

P425/1
PRINCIPAL
MATHEMATICS
Paper 1
2026
3 hours

Teacher's copy.

Sumit



UGANDA TEACHERS' EXAMINATIONS SCHEME

Uganda Advanced Certificate of Education

JOINT MOCK EXAMINATIONS

PRINCIPAL MATHEMATICS

Paper 1

3 hours

INSTRUCTIONS TO CANDIDATES:

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

*Section A consists of **one compulsory** item.*

*Section B has two parts; I and II each with two optional items. Respond to only **two** items from section B. choosing **one** item from **each** of the parts. I and II.*

*Respond to **three** items in all.*

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

Begin each item on a fresh page.

*All necessary working **must** be shown clearly.*

Graph paper is provided.

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

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Turn Over

SECTION A

The item in this section is compulsory.

Item 1

Masaka road passes in points $(3, -2)$ and $(2, 1)$, Mityana road passes at a point $(6, -7)$ but meets Masaka Road at 90° at Busega. Engineers are planning to construct Kajjansi road to obey the equation $5x + 12y - 18 = 0$ but Busega is a very busy trading Center and it must be at least 2km from Kajjansi road for the safety of the people doing business in Busega town. Due to the increased crime rate on Masaka Road, the Engineers installed three cameras at points $A(3, 2, -6)$, $B(7, 8, 4)$ and $C(13, 17, 19)$ but the engineers are not sure whether these three cameras are in the same line or not. The pole on which camera C was installed is supported by a strong wire to the ground. This supporting wire makes an angle of θ to the horizontal where θ is acute and $6\operatorname{cosec}^2\theta + 7\cot\theta = 9$, Before Busega business centre, there is a roundabout that satisfies the equation $x^2 + y^2 + 2x - 4y - 11 = 0$. A straight road touches this roundabout and moves to Nateete where Nateete is at point $(3, 5)$. Peter is planning to ride his motorcycle from Nateete to the roundabout through this straight road just to stop at the roundabout but the fuel he has can only cover 5km.

Hint; Assume 1unit = 1.4km

Task

- Determine whether Busega trading centre is at a safe location from Kajjansi road for the people doing business in this centre
- Establish whether the cameras on Masaka Road are in one straight line and determine the angle the wire supporting the pole on which camera C was installed makes to the horizontal.
- Recommend, based on calculations if Peter should rely on the fuel he has in the motorcycle for the journey from Nateete to the roundabout at Busega.

SECTION B

Answer only two items from this section, choosing one item from each of the parts I and II.

PART I

Item 2

Three students made shopping from the same shop on the same day. All items were of the same quality. Annet bought 5 books, 9 sets and 7 compo pens. Betty bought 8 books, a set and 4 compo pens. Cissy bought 6 books, 2 sets and 8 compo pens. Annet used a total of sh 65,500. Betty and Cissy spent a total of sh 90,500. Cissy spent sh18, 500 less than Annet. John needs 7 books, 4 sets and 6 compo pens however, he was given only sh 27,000 for the shopping but he is not sure whether this money will be enough to buy what he wants. The profit made by Mr. Luuti, the shop owner, after selling books is given by squaring the number of books sold add 300,000 and subtract seven hundred times the number of books sold. Mr Luuti made the smallest profit on Wednesday 3rd June 2026 because it was a public holiday in the country but he created several strategies of increasing sales such that he could get at most sh180,000 as profit on Sunday 7th June 2026 but he was not certain on the number of books to sell that Sunday. Mr Luuti's shop has two rooms. The first room is 4 metres by 2 metres while the second room has a square base whose length is 1 meter more than the length of diagonal of the first room. The area of the second room is in the form $a + b\sqrt{c}$ and this room is locked with a three digit pin obtained by arranging the roots of the equation $x^3 - 9x^2 + 23x - 15 = 0$ from the biggest to the smallest.

Turn Over

Task

- (a) Check whether John has enough money for the items he needs.
- (b) Compute the profit Mr. Luuti got on 3rd June 2026 and the range of number of books he had to sell on Sunday 7th June 2026
- (c) Determine the base area of the second room and the three digit pin used to lock this room.

Item 3

A group of seven students from SSENDE SS (excluding prefects) is needed from the 6 boys and 5 girls available to represent the rest in a workshop. The girls must be more than boys. These students will move with teachers and prefects to keep order on the way and in the workshop where the coordinate given from

$(9 + 2i)^2(3 - i)$ represents teachers and prefects in that order. They will also take some craft materials to be sold in this workshop. The prices of the craft materials will be in a certain progression. The cheapest craft will be at sh 3,000, the second will be at sh 6,000 while the third will be at sh 12,000. Mike is interested in buying the ninth craft material but he does not know how much to pay. Mike is also interested in knowing the actual number of members in the workshop who never came from SSENDE SS where these members from other schools are the coefficient of x^7 in the expansion $(3x^2 + \frac{4}{x})^8$. During the meeting, the students were told to go for lunch at 1:15pm and they were expected to come back after time t (in hours) where $0 < t < 1$ and $\log_3 t - \log_t 9 = 1$.

Task

- (a) Determine the number of ways the group needed can be selected and the number of teachers and prefects to move with the students for the workshop

- (b) Based on calculations, help Mike to know the price of the craft material he is interested in and the number of members in the workshop who never came from SSENDE SS
- (c) Generate the time at which the students are expected to come back from lunch

PART II

Item 4

On a certain fundraising ceremony, Mr. Dodo was hired to decorate the venue. The place was to have disco lights which obeys the equation $y = \frac{x^2-2x-8}{x^2-1}$.

On this ceremony there will be p VIP seats and q ordinary seats were

$\frac{257x-1392}{x^2+x-12} = \frac{p}{x-3} + \frac{q}{x+4}$. Each member who attended had to either buy a seat or keep standing. Each VIP seat was hired at sh 50,000 while an ordinary seat was hired at sh20,000. On this party, all seats from both categories were hired out. The tent in which the ordinary seats were placed obeys the equation

$y = 8 + 2x - x^2$ where x is distance from its centre.

Task

- (a) Sketch the region to be decorated by lights
- (b) Determine the total amount of money received from the hired seats
- (c) Calculate the area covered by the tent hosting ordinary seats with the ground.

Turn Over

Item 5

An athlete runs such that after time t in seconds, he is $\tan^{-1}(20t)$ metres from the starting point. His trainer promised him some gifts if he can run at a speed more than 5ms^{-1} after two seconds. He is running to keep his body fit in addition to getting some income from international competitions. He was inspired to do so after getting information that the rate at which a certain virus was spreading was proportional to the number of people having it at the time. The chances of getting the virus were higher in members who never wanted to do physical exercises for instance in 2012, only 400 people had the virus but in the year 2024, the number had reached 600. The worry is that if the number reaches 1400 people, the World Health Organisation will have to save the world by introducing a vaccine. The first vaccine will be kept in a box that will be cut from an aluminium rectangular material which is

2metres by 1 meter. Small equal squares are to be cut from each corner of the material, fold the remaining faces and cover the top with a strong material but the maximum space it can occupy is not known.

Task

- (a) Establish whether the athlete will get the gifts from his trainer as promised
- (b) Determine the;
 - (i) year in which the World Health Organisation is likely to introduce the vaccine for the virus
 - (ii) maximum space which can be occupied by the box made for keeping the vaccine.

END