

S475/1
SUBSID. MATHEMATICS
Paper 1
Nov./Dec. 2017
2²/₃ hours



UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

Answer all the eight questions in section A and only four questions in section B.

Any additional question(s) answered will not be marked.

Each question in section A carries 5 marks while each question in section B carries 15 marks.

All working must be shown clearly.

Begin each answer on a fresh sheet of paper.

Graph paper is provided.

Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

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

SECTION A: (40 MARKS)

Answer all the questions in this section.

- Given that $\log_3 x = 2 \log_3 4 - \log_3 5 + \log_3 9$, find the value of x .
(05 marks)
- A father and a mother with their five children are to sit on a bench. What is the probability that the father and mother will sit next to each other?
(05 marks)
- The vector $\mathbf{a} = 3\mathbf{i} + 2\mathbf{j}$ and $\mathbf{b} = 4\mathbf{i} - 5\mathbf{j}$.
Determine
(a) $|\mathbf{b}|$
(b) $\mathbf{a} \cdot \mathbf{b}$
(05 marks)

- The table below shows the expenditures in shillings of a University student for the years 2005 and 2006.

ITEM	EXPENDITURE (Shs)		WEIGHT
	2005	2006	
Text books	100,000	120,000	3
Pocket money	50,000	70,000	2
Research	40,000	50,000	1

Using the year 2005 as the base year, calculate the weighted aggregate price index.
(05 marks)

- Solve the differential equation:
$$3y \frac{dy}{dx} = \frac{1}{x^2} \quad \text{given that } y = 2 \text{ when } x = 1.$$

(05 marks)
- It was observed that 3 seeds in every 4 seeds planted germinate. If 16 seeds were planted, calculate the
(a) expected number of seeds that will germinate. (03 marks)
(b) probability that exactly 14 seeds will germinate. (02 marks)
- Using the matrix method, solve the simultaneous equations:
$$\begin{aligned} 3x - y &= 16. \\ x + 2y &= 3. \end{aligned}$$

(05 marks)
- A man of mass 80 kg carries a 50 kg bag of cement for a distance of 7 metres up a slope. The slope is inclined at an angle of 30° to the horizontal.
(a) Find the work done against gravity. (03 marks)

- (b) The man took 42 seconds to do the work. Calculate the power he developed. (02 marks)

SECTION B: (60 MARKS)

Answer only four questions from this section.

All questions carry equal marks.

9. The data below shows the weights in kg of 50 cattle on a farm.

60	81	76	68	84	112	76	102	86	67.
65	98	107	110	72	99	87	92	76	77
94	102	87	86	73	118	98	120	62	87
65	92	104	116	91	93	78	122	102	92
80	111	73	120	106	123	94	109	80	96

- (a) Form a grouped frequency table for the data with classes of equal intervals, starting with the class 60 – 69. (06 marks)
- (b) Draw a cumulative frequency curve (Ogive) for the given data. (04 marks)
- (c) Use your Ogive to estimate the;
- (i) lower and upper quartiles.
 - (ii) median weight.
 - (iii) number of cattle which weigh 118 kg and above. (05 marks)

10. A particle moves with velocity $V = 2t^2 - 9t + 10$ where t is time.

The particle is at the origin when $t = 0$. Determine the

- (a) expressions for the distance and the acceleration in terms of t . (07 marks)
- (b) distances of the particle from the origin when the particle is at rest. (08 marks)
11. The table below shows quarterly sales of cars for the years 2000, 2001 and 2002 by a company.

YEAR	QUARTER			
	1 st	2 nd	3 rd	4 th
2000	390	310	280	355
2001	420	320	305	410
2002	460	350	315	425

- (a) Calculate a four-point moving average for the data. (06 marks)
- (b) (i) Plot the original data and the four-point moving averages on the same axes. (06 marks)
- (ii) Comment on the trend of the sales of the cars. (01 mark)
- (iii) Use your graph to estimate the number of cars sold in the first quarter of 2003. (02 marks)

12. (a) Triangle OAB is such that angle $AOB = 90^\circ$, angle $ABO = \theta$, $\overline{OB} = 14.4$ cm and $\overline{OA} = 6$ cm. Find $\sin \theta + \cot \theta$. (07 marks)
- (b) Solve: $2\cos^2 x = \sin x + 1$ for $0^\circ \leq x \leq 360^\circ$ (08 marks)

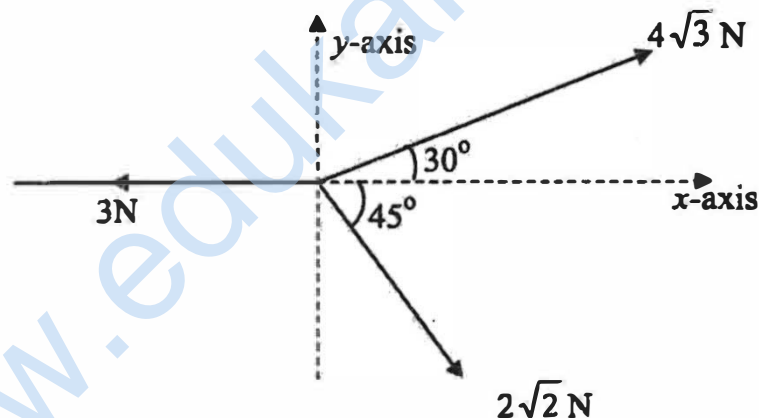
13. A continuous random variable X , has a probability density function (pdf) given by

$$f(x) = \begin{cases} k(x^2 + 6), & 0 \leq x \leq 3 \\ 0, & \text{Otherwise} \end{cases}$$

where k is a constant.

Determine the:

- (a) value of k . (04 marks)
- (b) $P(X > 1)$. (04 marks)
- (c) expectation, $E(X)$. (03 marks)
- (d) variance, $\text{Var}(X)$. (04 marks)
14. (a) Forces $P = 10\text{N}$ and $Q = 4\text{N}$ act away from a point A . The magnitude of their resultant is 8N . Find the angle between P and Q . (05 marks)
- (b) The diagram below shows three forces 3N , $4\sqrt{3}\text{N}$ and $2\sqrt{2}\text{N}$ acting on a particle at the origin.



Calculate the,

- (i) magnitude of the resultant force.
- (ii) angle the resultant makes with the x -axis.

(10 marks)