

GAYAZA HIGH SCHOOL**Uganda Advanced Certificate of Education****SENIOR FIVE APPLIED MATHEMATICS (P425/2)****Paper 2**

3 Hours.

INSTRUCTIONS TO CANDIDATES:

Attempt **all** the **eight** questions in Section **A** and **five** from section **B**

Begin each answer on a fresh sheet of paper

Mathematical tables with a list of formulae and squared papers are provided.

Silent non-programmable scientific calculators may be used.

In numerical work, take $g = 9.8 \text{ m s}^{-2}$.

State the degree of accuracy at the end of each question attempted using a calculator or tables

indicate **Cal** for calculator, or **Tab** for mathematical tables.

SECTION A(40 MARKS)

Answer **all** questions in this section.

1. The probability that a baby boy is born in a family is α and the probability that girl is born is β where $\alpha + \beta = 1$

Construct a sample space for the possible ways children could have been born in a family of three children. Hence construct the probability distribution table for the number N, of boys in a family of three children.

2. A particle starts from rest at the origin (0, 0). Its acceleration in ms^{-2} is given by $\mathbf{a} = 6\mathbf{i} - 4\mathbf{j}$. Find its speed and position after $t = 2$ seconds.
3. Mary's chance of passing an examination is $\frac{3}{5}$. If she sits for four examinations, find the probability that she passes:
- only three examinations.
 - at least one examination.
4. A heavy particle is projected from a point O at an angle of elevation α . Prove that the equation of the trajectory is $y = x \left(1 - \frac{x}{r}\right) \tan\alpha$, where r is the horizontal range.

5. Given the table below;

x	0	10	20	30
y	6.6	2.9	-0.1	-2.9

Use Linear interpolation to find;

- y when $x = 16$
 - x when $y = -1$.
6. A four-man team is to be selected from three women and 4 men.
- What is the probability that at least 3 men will be on the committee?
7. Forces of 2N, 4N, 3N and 2N act along the sides PQ, QR, RS, SP, of a square PQRS of side 2m. A force of $\sqrt{5}N$ acts along QM where M is the mid-point of PS. Calculate the;
- magnitude of this resultant
 - angle this resultant makes with PQ.
8. For a set of 9 numbers $\sum (x - \bar{x})^2 = 60$ and $\sum x^2 = 285$. Find the mean of the numbers.

SECTION B: (Answer any five questions)

9. (a) A train travelling along a straight line with constant acceleration is observed to travel consecutive distances of 1km in times of 30 s and 60 s respectively. Find the initial velocity and acceleration of the train.

(b) A constant force of 35N acting horizontally causes a particle of mass 2 kg to move over a rough horizontal plane. The particle passes two points A and B, 5m apart with speeds of 5ms^{-1} and 10ms^{-1} respectively. Find the magnitude of the frictional resistance.

10. The Senior five mathematics class while studying the topic on price indices carries out a practical lesson of baking a class cake. The table below shows the major items required and their corresponding prices in 2013 and 2014.

ITEM	PRICE		WEIGHT
	2013	2014	
Milk(Per litre)	1000	1300	0.5
Eggs(Per tray)	3500	4300	1
Sugar (Per kg)	3000	3800	2
Blue band (Per Kg)	7000	9000	1

Taking 2013 as the base year, calculate for 2014 the;

- Price relatives for each item.
- Simple aggregate price index.
- Weighted aggregate price index and comment on your result.

11. The probability mass function of a discrete random variable X is given by

$$f(x) = \begin{cases} k(2^x), & x = 0,1,2,3,4. \\ 0, & \text{elsewhere;} \end{cases}$$

Where k is a constant.

Find the;

- value of k
- mean of X.
- standard deviation of X.
- $P(1 < x \leq 4)$.

12. (a) John wishes to send a message to Mary. The probabilities that he uses e-mail, letter or personal contact are 0.4, 0.1 and 0.5 respectively. He uses only one method; the probabilities of Mary receiving the message if John uses e-mail, letter or personal contact are 0.6, 0.8 and 1 respectively.

(i) Find the probability that Mary receives the message.

(ii) Given that Mary receives the message find the probability that she received it via e-mail

(b) Two events A and B are such that $P(A) = \frac{2}{5}$, $P(A \cap B^c) = \frac{3}{10}$, $P(A^c/B) = \frac{3}{5}$.

Find (i) $P(A \cap B)$

(ii) $P(B)$

(iii) $P(A/B)$

13. (a) A stone is projected from a point O with initial velocity $5\mathbf{i} + 12\mathbf{j}$. Find a vector expression for the velocity and position of the projectile at time t .

(b) A particle is projected horizontally at 168ms^{-1} . Find the magnitude and direction of the velocity of the particle five seconds after projection.

14. Figure 1 shows one end of a light inelastic string attached to a mass of 1kg which rests on a smooth plane inclined at 30° to the horizontal.

