

S475/1
SUBSIDIARY
MATHEMATICS

Paper 1
26 July 2018
2 hours 40 mins



ENTEBBE JOINT EXAMINATION BUREAU

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

*Attempt all **eight** questions in Section A and any **four** from Section B.*

Each question in Section A carries five marks while each question in Section B carries fifteen marks.

Begin each answer on a fresh page.

Graph papers are provided.

*Any extra question(s) **will not** be assessed.*

All working must be shown clearly.

Silent, non-programmable Scientific Calculators and Mathematical tables with a list of formulae may be used.

Where necessary, take $g = 9.8 \text{ ms}^{-2}$

SECTION A

Answer **all** questions in this Section.

1. If A and B are independent events such that $P(A) = \frac{1}{4}$ and $P(B) = \frac{3}{5}$ find
 - (i) $P(A \cup B)$
 - (ii) $P(A' \cup B')$

(05 marks)
2. Find the angle between the vectors $\mathbf{a} = 2\mathbf{i} + 3\mathbf{j} + \mathbf{k}$ and $\mathbf{b} = 3\mathbf{i} - \mathbf{j} + 2\mathbf{k}$. (05 marks)
3. If $\sin(x + 60^\circ) = \cos(x + 60^\circ)$. Show that $\tan x = \frac{1 - \sqrt{3}}{1 + \sqrt{3}}$ (05 marks)
4. Ndeeba cell wants to choose a committee of 9 people from 10 men and 8 women. It can consist either of 5 men and 4 women or 4 men and 5 women. How many different committees can be chosen? (05 marks)
5. The roots of the equation $x^2 - 2x + 1 = 0$ are α and $(1 + n\alpha)$. Show that $n = 0$. (05 marks)
6. X has probability distribution as shown the table below.

X	1	2	3	4	5
$P(X = x)$	a	$3a$	$7/20$	$1/5$	$1/20$

Find the average of a and $E(x)$. (05 marks)
7. Solve the differential equation: $\frac{dy}{dx} = \frac{2x}{y+1}$ (05 marks)
 Given that $y = 2$, when $x = 1$.
8. A , B and C are checkpoints on a straight road such that $AB = 200$ cm. A cyclist moving with uniform acceleration passes A with a velocity of 40 ms^{-1} and notices that it takes him 4 seconds and 10 seconds to travel between A and B , and A and C respectively. How long is AC ? (05 marks)

SECTION B

9. The table below shows the number of printed copies in thousands and their cost in millions.

Number of printed copies (x) (000s)	14	29	55	74	18	36	61	79
Cost of printing y (000,000s)	96	81	54	38	93	73	50	35

- (a) Draw a scatter diagram to represent the data and comment. (06 marks)
- (b) Calculate Spearman's rank correlation coefficient and comment. (07 marks)
- (c) Estimate the cost of printing 40,000 copies. (01 mark)

10. (a) (i) Determine the turning point of the curve $y = (2 + x)(x + 1)$.
(04 marks)
- (ii) Sketch the curve in (a) (i) above.
(02 marks)
- (iii) Find the area enclosed by the curve in a (ii) and the x – axis.
(03 marks)
- (b) The gradient of the curve is $3x^2 - 2x + 1$. Find the equation of the curve given that it passes through the point $(-1, 4)$.
(06 marks)

11. The table below shows the prices in US dollars and weights of the five components of an engine in 1998 and 2005.

Component	A	B	C	D	E
Price (\$) 1998	35	70	43	180	480
Price (\$) 2005	60	135	105	290	800
Weight	6	5	3	2	1

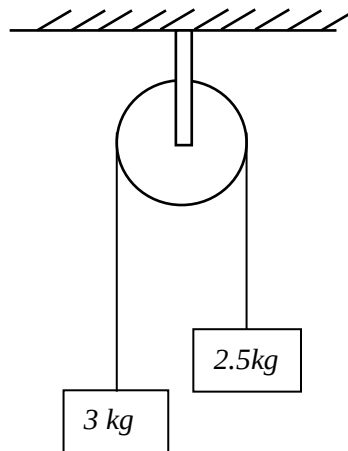
Taking 1998 as the base year:

- (a) Calculate for 2005 the
- (i) simple aggregate price index. (05 marks)
- (ii) price relative of each component. (05 marks)
- (iii) weighted aggregate price index. (3 marks)
- (b) Estimate the cost of an engine in 1998 given that its cost in 2005 was US\$ 1600.
(02 marks)
12. (a) In a group, the expected number of people who wear watches is 4 and variance is 3.2. if the number of people who wear watches follows a binomial distribution, find the probability that:
- (i) a person chosen at random from the group wears a watch. Hence find the number in the group. (05 marks)
- (ii) 7 people in the group wear watches. (02 marks)
- (b) The mean weight of pawpaws is approximately normally distributed with mean 1.8 kg and standard deviation 0.3 kg. Calculate the probability that a pawpaw picked at random will weight:
- (i) more than 1.63 kg. (03 marks)
- (ii) between 1.68 kg and 2.10 kg. (05 marks)
13. (a) Solve for x and y given that:

$$\begin{pmatrix} x + 2y & 14 \\ -3 & y - 2 \end{pmatrix} = \begin{pmatrix} 4 & 14 \\ -3 & 3x + 7 \end{pmatrix} \quad (06 \text{ marks})$$

- (b) A poultry farm has three units A, B and C. every month, Unit A produces 30 trays of eggs and 20 broilers, Unit B produces 40 trays of eggs and 15 broilers and Unit C produces 35 trays and 10 broilers. A tray of eggs costs Shs 3,000 and Shs 4,000 for each broiler.
- (i) Represent the above information in a 3×2 matrix for the eggs and broilers. (01 mark)
- (ii) Form a 2×1 cost matrix. (01 mark)
- (iii) Find the total sales at the farm given all eggs and broilers were sold. (05 marks)
- (iv) If the farm pays 17% to URA, find its total income. (02 marks)

14. (a) A rough surface is inclined at $\tan^{-1}\left(\frac{7}{24}\right)$ to the horizontal. A body of mass 5 kg lies on the surface and is pulled at a uniform speed, a distance of 0.75 m up the surface by force acting along the line of greatest slope. The coefficient of friction between the body and the surface is $\frac{5}{12}$. Find the work done against friction. (06 marks)
- (b) Two masses of 3 kg and 2.5 kg are connected by a light inextensible string which passes over a smooth fixed pulley as shown below:



If the system is released from rest, find the

- (i) acceleration of the masses and the tension in the string. (07 marks)
- (ii) speed at which the 3 kg mass hits the ground through a height of 50 cm. (02 marks)