{4x+3}{3}$ and $h(x) = \frac{1+2x}{8}$. Determine the values of x for which $gh(x) = \frac{6-x^2}{4}$. (*06 marks*)

12. In a certain school, there are 42 students in senior five science class. Of these, 25 offer physics (P), 20 offer chemistry (C) and 18 offer Biology (B). 10 students offer physics and chemistry, 8 offer Biology and chemistry and 7 offer Physics and Biology but not chemistry

    The number of students who not offer any of the three subjects is twice the number of those offering all the three subjects.

    a) Represent the above information on a Venn diagram. (*07 marks*)

    b) Find the number of students offering;

    (i) All the three subjects.

    (ii) At least two of these subjects. (*04 marks*)

    c) Find the probability that a student selected at random from this class offers only one subject. (*01 mark*)

13. A mini-bus sets off at 7:00am from station **A** to station **B**, $360\ km$ apart at a constant speed of $50\ km/hr$. After 2 hours non-stop drive, the fuel got finished and it parked for 60 minutes. After refueling, it proceeded with the remaining journey at a steady speed for 4 hours to station **B**.

    A taxi left station B at 8:00 am for station A and moved non-stop for $4\frac{1}{2}$ hours.

    a) Using scales, $2cm$ to $40km$ and $2cm$ to 1hour, draw the distance time graph for the two vehicles, using the same axes. (*06 marks*)

    b) Use your graphs to find the

    (i) Time of arrival for each vehicle.

    (ii) Time the two vehicles met and how far it was from station B.

    (*04 marks*)

c) Find the average speed of the mini bus in the last leg of the journey. (*02 marks*)

14. The table below shows the tax structure on taxable income of a certain company for its employees.

Taxable income (shs)	**Rate of tax (%)**
01 – 100,000	5
100,001 – 300,000	7
300,001 – 450,000	10
450,001 – 600,000	14
600,001 – 750,000	25
Above 750,000	30

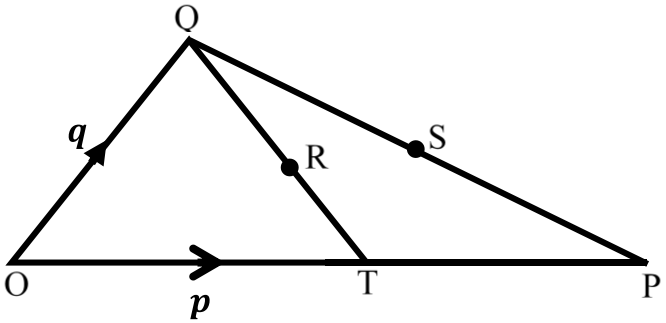
The following are the entitled allowances.

Housing shs 840,000 per annum
Electricity shs 600,000 per month
Medical shs 100,000 per month

Chil care, for only two children.
Shs.15,000 for a child below 10 years,
Shs.9,000 for a child from 10 – 15 years and shs.6,000 for a child above 15 years
An employee earns shs.950,000 a month, he has three children of age 8, 12 and 17 years.
Calculate his

a) Monthly taxable income (*05marks*)
b) Monthly income tax (*05 marks*)
c) Monthly net income (*02 marks*)

15. In the figure below, $\boldsymbol{OP = p}$ and $\boldsymbol{OQ = q}$. T and S are the mid-points of OP and QP respectively. R is a point on QT such that $\boldsymbol{QR = \frac{2}{3}QT}$.



a) Express in terms of $\boldsymbol{p}$ and $\boldsymbol{q}$ the vectors,
   (i) $\boldsymbol{QR}$
   (ii) $\boldsymbol{OR}$

(iii) $\boldsymbol{QS}$

(iv) $\boldsymbol{TS}$ (*08 marks*)

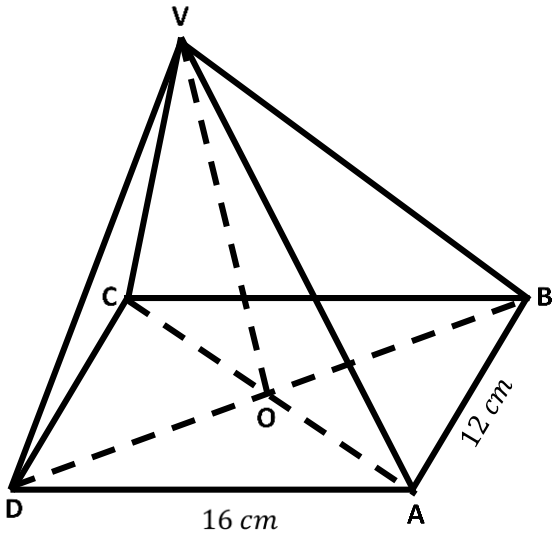
b) Show that O, R and S lie on a straight line. (*04 marks*)

16. The cost (C) of printing a school year planner is partly a constant and partly varies inversely as the number of copies (**N**) to be printed.
When 200 copies are printed, the cost per copy shs.850. when 400 copies are printed the cost per copy is shs.500.

a) Form an equation relating **C** and **N**. (*08 marks*)

b) (i) Calculate the cost per copy when 560 copies are printed. (*02 marks*)
(ii). If the cost per copy is shs.950, how many copies will be printed? (*02 marks*)

17. The figure below is a pyramid VABCD with O as its centre of its rectangular base of sides $12cm$ and $16cm$. He height of the pyramid is $24cm$.



Find;

(i) **VA** (*04 marks*)

(ii) The angle between VA and **ABCD.** (*03 marks*)

(iii) The angle between VAB and ABCD. (*03 marks*)

(iv) The volume of the pyramid. (*02 marks*)

END