

P425/2  
PRINCIPAL  
MATHEMATICS  
Paper 2  
Jul/Aug. 2026  
2½ hours



WAKISO-KAMPALA TEACHERS' ASSOCIATION (WAKATA)  
WAKATA MOCK EXAMINATIONS 2026  
Uganda Advanced Certificate of Education  
PRINCIPAL MATHEMATICS

WAKATA 2026

Paper 2

2 hours 30 minutes

**INSTRUCTIONS TO CANDIDATES:**

*This paper consists of two sections, A and B. It has five examination items.*

*Section A has one compulsory item.*

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

*Respond to three examination items in all.*

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

*All responses must be written in the answer booklet(s) provided*

*Where necessary use the value of  $g = 9.8\text{ms}^{-2}$ .*

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

*Neat work is a must!!*

## SECTION A

*This section is compulsory.*

### Item 1.

A small carrier business operating between Kabale and Mbarara uses motorcycles and small vans to transport parcels. The owner introduced a computerized system to estimate parcel charges, monitor fuel usage and determine container capacities. However, he is not sure whether the calculations are reliable enough for business decisions.

Previous records showed that parcels of masses 200g, 400g and 600g were charged Shs 700, Shs 1200 and Shs 3000 respectively. One customer brought a parcel weighing 185g, while another claimed to have Shs 2200, although the parcel mass was not recorded. The owner will keep the computerized charging system if the charge for the 185g parcel is less than 700, and the estimated mass corresponding to Shs 2200 less than 520g; otherwise, the fare estimates will be reviewed before use.

The business also manufactures conical metallic containers for motorcycles. One container had radius of 4.7cm and height of 12.65cm measured with possible errors of  $\pm 0.3$  and  $\pm 0.45$  respectively. The owner will use the container measurements for production if the difference between the upper and lower limits of the possible volume does not exceed  $140\text{cm}^3$ ; otherwise, the container dimensions will be re-measured.

In addition, the fuel consumption of one motorcycle while climbing a hilly road near Kabale was represented by the function  $y = \tan x$  over the interval  $\frac{\pi}{6} \leq x \leq \frac{\pi}{3}$ . The transport officer used 6 ordinates to estimate the total fuel used during the climbing session. The officer will use this fuel estimate for planning if the percentage error is less than 5%; otherwise, a more accurate method for determining the fuel consumption will be required.

### Task:

Help the owner of the carrier company interpret the information, choose suitable method and make justified decisions about the charging system, container measurements, and fuel consumption estimate.

Linear 60

Trish

## PART I

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

## Item 2.

The management committee of a secondary school became concerned about learners' academic performance, staff punctuality and the safety of the school transport system after several complaints from parents and teachers. During a planning meeting, the committee resolved that future decisions should be guided by proper mathematical analysis and evidence rather than assumptions. They therefore wished to study examination performance in order to improve academic standards, evaluate reliability of the staff punctuality arrangements, and assess whether the road commonly used by the school van was safe enough for regular transport activities.

The marks obtained by learners in a mock examination were grouped below;

| Marks interval   | Number of students |
|------------------|--------------------|
| $0 < x \leq 15$  | 6                  |
| $15 < x \leq 30$ | 8                  |
| $30 < x \leq 35$ | 15                 |
| $35 < x \leq 40$ | 20                 |
| $40 < x \leq 55$ | 10                 |
| $55 < x \leq 65$ | 7                  |
| $65 < x \leq 75$ | 4                  |

$$\frac{3000 - 700}{600 - 200} = \frac{2300}{400}$$

$$\begin{aligned} & - 0.5 - 15.5 \\ & 14.5 - 30.5 \\ & 29.5 - 35.5 \end{aligned}$$

The committee wished the director of studies to estimate the median mark using a suitable statistical graph and also use a computational method to determine the mean mark and standard deviation. The committee will maintain the current teaching plan if the mean mark is at least 50; otherwise, weekly tests will be introduced.

The committee also studied the punctuality of a staff member who travels by either route A or route B. The chance that he uses <sup>both</sup> route is 0.25. if route A is used, the <sup>chance</sup> that he arrives late is 0.6, while for route B it is 0.3. The committee will keep the current staff travel arrangement if the chance that the staff member used route B, after arriving late, is less than 0.7; otherwise, otherwise a stricter punctuality plan will be introduced.

In addition, accident records on a road used by the school van showed that the monthly number of accidents is a rectangular distribution from 5 to 12 accidents. The committee wished to determine the expected number of accidents in a month and the chance of having more than 7 accidents. The school will continue using the route for regular transport if this chance is less than 0.4; otherwise, an alternative route will be chosen.

$$\text{Var } f(x)^2 - 15 \sim 7^2$$

**Task:**

On behalf of the committee interpret the information, help it to make justified decisions about academic support, staff punctuality and safety school transport route.

