

**S475/1**  
**SUBSIDIARY**  
**MATHEMATICS**

**Paper 1**

**July / Aug 2022**

**2  $\frac{3}{4}$  hours**

**Name : .....**

**Signature : ..... Personal No : .....**



**KAMPALA WAKISO GIANT SCHOOLS' ASSOCIATION (KWGSA)**

**National Joint Mock Examination 2022**

**Uganda Advanced Certificate of Education**

**SUBSIDIARY MATHEMATICS**

**Paper 1**

**2 Hours 45 minutes**

**INSTRUCTIONS TO CANDIDATES**

*Answer **all** questions in section A and only **four** questions in section B.*

*Each question in section **A** carries 5 marks while in section **B** each question 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  $g = 9.8ms^{-2}$*

*Squared paper is provided*

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

## SECTION A (40 MARKS)

*Attempt all questions*

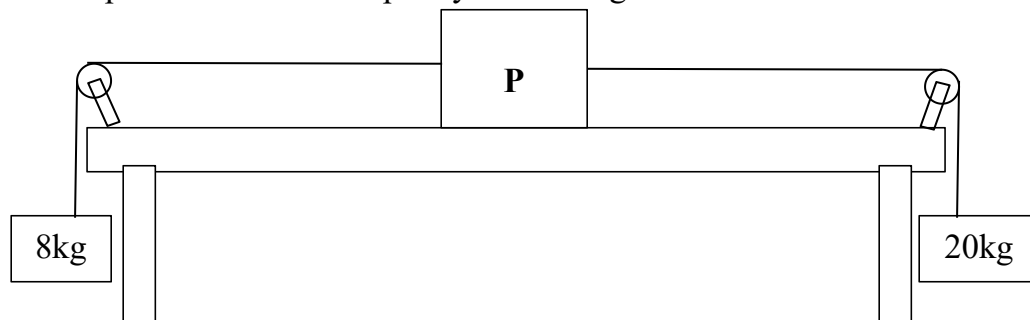
1. The roots of a quadratic equation  $2x^2 + 8x - 12 = 0$  are  $\alpha$  and  $\beta$ . Find the values of;  
(i)  $\alpha^2 + \beta^2$  (03 marks)  
(ii)  $\frac{1}{\alpha} + \frac{1}{\beta}$  (02 marks)
2. The ninth term of an arithmetic progression (A.P) is greater than the fifth term by 6. The sum of the first twelve terms is 123. Find the;  
(a) Common difference of the A.P (03 marks)  
(b) first term of the A.P (02 marks)
3. A bag contains 5 red pens and 7 blue pens. Two pens are picked at random with out replacement. Using a tree diagram, find the probability of picking the pen of the same colour. (05 marks)
4. A class of  $n$  students, sat for a mathematics test, Given that  $\sum fx = 2400$ ,  $\sum fx^2 = 19500$  and mean of  $x = 16$ . where  $x$  is the mark and  $f$  is the frequency; Determine the value of;  
(i)  $n$  (02 marks)  
(ii) standard deviation. (03 marks)
5. Prove that  $\frac{\sin\theta + \tan\theta}{1 + \cos\theta} = \tan\theta$  and hence find the value of  $\theta$  if  $\frac{\sin\theta + \tan\theta}{1 + \cos\theta} = 1$  for  $0^\circ \leq \theta \leq 90^\circ$  (05 marks)
6. Given that  $x = \sqrt{2}$ . Express  $\frac{5-x}{2+4x}$  in form of  $a + b\sqrt{2}$  (05 marks)
7. A force of 400N change the velocity of a body from  $8\text{ms}^{-1}$  to  $28\text{ms}^{-1}$  in 10 seconds. Calculate the;  
(i) total distance covered by the body  
(ii) work done by the force. (05 marks)
8. Solve the differential equation  $\frac{dy}{dx} = 3 + 8x$  given that  $y = 30$  when  $x = 6$ . (05 marks)

