SECTION A

Attempt all questions

1. Express 18 and 42 each as a product of its prime factors and hence find their highest common factor (HCF).

2. Express 2.10303....in the form $2\dfrac{a}{b}$,where a and b are integers.

3. Given that f(x)=2√x +6,find the value of x for which f(x)=16

4. Find the equation of a line passing through point (0, -5) and is perpendicular to the line y + 3x = 1

5. Simplify the following as far as possible,

$$\log_2 4 - \frac{1}{2}\log_3 8 + \log_2 8$$

6. Given that position vector $\mathbf{OP} = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and $\mathbf{OQ} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$ Find the coordinates of the mid-point of vector $\mathbf{PQ}$

7. Two similar conical flasks have heights of 32.4cm and 97.2cm. If the volume of the small flask is 3016cm³, find the volume of the big flask.

8. A tourist has US$ 1200 which he changes to Uganda shillings (Ug. Shs) at a rate of $1= Ug. Shs 3500. If he has a balance of Ug. Shs 900,000 after all expenses find;
   (a) the amount of money spent in Ug. Shs.
   (b) his balance in US dollars

9. The number of people who play football (F) or basketball (B) is twice the number of people who play F and B. If n(F) =9 and n(B) =6, how many play both games?

10. The quantity V varies directly as H and inversely as the square of W. Given that when W = 50, H =100 and V =80, find W , when H =320 and V = 100.

SECTION B (60 MARKS)

Attempt any five questions in this section. All questions carry equal marks.

11. A quantity R varies partly as the cube of V. When V = 20, R = 416 and when V =40, R = 3264.
    (a) Form an equation relating R and V
    (b) Determine the value of R when V =30

12. The functions f and g are defined by $f(x) = \dfrac{x}{x-5}$ and g(x) = x+4. Find;

    (a) g($^{-}$10)
    (b) $f^{-1}(x)$ and hence $f^{-1}(6)$
    (c) the value of x for which gf(x) + fg(x)= 0

13. In a mathematics class the teacher told students to bring a pen (P), a graph book (G) and a ruler (R) for use. During the next lesson it was found out that only 16 students brought all the items. 5 students did not have any of the items. 13 did not have a pen, 14 did not have a graph book and 20 did not have a ruler. One student only had a pen, 2 students had only a graph book and no student had only a ruler.
    (a) Represent the above information on a Venn diagram
    (b) How many students
        (i)   were in the class?
        (ii)   had a pen and a ruler only?

    c) If a student is selected at random find the probability that he had;

        (i)   at least 2 items.
        (ii)   only one item

14. A lorry set off from Tororo at 0730 hours at a steady speed of 40km/hr to Kampala, a distance of 180km away. After travelling for 2 hrs it stopped and rested for 1 and $\dfrac{1}{2}$ hrs, then continued at a steady speed of 50km/hr for the rest of the journey. A car also set off from Kampala to Tororo at the same time as the lorry at a steady speed of 60km/hr but suddenly reduced its speed after 2hrs to 15km/hr due to some mechanical fault for the remaining journey.
Using scales of 1cm to 10km and 1cm to 30 minutes on the vertical and horizontal axes respectively:
    (a) Draw distance time graphs showing the routes of the two vehicles.
    (b) Using your graphs determine the
        (i)   distance between the two vehicles after two hours.
        (ii)   difference in time of arrival at respective towns.

15. The diagram belwo shows a square CDEF with diagonals CE and DF each $= \sqrt{200}$ cm and four congruent isosceles triangles representing the net of a pyramid on a square base.
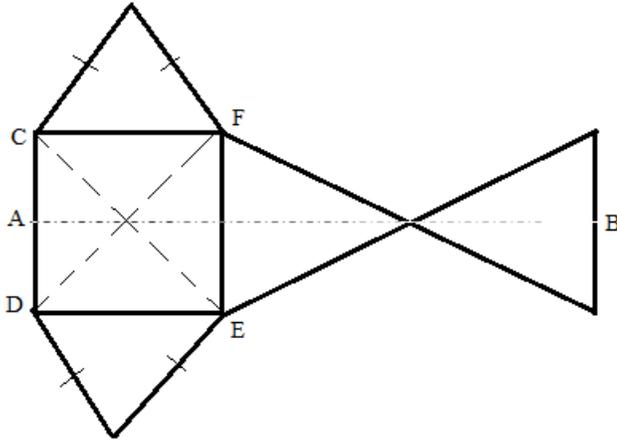
Given that AB = 46cm;
(a) Draw a sketch of the pyramid.
(b) Calculate the;
    (i)   height of the vertex of the pyramid above the base
    (ii)   angle between two opposite slanting planes
    (iii)   volume of the pyramid

16. (a) Calculate the simple interest on Shs. 990,000 for 8 months at a rate of 5 and $\frac{1}{2}$ per annum.

(b) The income tax rates of a certain country are shown in the table below:

Taxable income(shs)	Rate (%)
01 - 200,000	6
200,001-500,000	13
500,001-900-000	20
900-000 and above	30

    (i)   Calculate the income tax an employee pays if the employees' taxable income is Ug.Shs 1,170.000.
    (ii)   Given that the employees untaxed allowances is Shs 140,750/=. Find the employees net income.

15. In a triangle OPQ point R lies on the line PQ such that **3PR =PQ**. Point S lies on a line **OQ** and **OS**= $\frac{1}{4}$ **OQ**, while T lies on line **OR** such that **OT=TR**. If **OQ=q** and **OP=p** express in terms of **p** and **q** the vectors.

(a) (i) PQ   (ii) OR   (iii) PT

(b) Show that **PT: TS= 2:1**