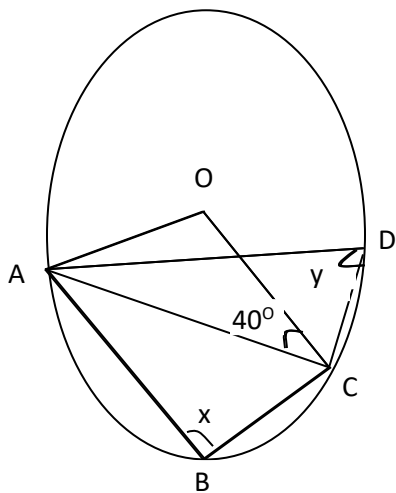**Uganda Certificate of Education**
MATHEMATICS
Paper 1

INSTRUCTIONS TO CANDIDATES
- *Answer all questions in both sections*

SECTION A

1. Given that $\alpha*b = \alpha^2 - (^-1)^b$

a) Evaluate $3*2$

b) Find the values of α if $\alpha*5 = 65$ (04marks)

2. Find matrix P if $P^{-1} = \begin{pmatrix} 2 & ^-1 \\ 5 & 6 \end{pmatrix}$ (04marks)

3. The circle below has its centre at 0

Calculate the value of the angles x and y

(04marks)

4. Solve the equation $\frac{p-7}{3} \frac{5+3p}{5} \frac{4p-5}{2}$ (04marks)

5. Form a quadratic equation in x whose roots are $\frac{3}{2}$ and $\frac{-2}{3}$ (04marks)

6. Find the two possible values of θ if $3\tan\theta = ^-5$ where $0^0 \leq \theta \leq 360^0$ (04marks)

7. A bag contains 4black (B) and 3red(R) pens. How many red pens must be added to the bag so that the probability of drawing a red pen is $\frac{3}{5}$? (04marks)

8. Factorise $(x+4)^2 - (x-2)^2$ and hence solve for x in $(x+4)^2 - (x-2)^2 = 36$. (04marks)

9. Find the values of y in the inequality $-3y + 8 \leq ^-16$ if $y < 12$ (04marks)

10. A senior three class has two streams P and Q. In a test, stream P has 40 students with an average mark of 70 and the whole class has 70 students with an average of 64. Find the average mark of the students in stream Q.

SECTION B

11. a) Copy and complete the table below
For $y = (2x + 3)(3x - 7)$

x	-2	-1	0	1	2	3
$2x+3$			3			9
$3x-7$			-7			2
y			-21			18

(03marks)

b) Use your completed table to draw a graph of
   $y = (2x+3)(3x-7)$ (05marks)
c) Use your graph to solve the equation; $6x^2 - 5x - 14 = 0$ (04marks)

12. a) Given that A= $\begin{pmatrix} -2 & 3 \\ 5 & x \end{pmatrix}$, B = $\begin{pmatrix} y & -z \\ -3 & 2 \end{pmatrix}$
   and BA = $\begin{pmatrix} -7 & -4 \\ 16 & 5 \end{pmatrix}$. Find the values of x, y
   and z

b) Solve the equation;
   $\begin{pmatrix} -3 + p \\ -q \end{pmatrix} - \frac{1}{2}\begin{pmatrix} 2q \\ 6-4q \end{pmatrix} = \begin{pmatrix} 11 \\ -7 \end{pmatrix}$ (05marks)

13. A triangle ABC with vertices A (3,2) and
    B(4,0) and C(6,3) is reflected in the line
    x-$y = 0$ to give an image triangle A'B'C'
    The triangle is then reflected in another line
    to give another image A''(0, 1), B'' (-1, 3) and
    C'' (-3, 0)
a) Draw the three triangles on the same set of
   axes using a scale of 1cm to unit on both
   axes.
b) State the co-ordinates of A¹,B¹and C¹
c) Find the equation of the second mirror line
                              (12marks)

14. A plane leaves airport A and flies for 160km
    on a bearing of 140^0 to airport B. it then
    changed direction to bearing of 260^0 and
    flies for 200km to airport C. using a scale
    drawing with 1cm to represent 20km, find,
a) The distance of airport Cand A
b) The bearing of airport A from C
c) How long it would take the plane to fly
   directly to airport A from C at a speed of
   40km/hr.   (12marks)

15. a) The length of a rectangular floor is 5m
    more than its width. The area of the floor is
    24m². Calculate the perimeter of the floor.
                              (6marks)

b) Given that $3T = 2\pi\sqrt{\dfrac{l}{n}}$ express n in terms of

   T, ι and π.
   Hence find n correct to 3s.f
   if $\pi = 3.142, l = 10 \ and \ T = 4$
                              (06marks)

16. A school hired a Fuso lorry and a Canter to
    transport desks to school. Each trip of the
    Fuso costs shs. 40,000 and that of a canter
    costs shs 25,000. The Fuso has a capacity of
    42 desks and a canter 14 desks. All the 126
    desks must be ferried and there is shs. 200,
    0000 available for the transport. The canter
    had to make more trips than the Fuso. If x
    and y represent the number of trips made by
    the fuso and canter respectively.

a) Write down five inequalities representing
   the given information   (05marks)

b) (i) Plot the inequalities on the same axes
   (ii) By shading the unwanted regions, show
        the region satisfying all the inequalities
                              (05marks)

c) Use your graph to find the number of trips
   each vehicle should make so as to spend the
   least amount of money.   (02marks)

                    END

**INSTRUCTIONS**
Answer all questions

SECTION A:

