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MATHEMATICS

PAPER 2

JULY/AUGUST. 2023

2 HOURS 30 MINS

Uganda Certificate of Education

SHAPTA JOINT ASSESSMENT BOARD 2023

MATHEMATICS

PAPER 2

2 HOURS 30 MINUTES

INSTRUCTIONS TO CANDIDATES:

- Answer **all** questions in section **A** and **FIVE** questions from section **B**.
- Any additional question(s) answered will not be marked.
- All necessary calculations must be done in the answer booklet provided.

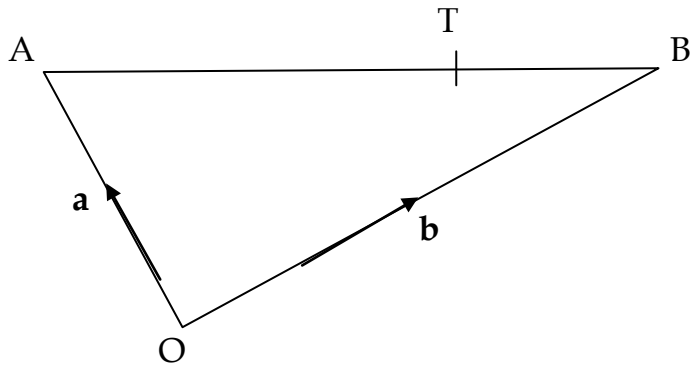
SECTION A

1. Express 0.1151515..... in the simplest of $\frac{x}{y}$. (**4 marks**)

2. Sets A and B are such that $n(A) = 8, n(A \cap B^I) = 3, n(A \cup B) = 14$ and $n(\in) = 16$. Represent the information on a Venn diagram hence state $n(B)$. (**4 marks**)

3. Determine the value of m. (**4 marks**)
   $4^{-m} \times 0.5 = 16^{m-1}$

4. Below is a triangle **OAB**, **T** is on **AB** such that **AT**:**TB** = 3:1, **OA** = **a** and **OB** = **b.**



   Determine **OT** in terms of **a** and **b**. (**4 marks**)

5. A machine depreciates by 8% per year. If its price is now Shs. 33.856 millions, what was the value of the machine 2 years ago?
   (**4 marks**)

6. A forest of area 75km^2 is represented on a map as 12cm^2. Determine the representative fraction (RF) of the map. (**4 marks**)

7. Given $g^{-1}(x) = \frac{6}{x+1}$, determine an expression for $g(x)$ hence evaluate $g(3)$.
   (**4 marks**)

8. Determine the equation of a line passing through (-2, 3) whose x-intercept is 4. (**4 marks**)

9. Two similar tins with base areas $14cm^2$ and $31.5cm^2$. The smaller tin has volume $52cm^2$. Determine the volume of the larger tin.
(**4 marks**)

10. The average speed for a cyclist who covered 120km is $15kmh^{-1}$. The speed for the 40km was $10kmh^{-1}$. How long did it take to cover the remaining 80km? (**4 marks**)

SECTION B

11. Given $f(x) = \frac{6}{x-a}$ and that $f(4) = 3$.

a) Determine; (i) value of a

(ii) $f(-1)$

(iii) value of x for which $f(x)$ is meaningless.

(**7 marks**)

b) Write an expression for $f^{-1}(x)$ hence determine value of x for which $f^{-1}(x) = 6$. (**5 marks**)

12. The school was to purchase a bus Shs. 328 million. A discount of 5% was allowed if one pays cash. They went to the bank and made a down payment of Shs. 50 million and got a loan for the balance at a rate of 24% per annum simple interest for 3 years. The payments were termly beginning with the proceeding term.

Calculate the;

(i) Amount for the loan acquired. (**2 marks**)

(ii) Total amount of money to be paid back. (**4 marks**)

(iii) Amount paid termly. (**3 marks**)

(iv) Amount saved by paying cash. (**3 marks**)

13. In a town, a survey on 50 homes was made to establish those who kept cows(C), Goats(G) or Dogs(D). All those who kept cows had dogs. 13 homes kept cows, 29 kept dogs, 32 kept goats, 6 kept neither, while 5 kept all the three.

