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MATHEMATICS  
Paper 2  
MAY 2016  
 $2\frac{1}{2}$  hours

**UGANDA CERTIFICATE OF EDUCATION**

**JOINT EXAMINATIONS 2016**

**MATHEMATICS**

**Paper 2**

**2 hours 30 minutes**

**INSTRUCTIONS TO CANDIDATES**

Answer **all** questions in section **A**, and any *five* questions in section **B**

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

Graph paper(s) is(are) provided.

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

**Turn over**

## SECTION A (40 marks)

1. Without using tables or calculator, evaluate  $\frac{\left(6\frac{1}{2}\right)^2 - \left(2\frac{1}{3}\right)^2}{8\frac{5}{6}}$ . (04 marks)
2. Find the equation of a line passing through the point  $(-2, -1)$  and is perpendicular to the line whose equation is  $3x - y - 6 = 0$ . (04 marks)
3. Given that  $f(x) = \frac{2x+a}{4-x}$  and  $f(0) = 1$  find the value of  $a$ . (04 marks)
3. Simplify:  $2\log 5 + \frac{1}{2}\log 81 - 2\log 3 + 2\log 2$ . (04 marks)
4. In a class of 15 students, 7 like Mathematics, 9 like English and 2 like neither of the subjects. Find the number of students who like both Mathematics and English. (04 marks)
5. The price of a house valued at 15 million shillings increased by 25% after the first year and decreased by 10% in the second year. Find the value of the house after a period of two years. (04 marks)
6. Given that  $P:Q = 5:8$  and  $Z:Q = 4:3$ , find  $P:Z$ , hence find  $P$  when  $Z = 7200$ . (04 marks)
7. Express  $\frac{3-2\sqrt{3}}{2+3\sqrt{3}}$  in the form  $a+b\sqrt{c}$  and write down the values of  $a$ ,  $b$  and  $c$ . (04 marks)
8. Given that  $\mathbf{p} = \begin{pmatrix} -2 \\ 0 \end{pmatrix}$ ,  $\mathbf{q} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$  and  $\mathbf{r} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$ , find  $\mathbf{p} + 5\mathbf{q} + \mathbf{r}$ . Hence find  $|\mathbf{p} - 5\mathbf{q} + \mathbf{r}|$  (04 marks)

9. A rectangle 6cm long and 5cm wide is enlarged so that its area becomes  $270 \text{ cm}^2$ . Find the linear scale factor of enlargement. (04 marks)
10. R is a point which is 13 units from the origin. If the x- coordinate is 12, find the possible values of the y-coordinate. (04 marks)

SECTION B (60 marks)

11. In a certain country, the following allowances are given to employees.

ALLOWANCE	AMOUNT
Marriage	10% of monthly income
Single	15% of monthly income
Biological child above 10years but below 20 years	Shs. 20,000
Biological child who is 10years or below	Shs. 30,000
Medical allowance	$\frac{1}{50}$ th of monthly income
Transport	Shs. 4,000 per day
Rent	Shs 200,000 per month

James is married with 3 children, 2 below 10 years of age and the other is 14 years old.

Andrew is single but has two dependants aged 11 years and 15 years respectively. Both earn a gross monthly salary of shs 1,600,000. The income structure is given below.

	Tax rate(%)
1 – 200,000	10
200,001 – 500,000	15
Above 500,000	20

- i) Calculate the taxable income for both James and Andrew.
- ii) Calculate the total amount of tax paid by both men. (12 marks)

12. All the 25 students of a class in a certain school do at least one of the optional subjects German (G), French (F) and Wood work (W). Given that 15 take German, 11 take French, 5 take Wood work and French, and 6 take Wood work and German only. Also  $n(F \cap W^c \cap G^c) = n(F \cap G \cap W^c)$  and 2 take all the three subjects,

(a) Draw a Venn diagram to show this information.

(b) find the number of students who take

(i) Wood work

(ii) German only

(c) If a student is picked at random from the class, find the probability that the student takes just one of these subjects. (12 marks)

13. Given that  $h(x) = 2x - 3$  and  $g(x) = x^2 - 3x$ ,

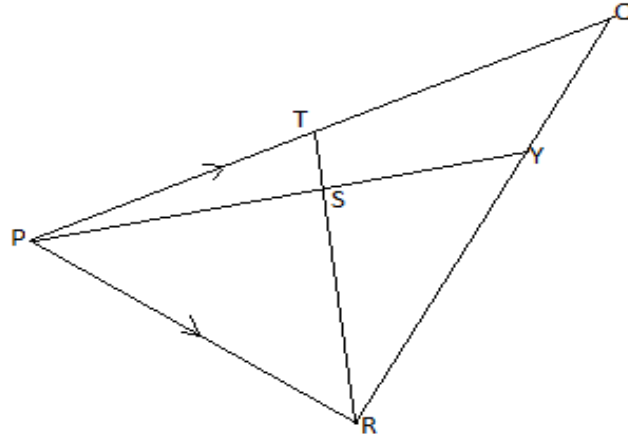
i) find  $h^{-1}(x)$  and  $h^{-1}(10)$ . (4 marks)

ii) obtain expressions for  $gh(x)$  and  $hg(x)$ . (4 marks)

iii) Solve for  $x$  if  $gh(x) = 11 + hg(x)$ . (4 marks)

14. In the figure below,  $\overline{PQ} : \overline{PT} = 4 : 1$ ,  $2\overline{PS} = \overline{PY}$ ,  $\overline{RS} : \overline{RT} = 2 : 3$ ,

$\overline{PT} = 3\mathbf{a}$  and  $\overline{PR} = 3\mathbf{b}$ .