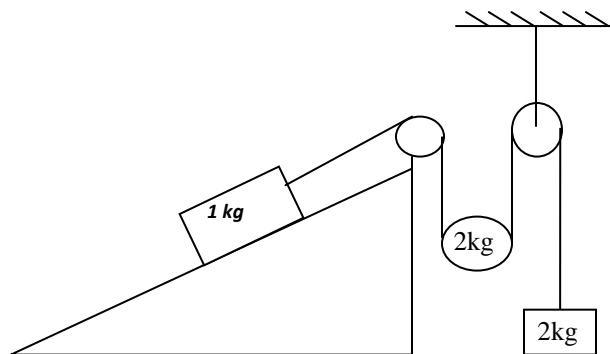


Fig. 1

The string passes over a smooth fixed pulley at the edge of the plane, under a second smooth moveable pulley of mass 2kg and over a third fixed pulley, and has a mass of 2kg attached to the other end. Find the:

- (i) acceleration of the masses and the moveable pulley
- (ii) tension in the string.

15(a) Find the range within which the exact value of z lies, given that

$$Z = \frac{1}{x} + \frac{1}{y} + xy, \quad x = 4.165 \pm 0.001$$

$$y = 6.72 \pm 0.01$$

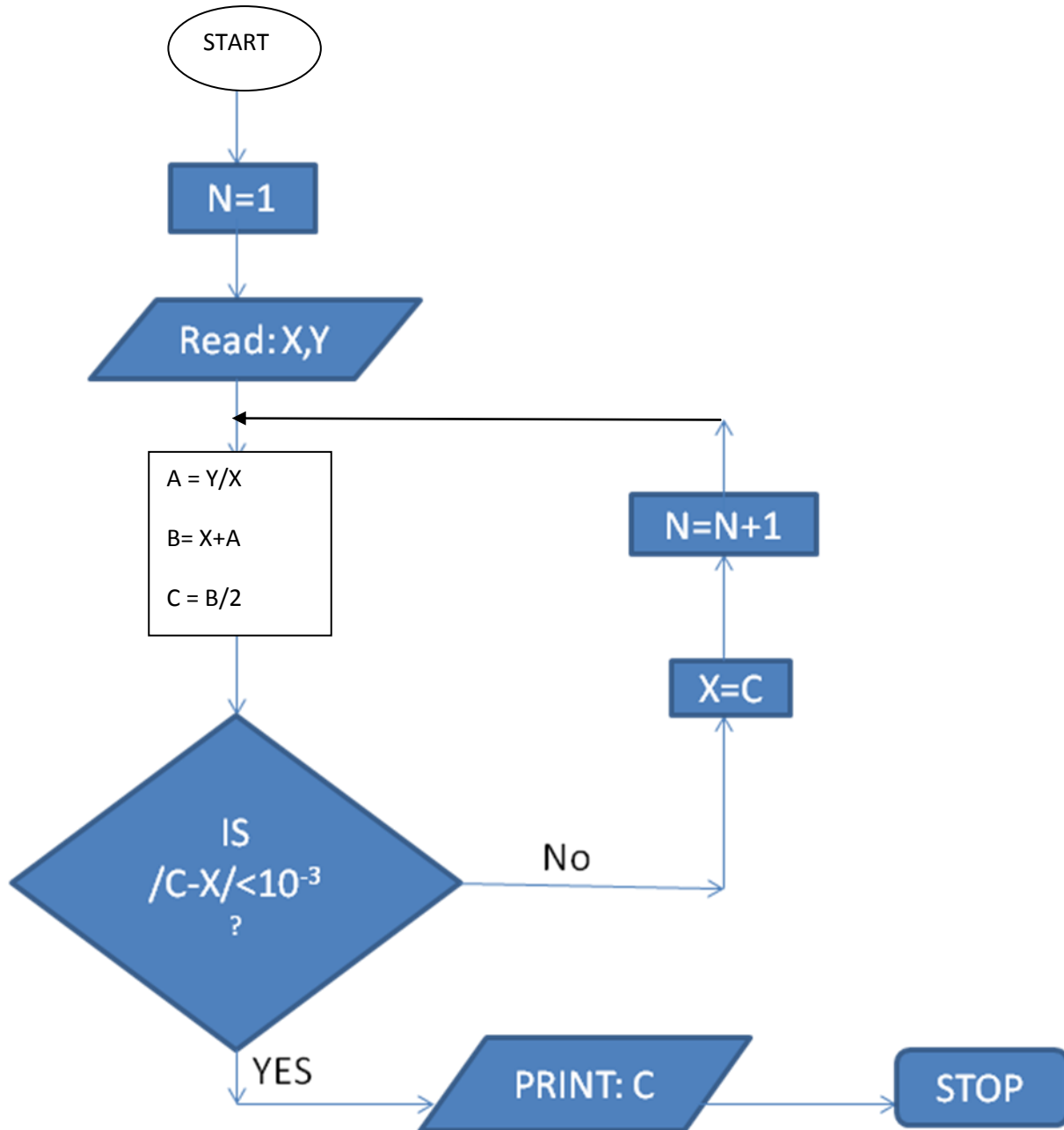
(b) Given that $X = 4.8654$ and $Y = 2.80$

- i) State the maximum possible errors in X and Y .
- iii) Find the limits within which XY lies correct to 4 decimal places.

16. (a) Show that one of the roots of the equations $e^x - 2x = 1$ is zero and the other lies between $x = 1$ and $x = 1.5$.

(b) Using the same graph, draw the curves $2e^x$ and $4 - x^2$ and use these to show that the equation $2e^x + x^2 - 4 = 0$ has two real roots. Use your graph to find these roots.

17. Study the flow chart below;



- i) Perform the dry run of the flow chart for $Y = 15$ and $X = 4$.
- ii) State the purpose of the flow chart.