

**456/1**  
**MATHEMATICS**  
**Paper 1**  
**21 July 2014**  
**2 1/2 hours**

**ENTEBBE JOINT EXAMINATION BUREAU**

Uganda Certificate of Education

MATHEMATICS Paper 1

2 hours 30 minutes

**INSTRUCTIONS TO CANDIDATES:**

*Attempt all questions in Section A and any five in Section B.*

*Any additional questions) answered shall not be marked*

*All necessary calculations must be done in the answer booklet provided  
Therefore, no paper should be given for rough work.*

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

*Graph papers **are** provided*

**0- M -1 2014 Entebbe Joint Examination Bureau:  
Mathematics Turn Over**

**SECTION A: 40 MARKS**

**Attempt all  
question**

1. Given that  $x^*y = \frac{x^4 + y^4}{x^2 + 2xy + y^2}$

(a)  $2 \times 3$  (02 marks)

(b)  $1 \times (2 \times 3)$  (02 marks)

2. Simplify:  $\frac{[125]^{1/5}}{[81]^{-1/4}} + \frac{[3]^{-1}}{[25]^{1/2}}$  (04 marks)

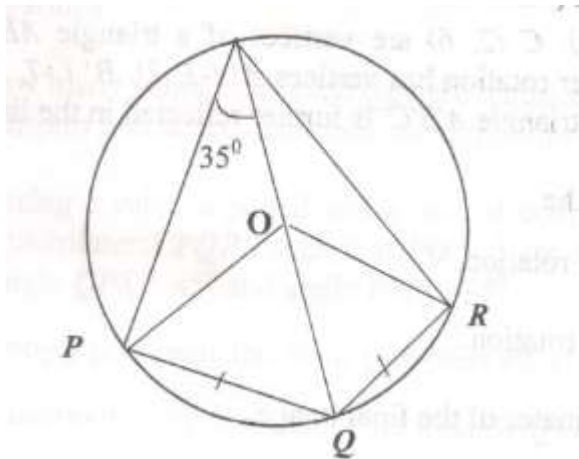
3. Given that  $P = \begin{bmatrix} -1 & 2 \\ 3 & -4 \end{bmatrix}$  and  $Q = \begin{bmatrix} -2 & 1 \\ 5 & -6 \end{bmatrix}$  Evaluate  $(P - Q)^2$  (04 marks)

4. Factorize completely:

$3px - 2py - 6qx + 4qy$  (04 marks)

5. An object of area  $14.5\text{cm}^2$  is transformed onto its image by a matrix  $M = \begin{bmatrix} 4 & 3 \\ 8 & 1 \end{bmatrix}$  Find the area of the image. (04 marks)

6. In the figure below, O is the centre of the circle,  $PQ = QR$  and angle  $PSQ = 35^\circ$



- Find: (i) the angle  $PQR$   
(ii) the obtuse angle  $POR$  (04 marks)

7. Given that  $y = \frac{ax^2 + 4}{R - bx^2}$ , express  $x$  in terms of  $a$ ,  $b$ ,  $R$  and  $y$ . (04 marks)

8. The mean of the numbers  $e$ ,  $e + 2$ ,  $e - 4$ ,  $2e + 3$  and  $e - 1$  is 2.4. Find  $e$ . (04 marks)

9. Determine the equation of the line through  $(3, 5)$  which is perpendicular to the line whose equation is  $2y = 6x + 5$ . (04 marks)

10. Given that  $d - b^2 = 34$ , and that  $a + b = 8$ , find the value of  $a$  and  $b$ . (04 marks)

### SECTION B (60 Marks)

11. (a) Given that  $y = (3x + 1)(5 - 2x)$ , copy and complete the table below. (06 marks)

$x$	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3	3.5	4
$3x + 1$													
$5 - 2x$													
$y$													

(03 marks)

- (b) Draw the graph of  $y = (3x + 1)(5 - 2x)$ , using a suitable scale and hence solve the equations: (04 marks)

(i)  $6 - 13x - 5 = 0$   
(ii)  $3x^2 + 4x - 5 = 0$  (05 marks)

12.  $A(8, 6)$ ,  $B(4, 10)$ ,  $C(2, 6)$  are vertices of a triangle  $ABC$ . Its image triangle  $A'B'C'$  under rotation has vertices  $A'(-1, 7)$ ,  $B'(-7, 3)$  and  $C'(-3, 1)$ . Then the image triangle  $A'B'C'$  is further reflected in the line  $y = 2$ .

