

P425/2

PRINCIPAL MATHEMATICS

Paper 2

April, 2026

2 ½ hours



NORTH KIGEZI DIOCESAN PREMOK EXAMINATIONS 2026

Uganda Advanced certificate of Education

PRINCIPAL MATHEMATICS

Paper 2

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

This examination paper has two sections; A and B.

It consists of five items.

Section A has one compulsory item.

Section B has two parts; I and II each with two items. Respond to one item from each part.

Respond to three examination items in all.

Any additional item (s) responded to will not be scored.

Graph paper is provided.

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

In numerical work, take g to be 9.8ms^{-2}

SECTION A

Respond to this compulsory item.

Item 1

The school librarian records the number of students present in the library and the corresponding number of hours spent reading.

| | | | | |
|---------------------------|----|----------------|----|----------------|
| <i>Time (hours)</i> | 2 | $2\frac{1}{4}$ | 3 | $3\frac{1}{2}$ |
| <i>Number of students</i> | 65 | 50 | 35 | 20 |

The librarian wants to estimate how many students spent $2\frac{1}{2}$ hours reading and also predict the number of hours spent by 10 students while still reading.

A delivery company in a town wants to estimate the total distance covered by one of its riders over a short trip. The rider's speed, v , varies according to the function

$v(x) = x + \sin x$, where x is time in hours and v is in kmh^{-1} . The manager wants to estimate the total distance traveled between $x = 0$ hours and $x = 2$ hours. Since the exact calculation is complicated, they decide to use the Trapezium rule with six ordinates to approximate the total distance.

Task:

Help;

- (a) The librarian to obtain the estimates of the number of students and hours by using numerical methods.
- (b) The company manager to
 - (i) Estimate the total distance traveled, giving the answer to approximately three decimal places.
 - (ii) Calculate the percentage error in the estimate and advise him on how to reduce it.

SECTION B

This section has two parts; I and II

Part I

Respond to one item from this part.

Item 2

A manufacturing company is reviewing the annual earnings of its factory workers to better understand wage distribution and plan future salary adjustments. The income (in million of shs) of 40 workers are recorded as follows:

| | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 1.0 | 1.1 | 1.0 | 1.2 | 5.4 | 1.6 | 2.0 | 2.5 |
| 2.1 | 2.2 | 1.3 | 1.7 | 1.8 | 2.4 | 3.0 | 2.2 |
| 2.7 | 3.5 | 4.0 | 4.4 | 3.9 | 5.0 | 5.4 | 5.3 |
| 4.4 | 3.7 | 3.6 | 3.9 | 5.2 | 5.1 | 5.7 | 1.5 |
| 1.6 | 1.9 | 3.4 | 4.3 | 2.6 | 3.8 | 5.3 | 4.0 |

To assist in decision making, the management team asks you, as a data analyst to help them organize and analyse this data.

A headteacher wants to find out whether there is a relationship between her students' performance in GP and ICT. She records marks of a group of students as shown below.

| | | | | | | | | |
|------------|----|----|----|----|----|----|----|----|
| GP | 72 | 80 | 50 | 64 | 72 | 56 | 50 | 60 |
| ICT | 78 | 79 | 65 | 60 | 85 | 67 | 54 | 65 |

Task:

- (a) Help the management team to:
- Organize the data into a frequency distribution table using equal class intervals of 0.5million shs, starting from 1.0m.
 - Determine the mean annual income and standard deviation of the incomes.
 - Present the data on a suitable graph and use it to estimate the commonest annual income.
- (b) Help the headteacher establish the relationship between the performance in GP and ICT, by calculating a suitable rank correlation coefficient. To what extent is this relationship?

Item 3

A delivery company monitors the time (in hours) it takes for a driver to complete a short route. Let x represent the time taken where $0 \leq x \leq 2$. The company models the probability distribution of x using the probability function below.

$$f(x) = \begin{cases} a & ; & 0 \leq x \leq 1.5 \\ \frac{a}{2}(2-x) & ; & 1.5 \leq x \leq 2 \\ 0 & ; & \text{otherwise} \end{cases}$$

The company monitor wishes to determine the value of the constant a so that this is a valid probability distribution function and then use it to use to analyse other related concerns.

John plays a game that involves tossing a special coin. The coin is designed so that getting a head is three times as likely as getting a tail. John is asked to toss the coin 5 times during the game. To win a prize, John must get utmost two tails in those 5 tosses.

Task:

- (a) Help the company monitor to;
- Determine the value of a
 - Find the probability that a delivery takes less than 1.6 hours.
 - Calculate the mean delivery time.
- (b) Help John to calculate his probability of winning the prize.

Part II

Respond to **one** item from this part.

Item 4

During a training session, two friends Alex and Ben, are standing 100m apart on a flat field. At the same moment, they each kick a ball towards each other.

Alex kicks his ball towards Ben with a speed of 60ms^{-1} at an angle of 30° above the horizontal. At the same time, Ben kicks his ball towards Alex with a speed of 50ms^{-1} at an angle α to the horizontal. The balls travel through the air and collide at some point between them. The trainer wishes to determine the angle α° and how long after being kicked the balls take to collide.

During the same session, another player Charles kicks the ball straight upwards from the ground with a speed of 21ms^{-1} . A spectator is watching closely and is curious about how high the ball will go and also find the times when the ball is at a height of 10metres above the ground.

Task:

Help the;

- Trainer to determine the value of α and the time taken for the balls to collide.
- Spectator to accomplish the task.

Item 5

A square metal frame ABCD of side 1metre is fixed on a flat surface. Along its edges and one diagonal, several forces are applied to test the stability of the frame. Forces of 3N, 4N, 4N, 3N and 5N are applied along AB, BC, CD, DA and CA respectively.

Engineers take the directions AB (horizontal) and AD (vertical) as the reference axes. They wish to determine the magnitude and direction of the resultant force on the metal frame. They also want to find the equation of the line of action of this resultant force.

At a construction site, a worker is testing a pulley system used to lift materials up a slanted surface. A 50kg load is placed on the rough ramp inclined at an angle of 30° to the horizontal. The load is connected by a light inextensible rope that passes over a smooth pulley fixed at the top of the ramp, to another hanging load of 30kg.

The coefficient of friction along the ramp is $\frac{1}{4}$. The worker wishes to know the tension in the rope and the acceleration of the system. The system will be suitable for use if the tension in the rope is greater than 300N.

Task:

- As a student of mechanics, help the engineers to accomplish their task
- Help the worker;
 - To know the acceleration of the system.
 - To determine if the pulley system will be suitable for use during the construction.

END