**Item 3.**

A beverage company Namanve is testing the reliability of some production and recruitment decisions before introducing a new factory line. The life time  $X$ , in years of a machine component is modeled by the density function below'

$$f(x) = \begin{cases} \beta & ; 2 \leq x \leq 3 \\ \beta(x - 2); & 3 \leq x \leq 4 \\ 0 & ; \text{otherwise} \end{cases}$$

Management only will buy a new component if both mean and the median time exceed 3 years but the standard deviation is less than 1.2. Otherwise, another make of the machine will be considered.

The marketing department is studying two independent customer choices: buying mango juice and buying passion fruit juice. The chances of buying both is  $\frac{2}{15}$ , while those of buying at least one type of juice are  $\frac{3}{5}$ . A flavor will be retained on the production line if its individual buying probability is at least 0.3, if not, it will be removed.

During recruitment exercise, each of the trainees performs 7 independent machine trails. From past records a correct start is twice as likely as an incorrect start. A trainee will proceed for further training if he/she makes exactly 5 correct starts.

**Task:**

Help the management to make informed decisions about the process of purchasing a new machine, flavor retention and to determine the qualification chances of a trainee to the next level.

## PART II

*Respond to only one item from this part*

### Item 4.

A school workshop is being prepared for a science exhibition. A heavy demonstration machine of mass 18kg with a square base ABCD has to be moved from the store to the display area without damaging the tiled floor. The side AB of the square base is taken as the x – axis while the side BC is taken as the y – axis.

To test whether the machine can be moved safely by pushing along the sides of its square base, four students apply forces of 18N, 22N, 10N and 14N along AB, BC, CD and DA respectively. The single force equivalent to the four forces will be approved as efficient only if its magnitude exceeds 10N.

The machine is then loaded onto a trolley of mass 8kg. To reduce the risk of the trolley front wheels jamming, the loaded trolley is pulled by a handle using a force of 120N inclined at  $35^\circ$

Above the horizontal. On the rough workshop floor, its speed increases from rest to  $4.8\text{ms}^{-1}$  in 4s. This method will be allowed only if the coefficient of friction is not greater than 0.5, since higher values would indicate too much rubbing and possible damage to the floor.

For better control, the teacher considers another method. The 18kg machine is placed on a trolley of mass 12kg, while another trolley of 8kg carries 10kg box of display material. The two loaded trolleys are connected by a light inextensible rope and move along a smooth corridor floor. The trolley carrying the machine is placed in front and is pulled by a horizontal force of 75N. As it moves forward, it pulls the rear trolley carrying the box of display material through the connecting rope. This method can be considered efficient if the acceleration does not exceed  $2.8\text{ms}^{-2}$ , to avoid sudden movement of the machine.

### Task:

As a student of mathematics, interpret the situation, choose suitable methods and use your results to judge the safer approach of moving the loaded machine.

### Item 5.

At 12 noon, a traffic officer was monitoring two vehicles near a busy junction. The police post was taken as the origin. Vehicle A was a school van and vehicle B was a delivery truck. Their positions and velocities were recorded as at 12 noon. The position vectors and velocities of the vehicles were recorded as follows.

| Vehicle | Position vector | Velocity              |
|---------|-----------------|-----------------------|
| A       | $(5i + 2j)km$   | $(15i + 10j)kmh^{-1}$ |
| B       | $(7i + 7j)km$   | $(9i - 5j)kmh^{-1}$   |

The officer wanted to know whether the two vehicles would reach the same point if they continued moving with their velocities. The officer wanted to know the time and possible meeting point so that he could direct the help group to the correct place.

Later, vehicle broke down near the junction and had to be towed away from the road. A police vehicle of mass 1800kg towed the damaged vehicle which was of 1200kg. The police vehicle used an extensible rope along a rough horizontal road. The police vehicle applied a driving force of 6000N. The damaged vehicle experienced friction of coefficient 0.2, while the police vehicle experienced a resistance of 800N.

The towing method would work if the motion remained controlled and the rope not overstrained. This would be achieved only if the acceleration was less than  $2ms^{-2}$ , and the tension did not exceed 3500N. Otherwise the police officer had to call a break down.

### Task:

As a student of mathematics, analyze the situation and advise on where help is needed and before what time. Also advise on whether to call a break down or not.

$$\begin{array}{|c|c|c|} \hline 185 & 200 & 400 \\ \hline y & 700 & 1200 \\ \hline \end{array}$$

$$700 - y = 15$$

$$y = 685 \text{ m/s}$$

$$\frac{1200 - y}{400 - 185} = \frac{700 - y}{200 - 185}$$

$$215(700 - y) = 15(1200 - y)$$

$$150,500 - 215y = 18000 - 15y$$

$$\text{max } = \frac{4\pi r^2}{3}$$

$$\sqrt{\frac{EFx^2}{-a} - (EFx)^2}$$