

P425/2
PRINCIPAL
MATHEMATICS
APRIL. 2026
 $2\frac{1}{3}$ HOURS

PILKINGTON COLLEGE MUGULUKA
UGANDA ADVANCED CERTIFICATE OF EDUCATION
PRINCIPAL MATHEMATICS

PAPER 2

2 hours 20 minutes

INSTRUCTIONS TO CANDIDATES:

- This paper consists of **Section A** and **Section B**.
- The paper has **4 items** in total, Respond to **3 items** in all.
- **Section A** has **2 items**; both items are **compulsory**.
- **Section B** has **2 items**; respond to **one item** only.
- Where necessary, assume $g = 9.8 \text{ m/s}^2$.

SECTION A: DATA AND PROBABILITY

This section is compulsory.

ITEM 1:

As a way of improving agricultural productivity in Uganda, the Ministry of Agriculture introduced an improved maize seed distribution program to farmers in Lira district. The farmers were supplied with three varieties of improved seeds: Hybrid (H), Longe 10 (L), and Bazoka (B). These seeds were distributed in the ratio of 30%, 50%, and 20% respectively. From previous farming records, Hybrid seeds have a 90% chance of germinating when planted, Longe 10 seeds have an 80% chance of germinating, and Bazoka seeds have a 70% chance of germinating. A farmer randomly selects and plants 100 seeds from this mixture on his farm.

Tasks:

Determine the probability that;

- a randomly selected seed will germinate
- a Longe 10 seed was planted given that it did not germinate
- more than 70 seeds will germinate
- between 75 and 90 seeds will germinate.

ITEM 2:

At a certain school in Kapelebyong district, student attendance varies daily due to factors such as weather conditions, transport challenges, and school activities. The number of students attending school each day is uniformly distributed between 80 and 100 students. During a mathematics test, the scores obtained by the students were recorded as follows;

Marks	<20	<30	<35	<40	<50	<60	<80
Number of Students	10	30	20	10	25	5	20

This information is important for teachers to understand overall performance and plan for improvement.

Tasks:

- a) Determine the expected number and the variance of students attending school daily.
- b) Find the average score and the standard deviation of the scores.
- c) Represent the data on an appropriate graph and use it to estimate the most common score obtained by the students.

SECTION B: MECHANICS

*Respond to **one** item only*

ITEM 3:

On the slopes of Mount Elgon, a mountain rescue team is carrying out an emergency operation to deliver medical supplies to an injured climber. A rescue package of mass 40 kg is lowered down a rocky slope inclined at 25° to the horizontal. The package is attached to a strong, lightweight rope fixed to an anchor point at the top of the slope.

Due to the steep and rough terrain, the team carefully controls the descent. The coefficient of kinetic friction between the package and the slope is 0.15. The rescue team applies a tension force so that the package moves down the slope with a constant acceleration of 0.5 m/s^2 .

Halfway down the 80 m slope, the rope suddenly breaks. The package continues sliding down the remaining part of the slope and then moves onto a horizontal rough plateau where it eventually comes to rest. Assume the coefficient of friction on the plateau is also 0.15.

Tasks:

- a) Find the friction force on the slope.
- b) Find the package's speed at the bottom of the slope after the rope breaks.
- c) Find how far the package slides on the horizontal plateau before stopping.

ITEM 4

On a training ride along a straight north-south road in Gulu, a cyclist named Alex rides due south. At a speed of 20 km/h, he observes that the wind appears to come from a bearing of 240° . When

he reduces his speed to 15 km/h (still riding due south), the wind appears to come from a bearing of 210° . Using these two observations, Alex determines the true velocity vector of the wind.

Interestingly, in a nearby open field in Gulu, two objects P and Q are moving in a way that is directly related to the wind vector Alex just calculated. Object P is initially at position $3\mathbf{i} - 2\mathbf{j}$ meters and moves with constant velocity $\mathbf{i} + \mathbf{j}$ m/s. At the same time, object Q is at position $\mathbf{i} + 4\mathbf{j}$ meters and moves with velocity $4\mathbf{i} - 2\mathbf{j}$ m/s.

Tasks:

- a) Using Alex's observations, determine the true velocity vector of the wind.
- b) Determine the position of P relative to Q as time passes, and hence describe their motion relative to each other.

END