

456/1
MATHEMATICS
Paper 1
Oct./Nov. 2022
2½ hours



UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

MATHEMATICS

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

*Answer **all** questions in Section A and any **five** questions from section B.*

*Any additional question(s) answered will **not** be marked.*

All necessary calculations must be done in the Answer booklet(s) provided.

Therefore, no paper should be given for rough work.

Graph paper is provided.

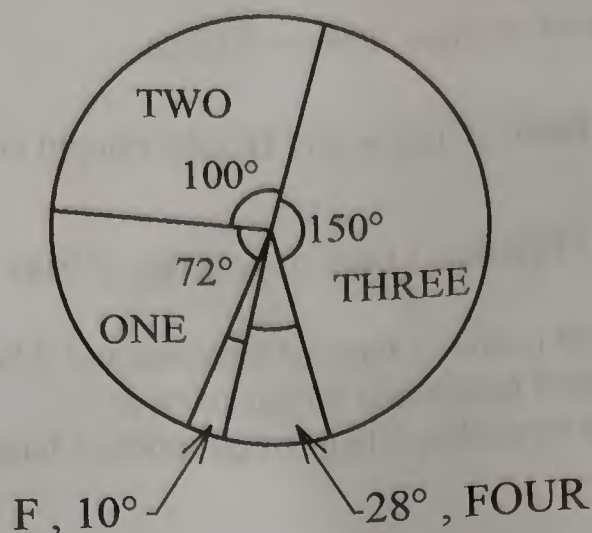
Silent, non programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A: (40 MARKS)

Answer all questions in this section.

1. Solve the equation: $3(4d-1) - (3d-2) = \frac{5}{9}d$. (04 marks)
2. Determine the inverse of the matrix $\begin{pmatrix} -6 & 7 \\ 1 & 2 \end{pmatrix}$. (04 marks)
3. A father is twice as old as his son. He is five times as old as his daughter.
Write an expression for their total age. (04 marks)
4. Simplify: $\frac{12m^2 - 27}{2m + 3}$. (04 marks)
5. A regular polygon has an exterior angle of 24° .
Determine:
(i) the number of sides of the polygon.
(ii) the angle sum of the polygon. (04 marks)
6. Under a translation, point $A(-2, 3)$ is mapped onto point $A'(5, 7)$.
Determine the translation vector. (04 marks)
7. The heights in centimetres of 6 pawpaw seedlings are 60, 55, 46, 43, 56 and 58. Using an assumed mean of 50, calculate the mean height of the seedlings. (04 marks)
8. Solve the inequality: $\frac{1}{2}(x-2) \geq 6+x$. (04 marks)

9. The pie chart below shows the grades obtained by 180 students in an examination.



- (a) How many candidates obtained grade F ?
- (b) What was the percentage of candidates in grade one? (04 marks)
10. Town B is 44 km south of town A. Town C is 33 km west of town B. Find the bearing of town A from town C. (04 marks)

SECTION B: (60 MARKS)

Answer any five questions from this section. All questions carry equal marks.

11. (a) The probability that student A will pass a mathematics test is $\frac{3}{5}$.
The probability that student B will pass the same test is $\frac{2}{3}$.
Determine the probability that student A will pass the test and student B fail the test. (04 marks)
- (b) A die has faces numbered 7, 8, 9, 10, 11 and 12. A second die has faces numbered 1, 2, 3, 4, 5 and 6. During a game, the two dice are tossed. The difference between the numbers on the first and second die are recorded as scores.
- (i) Construct a possibility space for the scores. (04 marks)
- (ii) Find the probability of obtaining a score that is a multiple of 2. (02 marks)
- (iii) Find the probability of obtaining a score of 3 or more. (02 marks)

12. (a) Solve the equation: $81^{x-3} \times 27^{2-x} = \frac{1}{243^x}$. (06 marks)
- (b) Find the value of n when $134_n = 54_{\text{eight}}$ (06 marks)

13. Four traders Akello, Baine, Cherop and Damba bought commodities as given below:

Akello bought 1 bag of posho, 5 bags of potatoes, 2 bags of sorghum and 2 bags of rice.