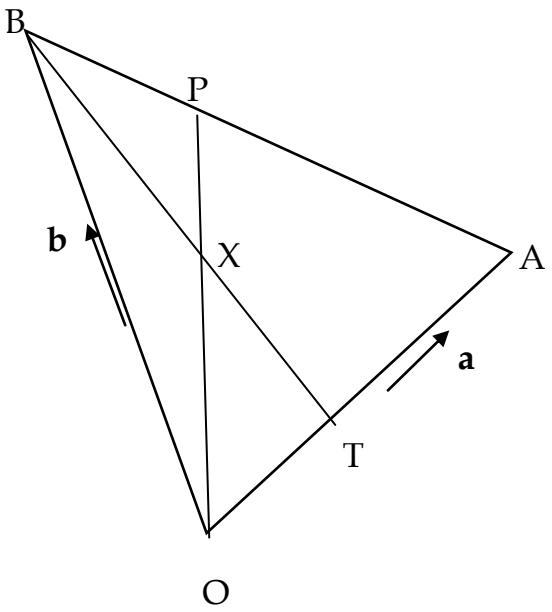
a) Draw a Venn diagram representing the information. (**5 marks**)

b) Determine;

(i) The number of homes that kept cows and goats. (**4 marks**)

(ii) The probability that a chosen home kept at least two. (**3 marks**)

14. Below is a triangle **OAB** in which **P** and **T** are on **AB** and **OA** respectively, 2**0T** = **TA**, **BP**:**PA** = 1:2, **OA** = **a**, **OB** = **b**, lines **OP** and **TB** meet at X. If **OX** = mOP and **TX** = nTB.



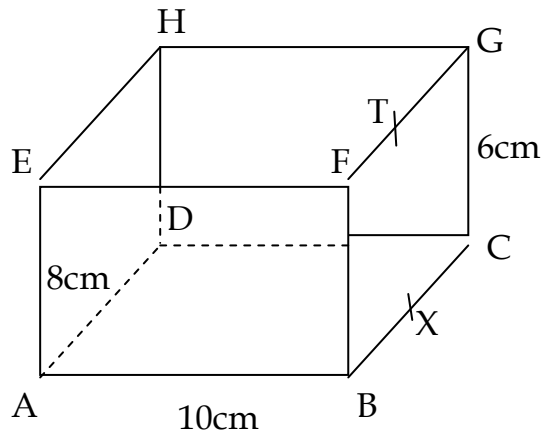
a) Express the following vectors in terms of a and b.
(i) TB (ii) AB (iii) OP (**5 marks**)

b) Express OX in terms of
(i) a, b and m (ii) a, b and n
hence determine values of m and n (**7 marks**)

15.a) Given $4\log_{10} 2 + \log_{10} x - \log_{10} 6 = 1$. Determine. The value of x.
(**3 marks**)

b) The quantity P is partly constant and partly varies inversely as q. Given P = 11 when q = 2 and that P = 8 when q = 4. Determine;
(i) an equation relating p and q
(ii) value of p when q = 3
(iii) value of q when p = 7 (**9 marks**)

16. Below is a cuboid ABCDEFGH in which AB = 10cm, AD = 8cm, GC = 6cm. T and X are mid points of FG and BC respectively.



Determine;

a) Lengths (i) DX
(ii) HX (**6 marks**)

b) Angle between HX and plane BCGF (**3 marks**)

c) Angle between HTXD and DCGH (**3 marks**)

17. Two towns A and B are 180km apart. At 8:15am when Kasi was 30km away from A cycling at 30kmh^{-1} towards B, Male set off from A cycling steadily towards B and arrived 30 minutes earlier than Kasi.

a) Calculate;
(i) The time of arrival at B by Kasi
(ii) Male's speed (**8 marks**)

b) i) Draw a distance – time graph, showing the routes of Kasi and Male.
ii) Determine when and at what distance from A, Male overtook Kasi.
(**4 marks**)

END