P425/2
Principle Mathematics
Paper 2
July/Aug, 2026
3 HOURS

PROVINCIAL EXAMINATIONS AGENCY (PEA)
COUHEIA MOCK EXAMINATIONS 2026
Uganda Advanced Certificate Of Education
PRINCIPLE MATHEMATICS
Paper 2
Time: 3 hours

INSTRUCTIONS TO CANDIDATES

- This paper consists of **two** sections; **A** and **B**; with five examination items.
- Answer a total of **three** items.
- Section **A** has **one compulsory** item.
- Section **B** has two parts **I** and **II**, select one item from each part.
- Any additional item(s) answered will **not be scored**.
- All answers must be written in the answer booklets/sheets provided.
- The graph paper is provided.
- Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.
- Where possible use $g = 9.8ms^{-2}$

P T O

SECTION A (Compulsory)

ITEM. 1

In the process of construction of a water reservoir, a team of surveyors measured the depth profile of land at equal intervals of 10 meters across the proposed site and obtained the following systematic measurements in meters; 2.4, 3.1, 3.8, 4.2, 4.0, 3.5 and 2.8. Engineers want to estimate the cross-sectional area of the land before excavation begins.

The engineer further explains that the amount of water expected to be pumped into the reservoir depends on solving the equation $x^3 - 4x - 10 = 0$, where x represents the operating efficiency factor of the pump. A preliminary estimate suggests that the value of x lies between 2 and 3. Since no exact algebraic solution is readily available.

Before final construction begins, the supervisor had to measure the planned rectangular concrete base of the reservoir and record the length as $30m \pm 0.1m$ and width as $30m \pm 0.1m$. The project committee was worried that inaccurate measurements may affect the construction budget and mount of materials required.

Tasks;

As a mathematics student, if given a chance to analytically advise on the above situation, how would you come up with;

a. The appropriate numerical method to find the approximate area of the land available for excavation.
b. A suitable iterative method to obtain the solution to 3 decimal places
c. The range within which the exact area lies and the percentage error in approximating the area

SECTION B Part I
(Choose one item)

ITEM. 2

In a secondary school, the issuance of school uniforms for senior ones depends on their heights. As they proceed in the successive classes their uniform sizes keep changing and new uniforms need to be issued again. It is the school policy that only when the initial mean height is at **least 125cm** and the inter-quartile range of the heights not exceeding **16cm** is when new uniforms will be issued. The heights are as follows;

Height(cm)	< 100	< 110	< 120	< 130	< 140	< 150	< 160	< 170
Cumulative frequency	0	27	85	215	320	370	395	400

Sometimes the head teacher prefers storing the heights of new senior one students in a graphical format to easily establish the **most common** height initially on admission to guide on the amount of material to purchase as students progress in the next classes. Unfortunately he is not a mathematician.

On the other hand, when a student completes S.4 and joins S.5 at the same school, free school uniform sets will be given as a reward under a condition that the relationship between the first 7 best performed subjects in MOCK and UCE is **at least high**. A student obtained the following grades:

MOCK	A	B	A	D	E	D	B	E
UCE	C	B	C	E	E	C	A	D

Tasks;

As a mathematics student, if consulted, advise the school to establish;

a. Whether new uniforms will or will not be issued.
b. How the head teacher will store the data and also highlight for him the most likely height to enable the change uniform.
c. In your own view, do you think a set of new uniforms will be given to that student joining S.5 with the scores provided? (Justify your responses backed by calculations)

ITEM. 3

In Uganda, the cases of road accidents are increasing because of wreck less crossing and over speeding of pedestrians and drivers respectively. Because of this, traffic lights have been mounted on most busy roads. A case in point is the Kampala northern bypass whereby at a given point the speeds of the cars are normally distributed. Police found out that 95% cars travelled at a speed less than $85kmh^{-1}$ and 10% travelled at a speed less than $55kmh^{-1}$.

On a certain day, an operation by police was carried out on 5 cars to find out how often these accidents occur. They came to realize that the chance of an accident to occur at this point was twice that of an accident not to occur. The O.C traffic instructed that if the chance that at least 3 accidents occurring in a week exceed 0.49, new road humps will be constructed unless otherwise.

In the process, many cars were impounded and each car had its issues depending on the mechanical conditions found on it. These conditions followed a continuous random variable that was uniformly distributed in the interval **a** to **b**. the mechanical conditions for car A had a lower quartile of 5 and an upper quartile of 9. It is a policy by the police to imprison a driver if the mechanical issues of the car lie in the interval between 2 and 12.

Tasks

As a senior six student if consulted, come up with a clear report on the following backed by calculations;

a. The average speed and proportion of cars that exceeded $50kmh^{-1}$
b. Whether new road humps will be constructed or not.
c. Whether it was possible for the driver of car A to be imprisoned or not.

SECTION B Part II
(Choose one item)

ITEM. 4

A trader in kasese who runs a dairy farm find challenges in delivering the milk uphill to where his dairy shop is located. Since he farm is located down at the foothill of Rwenzori Mountain, he was advised to buy a container and fasten 4 ropes on it to enable 4 men to lift it to the dairy uphill. The ropes were fastened in such a way that each was in the direction $N60^0E, 320^0, S20^0E$ *and* 210^0. The men could provide forces in the ropes equivalent to 30N, 20N, 70N and 60N each respectively.

In the long run, this seemed costly and time wasting. He was advised to instead use a pulley placed at the top of the hill driven by an engine. This made him buy a larger tank of mass 20kg to carry milk weighing 100kg and a cable that would pass over the smooth fixed pulley that would connect the tank to another mass of 10kg that could act as a counter weight. The tank containing milk will be moving up the slope of 3 in 5 that is rough with the coefficient of friction 0.4. The counter weight will hang freely vertically downwards on the other side of the hill to control downward motion for refill.

The pulley should be strong enough to withstand the force imposed on it by the cable for the combined masses uphill and also wishes that when the engine is switched off, the empty tank should be made to slide down with an acceleration of $1.896ms^{-2}$ under influence of a force PN acting downwards parallel to the plane.

Task;
As a mechanics student if consulted, use clear calculations to come up with proper advise on;

a.
   i. A single force and its direction that is equivalent to the system of forces imposed on the container by the four men.
   ii. Whether buying a pulley that could withstand a total net force of 180N for the combined mass uphill would work well for him.

b. The magnitude of force P required in achieving the required acceleration. How safe can this system be kept working efficiently? (Give scientific ways).

ITEM. 5
A game ranger at Murchison falls national park spots a buffalo running along a straight line towards river Nile. The ranger observes it at post A. at the moment of observation (t = 0), the buffalo is at point B, 120m east of post A and it is running due north at a constant speed of $20ms^{-1}$ relative to the ground.

Simultaneously, a rescue drone is launched from the post A to move as close as possible to the buffalo's path. The drone flies at a constant speed of $10ms^{-1}$ relative to the ground maintaining a fixed direction.
At the instant when the drone is $60\sqrt{3}m$ horizontally away from the buffalo, it projects a tranquilizer dart horizontally towards the buffalo. The dart is released from a height 80m above the ground with an initial speed ums^{-1}. To avoid injuring the buffalo, the speed with which the dart hits the buffalo should not exceed $47ms^{-1}$.

When the buffalo was hit, it got shocked and it jumped upwards a distance of 0.45m high. The game ranger wishes to get analysis of the above information mathematically for better reporting.

Tasks;
As a dynamics student, come up with necessary calculation to help the ranger establish;

a. The closest distance reached by the drone and the time it took to be achieved.
b. If the buffalo was injured or not.
c. The initial velocity with which the buffalo jumped.

END