## SECTION B (60 MARKS)

*Choose any four questions*

9. Given that  $y = x + 4x^2 - 3x^3$   
(a) Find the turning points of the curve and distinguish their nature. (10 marks)  
(b) Sketch the curve. (05 marks)

10. (a) Given that the forces  $F_1 = 2i + 3j$ ,  $F_2 = i - 2j$ ,  $F_3 = 2i + 6j$  and  $F_4 = 2Pi - 3Qj$  acting upon a particle in equilibrium. Find the values of **P** and **Q**. (05 marks)
- (b) A body **P** resting on a smooth horizontal table. Two bodies of masses 8kg and 20kg hanging freely, are attached to **P** by a light in extensible string which passes over smooth pulleys at the edge of the table as shown below.



If the strings remains taut and the system accelerates at a rate of  $4\text{ms}^{-1}$ , when released from rest, calculate the;

- (i) Tension in the string. (07 marks)
- (ii) Mass of the body **P**. (03 marks)
11. (a) The table below shows the price (Ushs) of flour and eggs in the years 2010 and 2020.
- | Commodity Prices (UShs.) |        |        |
|--------------------------|--------|--------|
|                          | 2010   | 2020   |
| Flour (Kgs)              | 60,000 | 90,000 |
| Eggs (trays)             | 50,000 | 75,000 |
- Taking 2010 as the base year, calculate the;
- (i) Price relative of each commodity
- (ii) A simple aggregate price index. (07 marks)
- (b) Given vectors  $a = i - 2i$ ,  $b = 3i - j$  and  $c = i + 2j$ . Find the;
- (i) length of  $5a + 3c - b$  (04 marks)
- (ii) angle between vectors  $\tilde{a}$  and  $\tilde{b}$  (04 marks)
12. (a) Given a random variable **X** has a p.d.f given by  $P(0) = 0.1$ ,  $P(1) = 0.2$ ,  $P(2) = a$ ,  $P(3) = 0.15$  and  $P(4) = 0.25$ . Find the;
- (i) value of **a** (03 marks)
- (ii) expectation of **X** (03 marks)
- (iii) variance of **X**. (03 marks)
- (b) Two events **A** and **B** are such that  $P(A) = \frac{2}{3}$  and  $P(B) = \frac{1}{5}$ . Find;
- (i)  $P(A \cup B)^I$  if **A** and **B** are mutually exclusive. (03 marks)
- (ii)  $P(A \cap B^I)$  and  $P(A^I \cap B^I)$  if **A** and **B** are independent. (03 marks)

13. The table below shows the marks of 8 students in mid-term test and End of term test in English.

Mid term test (x)	80	70	47	62	70	76	79	67
Enfd of term (y)	80	50	32	60	69	67	80	49

- (a) (i) Draw a scatter diagram for the data.  
(ii) On the same diagram, draw a line of the best fit.  
(iii) Use the line to find the value of  $y$  when  $x = 75$ . (08 marks)
- (b) Calculate the Spearman's rank correlation coefficient and comment on your result. (07 marks)
14. (a) Given the matrices  $A = \begin{pmatrix} -5 & 10 \\ 8 & 4 \end{pmatrix}$ , and  $B = \begin{pmatrix} 2 & -3 \\ -2 & 1 \end{pmatrix}$  find;  
(i)  $\mathbf{AB}$  and  $\mathbf{BA}$  and comment on your results. (06 marks)  
(ii) matrix  $\mathbf{M}$  such that  $2\mathbf{A} + \mathbf{M} = \mathbf{B}$  (04 marks)
- (b) Use matrix method to solve the equations  
 $4y - 3x = 4$   
 $4x + 3y = 8$  (05 marks)

15. (a) The table below shows the marks obtained by 80 students in a test.

Marks	50-54	55-59	60-64	65-69	70-74	75-79	80-84
No. Of candidates	5	6	16	20	16	11	6

Calculate the;

- (i) Mean mark (05 marks)  
(ii) Standard deviation. (03 marks)  
(iii) Median mark. (03 marks)
- (b) Draw a histogram and use it to estimate the modal mark. (04 marks)

END