ASSHU MBARARA JOINT MOCK EXAMINATIONS 2022
Uganda Advanced Certificate of Education

PURE MATHEMATICS

PAPER 1

3 hours

INSTRUCTIONS TO CANDIDATES

- Answer all the **eight** questions in section A and any **five** from section **B**
- Any additional question(s) will not be marked.
- All necessary working must be shown clearly
- Begin each answer on a **fresh** sheet of paper.
- Silent non-programmable scientific calculators and mathematical with a list of formulae may be used.

SECTION A (40 MARKS)

Answer all the questions in this section

1. Solve for x

$$\log_{25} x + \log_{125} x + \log_{625} x = \frac{13}{2}$$

(5 mks)

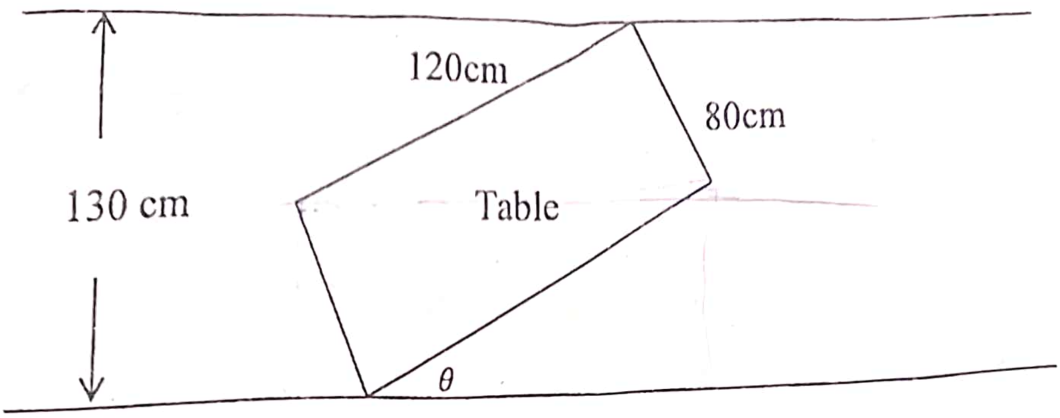
2. Differentiate $\ln\left(\frac{1}{\sqrt{2x+3}}\right)$ with respect to . Hence show that

$$\int_{-1}^{3} \frac{1}{2x+3} dx = \ln 3$$

(5 mks)

3. Show that the points A, B and C with position vectors $2\mathbf{i} - \mathbf{j} + 3\mathbf{k}$, $5\mathbf{i} - 5\mathbf{j} + 3\mathbf{k}$ and $7\mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$ respectively, are vertices of a triangle. (5 mks)

4. The diagram below shows a table jammed in a corridor, the table is 120cm long and 80cm wide, and the width of the corridor is 130cm. Show that $12 \sin\theta + 8\cos\theta = 13$. (5 mks)



5. Solve the simultaneous equations

$8^{x-y} = 4^{x+y}$ and

$5^{x^2-y^2} = 15625$ (5 mks)

6. Find $\int \frac{1}{\sqrt{x}} \cos^2 \sqrt{x}\, dx$ (5 mks)

7. The equation of a curve is given by $x^2 - 8x - 4y + 20 = 0$

(a) Show that a curve is a parabola (3 mks)

(b) Find the coordinates of the vertex and equation of the directrix. (2mks)

8. A curve is defined by parametric equations

$x = 2t^2 - t$

$y = 4t - 1$

find the equation of the tangent to the curve at the point (1, 3). (5 mks)

SECTION B (60 MARKS)

Answer any five questions from this section. All questions carry equal marks.

9. (a) Complex numbers Z and W are given by $\frac{Z+4}{Z} = 2 - i$ and $W = {}^{-}\sqrt{6} + i\sqrt{2}$

(i) Find Z in the form $x + iy$.

(ii) Show that $|Z| = |W|$

(b) In an argand diagram P represents a complex number Z such that

$$\left|\frac{Z-1}{Z+2-3i}\right| = 2$$

Show that P lies on a circle and find

(i) radius of that circle

(ii) the complex number represented by its centre (6 mks)

10(a) Find the locus of a point, P whose distance from the point (3,2) is twice its distance from the point (1, 1)

(b) Find the equation a circle passing through the points (-1, 4) and (2, 5) and whose centre lies on the line 2x+y= 5. (7 mks)

11. Express $f(x) = \frac{8-x^2}{(2+x)(2-x)}$ into partial fractions hence find

(i) $f'(x)$

(ii) $\int_0^1 f(x)\,dx$ (12 mks)

12. Given that t = tan ½ x, express $\sqrt{\frac{1-\cos x}{1+\cos x}}$ in terms of t, hence solve the

$\sqrt{\frac{1-\cos x}{1+\cos x}} = 2$ for $0° \leq x \leq 360°$ (6 mks)

(b) Prove that $\frac{\sin 5\theta + 2\sin 3\theta + \sin\theta}{\cos\theta - \cos 5\theta} = \cot\theta$ (6 mks)

13. Given the points P(2,2,4) , Q(0, 6, 8) , X (-2, -2, -3) and Y(2, 6, 9)

(a) Find, in vector form equations of lines PQ and XY. (6 mks)

(b) Find equation of the plane passing through the points P, Q and X. (4 mks)

(c) Show that point Y lies in the plane in part (b) above. (2 mks)

14(a) Solve the equation $9x^{2/3} - 8x^{-2/3} + 14 = 0$

(b) A wire 60cm long is divided into 6 parts whose lengths are in arithmetic progression (A.P). The longest part is 3 times the shortest part find the length of the longest part.

(6 mks)

15. Sketch the curve $y = (4x + 5)(x^2 - 2x + 1)$ and find the area enclosed between the curve and x-axis. (12 mks)

16. (a) Solve the differential equation $\frac{dy}{dx} = e^{2(x-y)}$ (3mks)

(b) The rate of fall of temperature, θ of the body is proportional to $(\theta - A)$, where A°C is the temperature of the surrounding. If the temperature of the surrounding remains at A°C and that of body drops from 4A to 3A in one minute. Find θ in terms of A after 2 minutes. (9 mks)

END

16. (a) Solve the differential equation $\frac{dy}{dx} = e^{2(x-y)}$ (3mks)

(b) The rate of fall of temperature, θ of the body is proportional to $(\theta - A)$, where A°C is the temperature of the surrounding. If the temperature of the surrounding remains at A°C and that of body drops from 4A to 3A in one minute. Find θ in terms of A after 2 minutes. (9 mks)

END