

S475/1
Subsidiary
Mathematics
Paper 1
 $2\frac{2}{3}$ hours.

MOCK EXAMINATIONS 2018
Uganda Advanced Certificate of Education
Subsidiary Mathematics Paper 1
Time: 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) 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.
- Where necessary, take acceleration due to gravity $g = 9.8 \text{ m s}^{-2}$.
- Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

Section A (40 Marks)

Answer all the questions in this section.

Qn 1: Without using tables or a calculator, simplify:

$$\frac{1}{2} \log_{10} 1600 - 2 \log \left(\frac{x}{5} \right) + \log x^2 \quad [5 \text{ marks}]$$

Qn 2: A sample of ten students were given a test at the beginning of the term and their scores, X , were compared with their scores, Y , obtained in an examination at the end of the term as shown in the table below.

X	35	65	55	25	45	75	20	90	51	60
Y	86	70	84	92	79	68	96	58	86	77

Calculate the rank correlation coefficient and comment on your result.
[5 marks]

Qn 3: The distance s m of a particle moving in a straight line measured from a fixed point O on the line is given by $s = 2t^3 - 15t^2 + 24t + 20$ where t is the time in seconds after start. Determine the times when the particle is at instantaneous rest.
[5 marks]

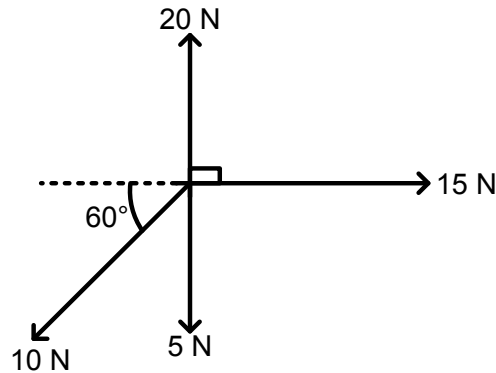
Qn 4: Three events A , B and C are such that $P(B) = \frac{3}{5}$, $P(C) = \frac{4}{5}$, $P(C/B) = \frac{9}{20}$
and $P(A \cap C) = \frac{7}{25}$. Find:
(a). $P(B \cap C)$, [2 marks]
(b). $P(A/C)$. [3 marks]

Qn 5: Given the vectors $\vec{p} = i - 2j$, $\vec{q} = 3i - j$ and $\vec{r} = i + 2j$, find the length of the vector $3\vec{p} - 5\vec{q} + 2\vec{r}$.
[5 marks]

Qn 6: Find the number of ways in which the letters of the word **PROBABILITY** can be arranged in a straight line so that the **B**'s are separated.
[5 marks]

Qn 7: Given that $\cos \theta = \frac{8}{17}$ and $180^\circ \leq \theta \leq 360^\circ$, find the value of $16 \tan \theta - 51 \sin \theta$. [5 marks]

Qn 8: The figure below shows a system of four forces in acting in the directions shown below.



Find the magnitude of the resultant force in the above system. [5 marks]

Section B (60 Marks)

Answer only **four** questions from this section. All questions carry equal marks.

Question 9:

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

$$f(x) = \begin{cases} k(4x - x^2) & ; 0 \leq x \leq 3, \\ 0 & ; \text{elsewhere.} \end{cases}$$

Where k is a constant.

Determine the:

- (a). value of k . [4 marks]
- (b). $P(X > 1)$. [4 marks]
- (c). expectation, $E(X)$. [3 marks]
- (d). variance, $Var(X)$. [4 marks]

Question 10:

John sold food stuff to a certain school in March on weekly basis as follows:

- Week 1: He sold 20 kg of sugar (S), 30 kg of maize flour (M) and 10 kg of rice (R).
- Week 2: He sold 14 kg of sugar, 25 kg of maize flour and 18 kg of rice.
- Week 3: He sold 30 kg of sugar, 20 kg of maize flour and 5 kg of rice.
- Week 4: He sold 15 kg of maize flour and 10 kg of rice.

If a kg of sugar costs shs. 4,000; of maize flour shs.3,000; and of rice shs. 3,500.

- (a). (i). Write a 4×3 matrix for the food stuff quantity.
- (ii). Write a 3×1 matrix for the cost.
- (b). By matrix multiplication, determine the value of the sales in each week.
- (c). If John made a profit of 25% by selling all the items, determine the total cost price of the items. [15 marks]

Question 11:

The table below shows the prices of some food items and their corresponding weights in years 2000, 2005 and 2010.

Commodity	Unit	Price(in UgShs)			Weight
		2000	2005	2010	
Matooke	Bunch	17,000	15,000	20,000	5
Meat	kilogram	7,500	8,000	8,500	4
Posho	kilogram	3,000	2,800	2,600	3
Beans	kilogram	3,200	3,000	2,800	2
Vegetables	kilogram	1,000	1,500	2,000	1

Using **2000** as the base year, calculate the:

- (a). Simple aggregate price index for **2005**. Comment on your result. [5 marks]
- (b). Price relative for each food item for **2010**. [5 marks]
- (c). Weighted average price index for **2010**. [5 marks]

Question 12:

A radioactive element decays at a rate proportional to the amount x grams of the element present at any time t . A certain isotope of Uranium decays so that half of its original amount disappears in 20 days. If initially, there was 100 grams of the isotope,

- (i). Form a differential equation relating amount present with time. [3 marks]

- (ii). Solve the differential equation formed in (a) above. [8 marks]
 (iii). Find the fraction that would remain after 50 days. [4 marks]

Question 13:

The number of customers who visit a certain bank for the days Monday to Friday were recorded for four weeks.

Week	Mon	Tue	Wed	Thur	Fri
I	200	250	310	320	260
II	300	340	400	380	360
III	380	380	400	400	370
IV	380	400	400	400	400

- (a). Using a suitable table, calculate the five-day moving totals and moving averages. [6 marks]
 (b). On the same axes, plot the number of customers per visit and moving averages. [5 marks]
 (c). Using your graph in (b) above,
 (i). comment on the trend of the number of customers who visit the bank over the three weeks. [1 marks]
 (ii). estimate the number of customers who will visit the bank on Monday of the fifth week. [3 marks]

Question 14:

- (a). A force acting on a particle of mass 5 kg moves it along a straight line with a velocity of 10 m s^{-1} . The rate at which work is done by the force is 50 watts. If the particle starts from rest, determine the time it takes to move a distance of 100 m.
 (b). A particle of mass 1.5 kg is projected up an incline of $\arcsin \frac{1}{7}$ with an initial speed of 4 m s^{-1} . How far will it travel up the incline if:
 (i). the surface is smooth,
 (ii). the coefficient of friction is 0.5? [15 marks]

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