BUSOGA REGION JOINT EXAMINATION BOARD
Uganda Certificate of Education
MOCK EXAMINATION 2017
MATHEMATICS
Paper 1
2 hours 30 minutes

MONDAY: 31ST/07/2017   **MORNING: 9:00AM – 11:30AM**

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 booklets provided. Therefore, no paper should be given for rough work.*

- *Graph paper is provided*

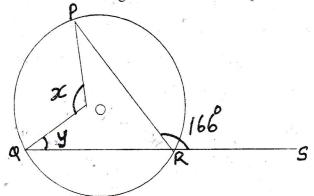- *Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.*

Answer all questions in this section.

1. Solve the equation:

$$\frac{x}{2} + \frac{x}{3} = \frac{13}{2} - \frac{x}{4}$$ (04mks)

2. Given that $m \, \Psi \, n = \dfrac{m}{n} + \dfrac{n}{m}$, find the value (s) of P if $4 \, \Psi \, P = 2\frac{1}{2}$ (04mks)

3. Make y the subject of the formula; $\dfrac{1}{x} = 1 + \dfrac{3}{y-2}$ (04mks)

4. Given that $2G + \begin{pmatrix} 4 & 6 \\ 1 & 7 \end{pmatrix} = \begin{pmatrix} 10 & 4 \\ 5 & 1 \end{pmatrix}$ (04mks)

   Find the determinant of G.

5. The numbers 5, 2, 12 and 9 have a mean m. the numbers 5, 2, 12, 9 and y have a mean m – 1 and median m. Determine the values of m and y.(04mks)

6. The digits 1. 2 and 3 are arranged randomly to form two digits and three digit numbers. No digit is repeated in the numbers formed.

   i. Write down the sample space. (02mks)

   ii. Find the probability that the number formed is a prime number (02mks)

7. The figure below shows a circle of centre 0. Angle PRS = 166^0 and QRS is a straight line.

   Find the values of x and y. (04mks)

8. Given that $COS\theta = 0.8$ and θ is reflex. without using mathematical tables or a calculator, find the value of

   i. $\sin\theta$

   ii. $\tan\theta$ (04mks)

9. The solution set of a quadratic equation $ax^2 + 3x + b = 1$ is $(2, -1)$, determine the values of a and b. (04mks)

10. Find the matrix of transformation for which $P(3, 0)$ is mapped onto $P^1(3, 6)$ and $Q(0, -4)$ is mapped onto $Q^1(-8, 4)$. (04mks)

SECTION B: (60 MARKS)

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

11. The table below shows marks of 28 third year university student marked out of 80.

Marks	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Number of students	2	9	1	8	2	5	1

a) Calculate the student's mean marks (05mks)

b) i) Draw a cumulative frequency curve.

   ii) Use the ogive to estimate the median mark. (07mks)

12. a) A father is twice as old as his son. In 11 years' time, the son will be the same age as the father was 17 years ago. Find the present age of the son. (05mks)

b) From the roof of a house, a girl can see a coconut tree which is 20 metres away from the house. She measures the angle of elevation of the top of the tree as 21^0 and the angle of depression of the bottom of the tree as 13^0. Calculate the height of the coconut tree. (07mks)

13. a) Draw the graph of $y = (2 - x)(x + 1)$ for $^-3 \le x \le 4$ (06mks)

b) Using the same axes, draw the line $3x = 5 - y$ (02mks)

c) Write down a quadratic equation satisfied by the values of x where the two graphs intersect. (04mks)

14. a) Given that $D = \begin{pmatrix} 3 & -2 \\ 0 & 2 \end{pmatrix}$ and $E = \begin{pmatrix} 6 & 0 \\ 0 & 6 \end{pmatrix}$ find the constant K given that

$D^2 + E = KD$ (05mks)

b) $\begin{pmatrix} 3 - P & 3 \\ -1 & -2 \end{pmatrix}\begin{pmatrix} -3 \\ q \end{pmatrix} = \begin{pmatrix} -3 \\ q \end{pmatrix}$ hence show that $(P^2 + q^2)^{\frac{5}{2}} = 4\sqrt{2}$ (07mks)

15. Triangle ABC has vertices $(2, 1)$, $(5, 1)$ and $(5, 3)$ respectively is mapped on to triangle $A_1 B_1 C_1$ by an enlargement centre $(0,0)$ and scale factor of 2. Triangle $A_1 B_1 C_1$ is then rotated

through half turn about the centre O to triangle $A_2 B_2 C_2$. Triangle $A_2 B_2 C_2$ is again enlarged by a scale factor 2 centre O.

a) Write down the matrices for

    i.   Enlargement (E)

    ii.   Half turn (H)   (02mks)

b) Find the coordinates of

    i. A_1. B_1 and C_1

    ii. A_2. B_2 and C_2

    iii. A_3. B_3 and C_3 (08mks)

c) Describe a single transformation which is equivalent to the combination of EHE (02mks)

16. The bearing of B from A is 040^0, the bearing of C from A is 060^0 and the bearing of B from C is 290^0.

a) Draw a diagram showing the relative positions of A, B and C.   (06mks)

b) Calculate the

    i.   Size of angle ABC   (03mks)

    ii.   Bearing of A from C   (03mks)

17. A car park is to be laid for X taxis and Y buses. Taxis are allowed $10m^2$ of space and buses $20m^2$ and there is only $500m^2$ spaces available. Not more than 40 vehicles are allowed at a time. There are always both types of vehicles parked and at most 15 buses are allowed at a time.

a) Write down five inequalities satisfying the given conditions.   (04mks)

b) Plot graphs of the inequalities you have formed on the same axes and shade out the unwanted regions.   (04mks)

c) If the parking charge for a taxi is shs. 50,000 and that for the buses is shs. 200,000 per day. Find how many vehicles of each type should be parked in order to obtain maximum income and calculate this maximum income.   (04mks)

END