

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.

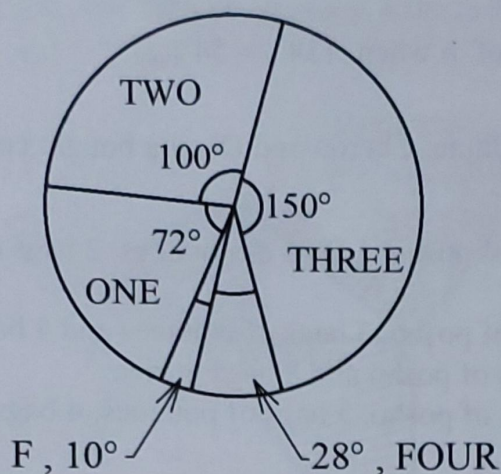
Silent, non programmable scientific calculators and mathematical tables with a list of formulae may be used.

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 $\begin{pmatrix} -6 & 7 \\ 1 & 2 \end{pmatrix}$. $\frac{1}{\det} [\text{adjoint}]$ (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.

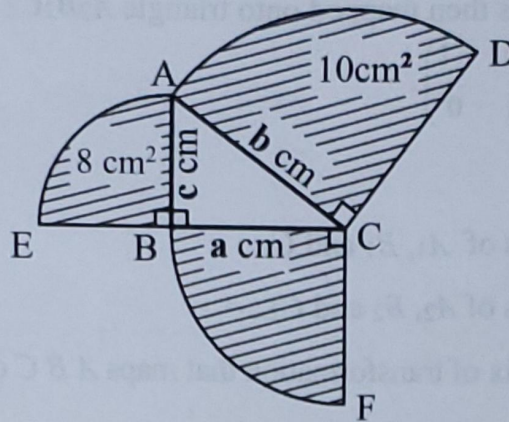
(06 marks)

- (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)