

**S475/1**  
**SUBSID. MATHEMATICS**  
**Paper 1**  
**Nov./ Dec. 2018**  
**2  $\frac{2}{3}$  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.*

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

*Squared paper is provided.*

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

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## SECTION A: (40 MARKS)

Answer all the questions in this section.

1. The roots of the equation  $4x^2 + 9x - k = 0$  are  $\alpha$  and 2.  
Find the values of  $\alpha$  and  $k$ . (05 marks)

2. A random variable  $X$  has a probability distribution given by

$$P(X = x) = \begin{cases} \frac{x}{10}, & x = 1, 2, 3, \\ 0, & \text{elsewhere} \end{cases}$$

Calculate:

- (a)  $P(1 \leq X < 3)$ . (03 marks)  
(b) the mean of  $X$ ,  $E(X)$ . (02 marks)
3. Show that  $\frac{1 - \cos^2 \theta}{\sec^2 \theta - 1} = \cos^2 \theta$ .

Hence, solve the equation  $\frac{1 - \cos^2 \theta}{\sec^2 \theta - 1} = \frac{3}{4}$  for  $0^\circ \leq \theta \leq 90^\circ$ . (05 marks)

4. Events  $A$  and  $B$  are such that  $P(A) = \frac{6}{13}$ ,  $P(B) = \frac{2}{5}$  and  $P(A/B) = \frac{1}{4}$ .

Find:

- (a)  $P(A \cap B)$ . (02 marks)  
(b)  $P(A \cup B)$ . (03 marks)

5. Express  $\frac{4}{\sqrt{3} + \sqrt{2}} + \frac{4}{\sqrt{3} - \sqrt{2}}$  in the form  $b\sqrt{c}$  where  $b$  and  $c$  are integers.  
(05 marks)

6. The marks scored in the test by 8 students are : 5, 9, 11, 15, 19, 15, 10, 14.

Determine the:

- (a) mean mark. (02 marks)  
(b) variance. (03 marks)

7. Evaluate  $\int_{-1}^2 \frac{2x^4 - x^5}{x^2} dx$  (05 marks)

8. A force of  $65N$  is inclined at an angle of  $\theta$  to the horizontal. The horizontal component of the force is  $25N$ .

Calculate the:

- (a) angle  $\theta$ . (03 marks)  
(b) vertical component of the force. (02 marks)

**SECTION B: (60 MARKS)**

Answer only four questions from this section.

9. The table below shows scores by 10 students (A to J) in Physics and Mathematics tests.

Student	A	B	C	D	E	F	G	H	I	J
Mathematics (x)	28	20	40	28	21	31	36	29	33	24
Physics (y)	30	20	40	28	22	35	35	27	31	23

- (a) (i) Plot a scatter diagram for the given data.  
(ii) Draw a line of best fit on the scatter diagram.  
(iii) Estimate the score in Mathematics for a student who scored 37 in Physics. (08 marks)
- (b) Calculate the rank correlation coefficient for the data and comment on your result. (07 marks)
10. Points A, B and C have position vectors,  $2j$ ,  $4i$  and  $2i - 2j$  respectively in the  $x - y$  plane.
- (a) Find  $2OA + 3OB - 4OC$ . (04 marks)
- (b) Determine;
- (i)  $AB$  and  $AC$ . (04 marks)
- (ii)  $AB \cdot AC$ . (02 marks)
- (iii) angle  $BAC$ . (05 marks)
11. A factory sells animal food in bags. The weights of the bags are normally distributed with mean weight 50kg and standard deviation 2.8 kg.
- (a) Find the probability that the weight of any bag selected at random;
- (i) is more than 52 kg. (04 marks)
- (ii) lies between 46 and 55 kg. (05 marks)
- (b) Determine the percentage of bags whose weights are less than 54 kg. (06 marks)
12. The equation of a curve is  $y = 3x^2 + 2$ .
- (a) (i) Determine the turning point of the curve.  
(ii) Find the nature of the turning point.  
(iii) Sketch the graph of the curve. (07 marks)
- (b) The curve and the line  $y = 14$  intersect at the points  $(-2, 14)$  and  $(2, 14)$ . Calculate the area of the region enclosed between the line and the curve. (08 marks)

13. The table below shows the sales in thousands of copies by a local Newspaper over a period of 12 weeks.

Week	1	2	3	4	5	6	7	8	9	10	11	12
Number of copies sold	315	378	490	430	510	580	565	595	640	660	628	670

- (a) Calculate the 3-week moving averages for the copies sold. (06 marks)
- (b) (i) On the same axes, plot the original data and the 3-week moving averages. (06 marks)
- (ii) Use your graphs to estimate the number of copies sold in the 13<sup>th</sup> week. (03 marks)
14. A body of mass 4 kg is initially at rest at a point  $P$  whose position vector is  $(3i + 4j) m$ . A constant force  $F = (8i + 4j) N$  acts on the body causing it to move. The body passes through another point  $Q$  after 4 seconds. Find the;
- (a) acceleration of the body. (02 marks)
- (b) velocity of the body as it passes through  $Q$ . (03 marks)
- (c) kinetic energy of the body after the 4 seconds. (04 marks)
- (d) distance between the points  $P$  and  $Q$ . (06 marks)