1. Express 0.439339……. as a fraction in its lowest term. (4 marks)

2. Use logarithm tables to evaluate;
$$\frac{22.60}{47.80 \; x \; 0.329}$$
(4 marks)

3. The function $f(x) \; = \; ax^3 – 170x$.
If $f(5) = 25$, find the value of a. (4 marks)

4. Find the H.C.F of 630 and 990. (4 marks)

5. Given that; $\frac{P+q \sqrt{7}}{r} \; = \; \frac{7 + \sqrt{7}}{7 - \sqrt{7}}$, find the values of P, q and r. (4 marks)

6. A wooden box is 3m long, 150cm wide and 2m high. Find the surface area in m2 of the box. (4 marks)

7. A straight line passes through the points A(-1, 8) and B(2, -1). Find the equation of another line which is a perpendicular bisector of line AB. (4 marks)

8. In a class of 64 students, 35 like Posho (P), 38 like Rice (R) and 9 like neither of the foods. Find the number of students who like both posho and rice. (4 marks)

9. Two similar plastic containers have capacities of 2 litres and 16 litres. If the height of the small container is 20cm, find the height of the big container. (4 marks)

10. Given that a = $\begin{pmatrix} -4 \\ 9 \end{pmatrix}$, b = $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$ and c = 4b + a.
Find the magnitude of c. (4 marks)

SECTION B:

11. The Venn diagram below shows 250 types of vehicles being sold in 3 bonds in Uganda namely Nagayi (N), Osama (O) amd Cosmos (C).
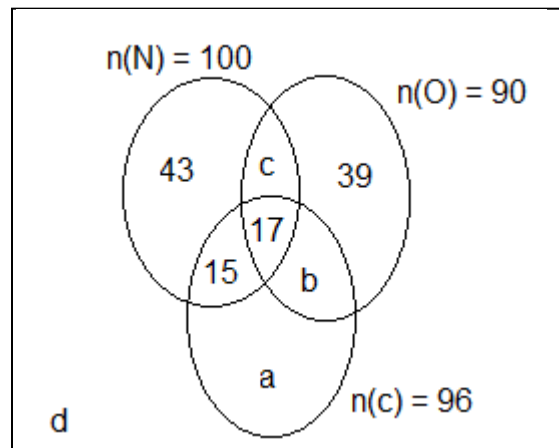
a) Find the values of a, b, c and d. (8 marks)
b) Find the number of vehicles sold in atmost one bond. (2 marks)
c) If a vehicle is picked at random from the bonds, find the probability that it is Nagayi and Osama but not Cosmos' bond. (2 marks)

12. If $f(x) \; = \; px + 15$ and $f(4) \; = \; 67$.
a) Find the value of:
   (i) P
   (ii) F(2) and (f(-1)
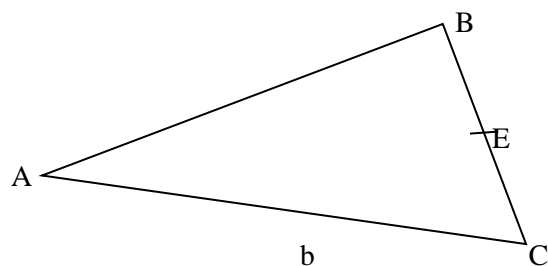
b) Determine f⁻¹ (93).

13. The diagram below shows a lampshade made out of the lower part of a cone.
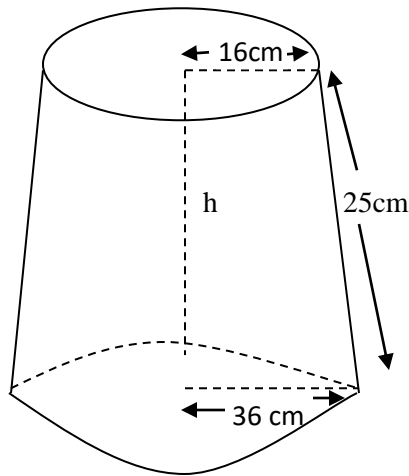
Calculate the;
a) Height, h of the lampshade   (8 marks)
b) Surface area of the lampshade.
   (Take π = 3.14)   (4 marks)

14. In the diagram below, $\underline{AB} = \underline{b}$, $\underline{AC} = \underline{c}$, $2\overline{CB} = 5\overline{EB}$ and $\overline{AD} : \overline{DC} = 2:3$.

a) Express the following vectors in terms of b and c.
(i) CB
(ii) CE
(iii) AE   (7 marks)

b) Show that DE is parallel to AB. (5 marks)

15. The table below shows the income tax rates of a certain country for government employees.

Taxable income (shs)	Tax Rate (%)
1 – 100,000	5
100,001 – 300,000	15
300001 – 700,000	20
700,001 – 1,500,000	30
1,500,001 – and above	50

An employee earns a gross monthly salary of 2,500,000 which includes the following allowances of 10% of the gross monthly income.
- Family allowances shs 200,000.
- Fuel allowances of shs 155,000
- Medical care allowance of shs 135,000.

Calculate the;
a) Taxable income   (3 marks)
b) Income tax paid   (7 marks)
c) Percentage of gross salary which the employee pays as tax.   (2 marks)

16. Arua is 600km from Kampala. At 9.30 am, James was 129km away from Arua moving towards Kampala on a motocycle at a speed of 80km/hr, when Richard set off from Arua in a saloon car moving non-stop at 100km/hr towards Kampala, at 2.42pm, Richard overtook James and they continued their journey. By using calculations, without drawing the graph, determine;
(i) The distance from Arua when Richard overtook James.
(ii) The time when James set off from Arua.
(iii) The time(s) when Richard and James arrived at Kampala.
(iv) Difference in time(s) of arrival of the two men.

END