Graphically, find the

- (i) Centre of rotation, (05 marks)
- (ii) Angle of rotation. (02 marks)
- (iii) Co - ordinates of the final image. (05 marks)

13. The table below shows the heights (in centimeters) of 40 Senior 6 students at Elgon High School Mbale.

155	172	164	57	179	148	166	153
161	176	159	151	165	154	160	172
156	163	169	171	157	160	168	158
173	146	156	167	152	169	150	162

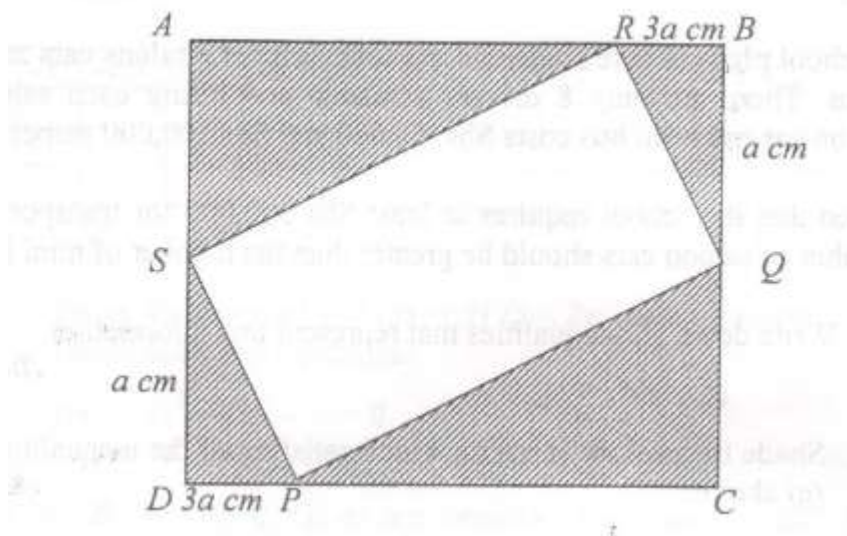
- (a) Construct a frequency table starting with 145 - 149 class. Calculate the mean height. (05 marks)
  - (b) Draw a cumulative frequency curve and use it to estimate the
    - (i) Median height. (04 marks)
    - (ii) The probability that a student selected at random from the school has a height of 152 cms and above. (03 marks)
- 14.** A school plans to take students for a tour. It hires  $x$  saloon cars and  $y$  mini buses. There are only 8 drivers available and hiring each saloon car and mini bus costs Shs. 60,000 and Shs 100,000 respectively.
- Given that the school requires at least Shs 300,000 for transport and the number of saloon cars should be greater than the number of mini buses,
- (a) Write down all inequalities that represent this information. (04 marks)
  - (b) Shade the unwanted region which satisfies all the inequalities in part (a) above. (04 marks)
  - (c) How many vehicles of each type are required to minimize the cost of transport and hence determine the minimum cost? (04 marks)
- 15.** (a) Using a ruler, a pencil and a pair of compasses only, construct a quadrilateral  $PQRS$  such that  $PQ = 5$  cm,  $PS = 8$  cm,  $SR = 7$  cm, angle  $QPS = 45^\circ$  and angle  $PSR = 75^\circ$ .

- (b) Drop a perpendicular from  $Q$  to meet  $PS$  at  $T$ .
- (c) Construct a circumcircle of the triangle  $QTR$  and measure: (i)
- The radius of the circle,
- (ii) The length of  $TR$ . (12 marks)

**16.** A bottling company has 3 plants,  $P$ ,  $Q$  and  $R$ . Everyday plant  $P$  produces 300 crates of Creps Juice and 200 crates of Schweppes. Plant  $Q$  produces 400 crates of Creps Juice and 150 crates of Schweppes and plant  $R$  produces 350 crates of Creps Juice and 100 of Schweppes **Turn Over** period.

- (1) From a  $2 \times 1$  matrix for the crates produced by the three Plants.
- (ii) Find the sales of the company if all crates are sold.
- (iii) Given that the company charges 20% VAT, find the total income generated from the company's daily sales. (12 marks)

17. The figure  $ABCD$  below is a rectangle in which  $AB = 30\text{cm}$  and  $AD = 10\text{cm}$  given that  $RB = PD = 3a\text{ cm}$  and  $BQ = SD = a\text{ cm}$ .



- (i) Obtain expressions for the areas of triangles  $RBQ$  and  $PQC$ .
- (ii) Show that the area ( $A$ ) of the parallelogram  $PQRS = 6a(10 - a)\text{ cm}^2$  and hence find  $a$  when  $A = 864\text{ cm}^2$  (12 marks)