- (a) Express in terms of **a** and **b**
- (i)  $\overrightarrow{RS}$                       ii)  $\overrightarrow{PY}$                       iii)  $\overrightarrow{RQ}$ .
- (b) Find the ratio of  $\overline{RY}$  to  $\overline{RQ}$ . (12 marks)

15a) If p varies jointly as q and r squared, and  $p = 225$  when  $q = 4$  and  $r = 3$ , find p when  $q = 6$  and  $r = 8$ . (4 marks)

b) The following notice was advertised by Peter Educational consultants.

**PETER EDUCATION CONSULTANCY**

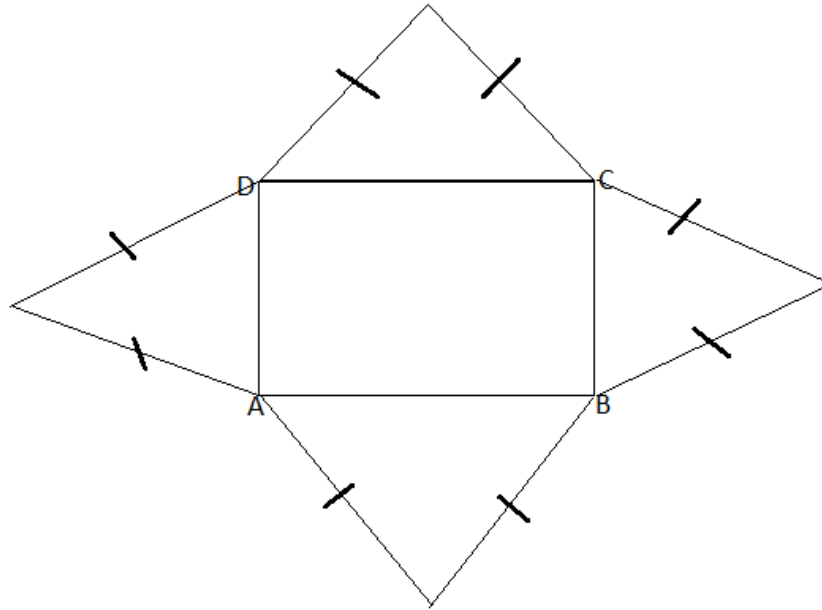
This is to inform our esteemed customers to note that with effect from 3<sup>rd</sup> June 2016, the holiday package payments will be as follows:

- a) A fixed consultancy fee.
- b) A charge for each holiday package bought.

In July, Allen bought 50 copies of holiday packages and paid shs 20,000. In July, Allen also bought 30 copies of the packages and paid shs 16,000.

- i) Find the cost equation.
- ii) How many copies would Allen get if she paid shs 58,000? (8 marks)

16. The figure below shows a net of a pyramid.



If  $V$  is the vertex of the pyramid  $VABCD$  with a rectangular base  $ABCD$  and triangles of slant sides  $26\text{ cm}$  with  $AB = 16\text{ cm}$  and  $BC = 12\text{ cm}$ .

- a) Draw a right pyramid showing clearly points  $VABCD$ , find the height of the pyramid. (5 marks)
  - b) Find the area of  $VAB$ . (3 marks)
  - c) Find the angle between:
    - i) Edge  $VA$  and the base. (2 marks)
    - ii) Face  $VAB$  and the base. (2 marks)
17. Mbarara is about  $255\text{ km}$  away from Masaka. A bus leaves Masaka for Mbarara at  $8:45\text{ am}$  travelling at a steady speed of  $60\text{ km h}^{-1}$ . A taxi leaves Mbarara an hour later at a speed of  $135\text{ km h}^{-1}$  but gets a flat tire after travelling for  $1\text{ hr}$ . The mechanical problem was fixed after  $60\text{ mins}$  and then the taxi arrived at  $1:45\text{ pm}$

Draw on the same axes, the distance – time graphs showing the journey of the bus and taxi. (Use scales of  $2\text{ cm} \square 30\text{ km}$  and  $2\text{ cm} \square 1\text{ hr}$ ).

Determine:

- i) the time and distance from Masaka when the taxi overtakes the bus.
- ii) state the times when the two vehicles arrive at Mbale.
- iii) differences in the times of arrival of the two vehicles.

**END**