Baine bought 5 bags of posho, 3 bags of potatoes and 4 bags of rice.

Cherop bought 4 bags of posho and 8 bags of rice.

Damba bought 2 bags of posho, 3 bags of potatoes, 4 bags of sorghum and 3 bags of rice.

The cost per bag of the commodities was:

Posho at Shs100,000.

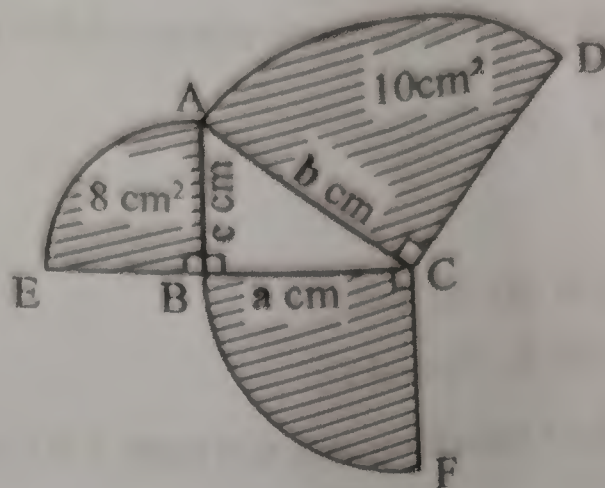
Potatoes at Shs75,000.

Sorghum at Shs60,000.

Rice at Shs200,000.

- (a) Write the matrix for the:
- (i) commodities. (02 marks)
- (ii) costs. (01 mark)
- (b) Using matrix multiplication, find how much each trader spent on the commodities. (06 marks)
- (c) The traders sold all the commodities and got the following amounts: Akello got Shs1,145,000, Baine got Shs1,725,000, Cherop got Shs2,300,000 and Damba got Shs1,445,000. Determine the profit of each trader using matrices. (03 marks)

14. In the figure below, ABC is a right angled triangle. $AB = c$ cm, $BC = a$ cm and $AC = b$ cm. The area of quadrant ABE is 8 cm^2 . The area of quadrant ACD is 10 cm^2 .



- (a) Find the values of b and c . (06 marks)
- (b) Find the area of:
- triangle ABC.
 - quadrant BCF. (06 marks)
15. (a) A motor cyclist rides from home to a trading centre at 30 km/hr . The cyclist immediately rushes back home at 45 km/hr . This whole journey takes 50 minutes.
- Determine:
- the distance between the home and the trading centre.
 - the time spent to travel from the trading centre back home. (07 marks)
- (b) Solome was given Shs6,200 which was exactly enough to buy 3 loaves of bread and 2 kg of salt. However, she made a mistake and purchased 2 loaves of bread and 3 kg of salt. She then had a balance of Shs400.
- Calculate the cost of:
- a loaf of bread.
 - a kilogram of salt. (05 marks)

16. Triangle ABC with vertices $A(4,1)$, $B(4,4)$ and $C(2,1)$ is mapped onto triangle $A_1B_1C_1$ by a transformation whose matrix is $\begin{pmatrix} 2 & 1 \\ 1 & -2 \end{pmatrix}$.
Triangle $A_1B_1C_1$ is then mapped onto triangle $A_2B_2C_2$ by a transformation whose matrix is $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.

Determine the:

- (a) coordinates of A_1 , B_1 and C_1 . (05 marks)
 - (b) coordinates of A_2 , B_2 and C_2 . (05 marks)
 - (c) single matrix of transformation that maps ABC onto $A_2B_2C_2$. (02 marks)
17. The points $P(6,1)$, $Q(9,4)$, $R(7,8)$, $S(2,6)$ and $T(2,4)$ are vertices of a feasible region.
- (a) Show the feasible region on the graph with lines RS and ST as broken lines. (05 marks)
 - (b) Find two inequalities that describe the feasible region using the lines PQ and SR . (05 marks)
 - (c) Determine the maximum value of $2x + 3y$ in the feasible region. (02 marks)