

ST. HENRY'S COLLEGE KITOVU

PRE-MOCK EXAMINATIONS JULY 2007

MATHEMATICS - S.4

Paper 1

P 456/1

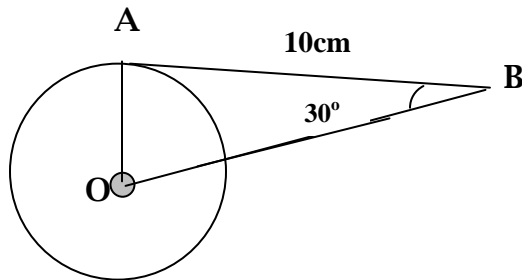
2 ½ Hours

INSTRUCTIONS

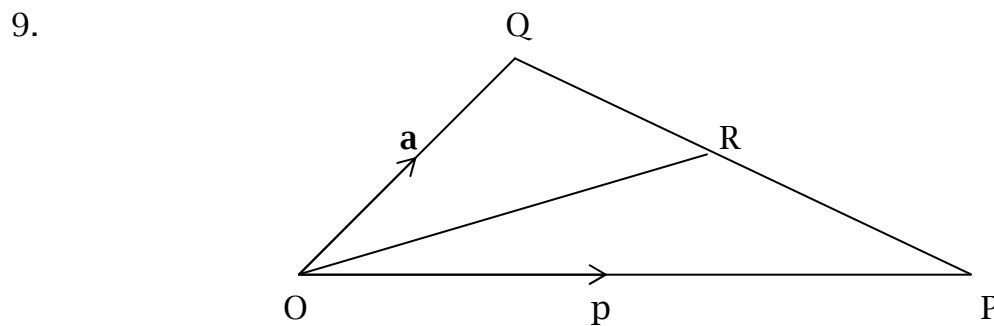
Answer **All** questions in Section A and not more than five (5) questions in Section B.

SECTION A (40 MARKS)

- Given that $x * y = \frac{x^2 + y^2}{10y}$, find
 - $4 * -12$
 - $7 * (4 * -12)$(4 marks)
- From the top of a cliff 100m high the angle of depression of a boat is 17° . Find the distance of the boat from the foot of the cliff below the observer. (4 marks)
- A lake of area 100.5km^2 is represented by an area of 5cm^2 on a map. Find the length (in km) of a horizontal road measuring 4.5cm on the map. (4 marks)
- Given that $f(x) = \frac{1}{2}(3x + 76)$. Find the value of x such that $f(x) = 10$. (4 marks)
- In the figure below $AB = 10\text{cm}$ is a tangent to a circle at A. angle $ABO = 30^\circ$. Find the:



- i) length OB
 ii) radius of the circle (4 marks)
6. Find two numbers such that 3 times the smaller exceeds twice the larger by 3, and 7 times the smaller exceeds 5 times the larger by 2. (4 marks)
7. Solve the inequality $3(x - 2) \geq 2(7 - x)$ (4 marks)
8. Given that y is inversely proportional to x and directly proportional to the square of Z and that $Z = 2, x = 4$; when $y = 1$, find;
- i) the value(s) of z when $y = z$ and $x = 2$.
 ii) the value of x when $y = 4$ and $z = 12$



In the figure, $5 \overrightarrow{PR} = 2 \overrightarrow{PQ}$. Find

- a) PR and
 b) QR in terms of P and Q (4 marks)
10. Given that $\frac{6}{3\sqrt{2} - 2\sqrt{3}} = a\sqrt{2} + b\sqrt{3}$. find the values of a and b

(4 marks)

SECTION B

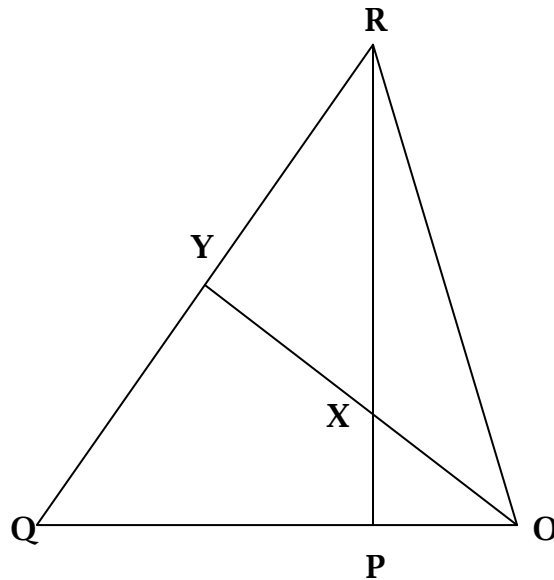
11. Faces of 36 small wooden cubes are to be painted either yellow or orange or red. Of these 20 cubes have all their faces painted yellow and 12 have all their faces painted orange. There are 10 cubes with yellow and red, 16 red and orange and 8 yellow and orange. Cubes with all faces painted red are three more than those with all faces orange.

Given that Y represents the set of cubes with at least a yellow face, O represents that of cubes with at least an orange face and R represents the cubes with at least a red face.

- a) Represent the above information in a Venn diagram, showing the remaining information
- b) Find the number of cubes with:
- all the three different colour faces,
 - at least one of each of the three colour faces.
- c) If a cube is picked at random, what is the probability that it is orange or red only?
12. Draw the graph of the curve $x^2 - 2x + 1$ for $-3 \leq x \leq 3$. Use your graph to find the solutions of the following equations.
- $x^2 - 2x + 1 = 0$
 - $x^2 - x - 6 = 0$
13. The vertices of triangle PQR; P (1, 0); Q (1 , 2); R (5,2) are mapped onto the triangle P' Q' R' by the transformation whose matrix M is $\begin{pmatrix} 1 & 0 \\ 2 & 4 \end{pmatrix}$
- a) Find the
- coordinates of the vertices of the image triangle
 - ratio of the area of triangle PQR to the area of triangle P'Q'R'.
- b) Plot on the same axes triangle PQR and its image.

- c) Determine the matrix of the transformation which maps $P'Q'R$ back to PQR .

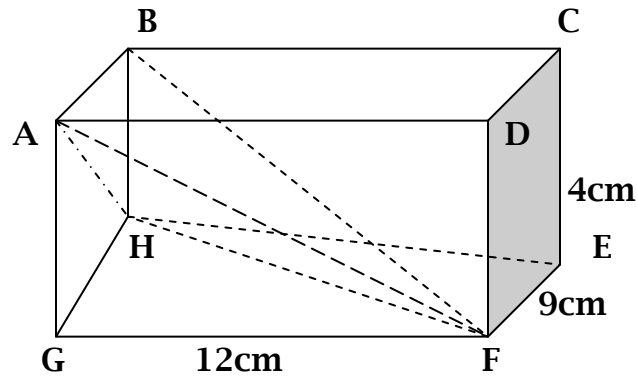
14.



In the figure $\overrightarrow{OP} = \mathbf{a}$ and $\overrightarrow{OR} = \mathbf{b}$

- a) i) Express \overrightarrow{RP} in terms of \mathbf{a} and \mathbf{b} .
- ii) If X is a point on \overrightarrow{RP} such that $\overrightarrow{RX} : \overrightarrow{RP} = 2:5$, express \overrightarrow{OX} in terms of \mathbf{a} and \mathbf{b} .
- b) Given that $\overrightarrow{RY} = m \overrightarrow{RQ}$ and that $\overrightarrow{OQ} : \overrightarrow{OR} = 3:1$. Express \overrightarrow{OY} in terms of \mathbf{a} , \mathbf{b} , and m .
- c) If $\overrightarrow{OY} = n \overrightarrow{OX}$, use the result of a) ii) and b) to evaluate m and n .
- d) Show that P , X and R are collinear.

15.



The above diagram is a cuboid with the dimensions as shown

- Calculate
- i) the length AF
 - ii) the length BF
 - iii) the \angle BFA and
 - iv) the angle between the planes BAF and ABCD.

16. In a certain country, income structure is such that a person's monthly income has certain allowances deducted from it before it is subjected to taxation. The allowances are as follows: Marriage allowance shs. 25,500, per month, medical shs. 12,000, housing allowance shs.15,000, transport shs. 20,000, family allowance for only three children at the following rates shs. 5,500 per child, 18 years old or above, shs. 7,800 for each child above 11 years but below 18 years, shs. 9,300 for each child below 11 years old. The table below shows the tax structure on taxable income.

Income		Tax rate
0-20,000	— 20,000	10%
20,001.00	— 40,000	15%
40,001.00	— 60,000	20%
60,001.00	— 80,000	25%
80,001.00	— 100,000	30%
Above 100,000	—	35%

Wadribo married with four children, ages 13 years, 17 years and 21 years old, earns shs. 367,000 per month.

Determine:

- a) The taxable income and the income tax he pays under the tax rates given.
 - b) The percentage of his gross monthly income paid in tax.
17. A firm wants to buy a number of new cars of two types namely Renault and Ferarri. A Renault car costs \$ 4000 and requires \$ 32 per week to maintain it. A Ferarri car costs \$ 4800 and requires \$ 20 per week to maintain it. The firm has \$36,000 to spend on the purchase of the cars and \$ 240 per week for maintenance. It must buy at least cars, 4 Renault cars and at least 2 Ferarri cars.
- a)
 - i) by taking x to be the number of Renault cars and y be the number of Ferrari cars the firm buys, write down all the inequalities representing the above information.
 - ii) Using a scale of 1cm to represent 1 unit on both axes, plot these inequalities on a graph paper.
 - b) Find the possible number of cars each type the firm should buy In order to keep maintenance costs as low as possible.

*** END ***