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MATHEMATICS
Paper 2
Jul./Aug. 2023
2 ½ Hours

SENIOR EDUCATION CONSULTANTS (SEC) JOINT MOCK EXAMINATIONS, 2023

Uganda Certificate of Education

MATHEMATICS

Paper 2

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- *Answer **all** questions in Section A and **not** more than **five** from section **B**.*

- ***All** necessary calculations **must** be shown clearly with the rest of the answers.*

- *Graph papers will be provided.*

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

- *Any additional question(s) answered will **not** be marked.*

SECTION A (40 MARKS)
Attempt all questions in this section

1. Simplify $\dfrac{1\frac{1}{2}-(8\frac{1}{3}\div 2\frac{1}{2})}{1\frac{1}{5}of\ (1\frac{1}{4}+1\frac{2}{3})}$

2. Given that $n(P)=7, n(Q)=9, n(P\cup Q)^1=2$ and $n(\varepsilon)=15$. Find

   (a) $n(P\cup Q)$

   (b) $n(P\cup Q^1)$

3. Under the hire purchase an item was bought by paying a deposit of shs.85,000 followed y a six monthly installment of shs.120,000 each. If the hire purchase price is 15% higher than cash price, calculate the cash price.

4. If $f^{-1}(x)=2x^2-3$, find an expression for

   (i) $f(x)$

   (ii) $f(15)$

5. A line through $(2,3)$ and $(^-1,2)$ crosses at right angel, a line $ax+by=11$ at point $(3,2)$. Find the value of a and b

6. If $\dfrac{2+\sqrt{3}}{2-\sqrt{3}}=p+q\sqrt{r}$, state the values of p, q and r.

7. A wooden box is 2m long and 0.5m wide. If its total surface area is $17m^2$, find the height of the box.

8. T is the point (-6, 8). If OT$= a-2b$ and $a=\begin{pmatrix}2\\4\end{pmatrix}$. Find the magnitude of a.

9. Find the point of intersection of the lines $y=2x-3$ and $y+x+3=0$.

10. A container has a volume of 6400cm³ and surface are of 8000cm². Find the surface area of a similar container which has a volume 2700cm³

SECTION B (60 MARKS)

*Answer any **five** questions from this section*

11. (a) Use mathematical tables to evaluate

$$\sqrt{0.3215 \times 1.439}$$

(b) Given that $128^x = 16^y$. Find the value of $\frac{x}{y}$.

12. At a certain hotel, thirty nine guests ordered for fish(F), chicken© and beef (B), 24 ordered for fish, 16 ordered for beef and 17 ordered for chicken. Those who ordered for fish and chicken were more than those who ordered for both chicken and beef by one person, 9 ordered for fish and beef, 2 ordered for all the three.

   (a) Represent the above information on a venn diagram.

   (b) Find how many guests ordered for both chicken and beef.

   (c) If a guest is picked at random from the hotel, what is the probability that the guest did not order for fish.

13. (a) The range of the function $f(x) = 5x + 1$ is $\{1, 6, 11, 16\}$. Find its domain.

   (b) Given that $g(y) = 2y + 6$ and $h(y) = \frac{y}{3y-10}$

   Find

   (i) $hg(^1/_3)$

   (ii) value of y when $hg(y)$ is meaning less.

14. Lira is 360km a way from Kampala. At 7:30am a mini bus leaves Lira for Kampala travelling at a steady non stop speed of $50km/hr$. Two hours later Otada bus travelling at a steady non stop speed of $80km/hr$ left Kampala for Lira.

   (a) Using a scale of 2cm to represent 1 hour and 2cm to represent 50km, draw on the same axes graphs showing the journeys of the two vehicles.

   (b) Using your graphs determine the
      (i) distance from Lira where the two vehicles met.

      (ii) time when the two vehicles met.

      (iii) difference in the time of arrival at their respective destination.

15. The diagram below shows a trapezium OABC $\overrightarrow{OA} = a, \overrightarrow{OC} = c$ and $\overrightarrow{CB} = 3a$. X and Y are points on $\overrightarrow{AC}$ such that $\overrightarrow{AX}:\overrightarrow{XC} = 1:2$ and $\overrightarrow{AY}:YC = 1:3$.
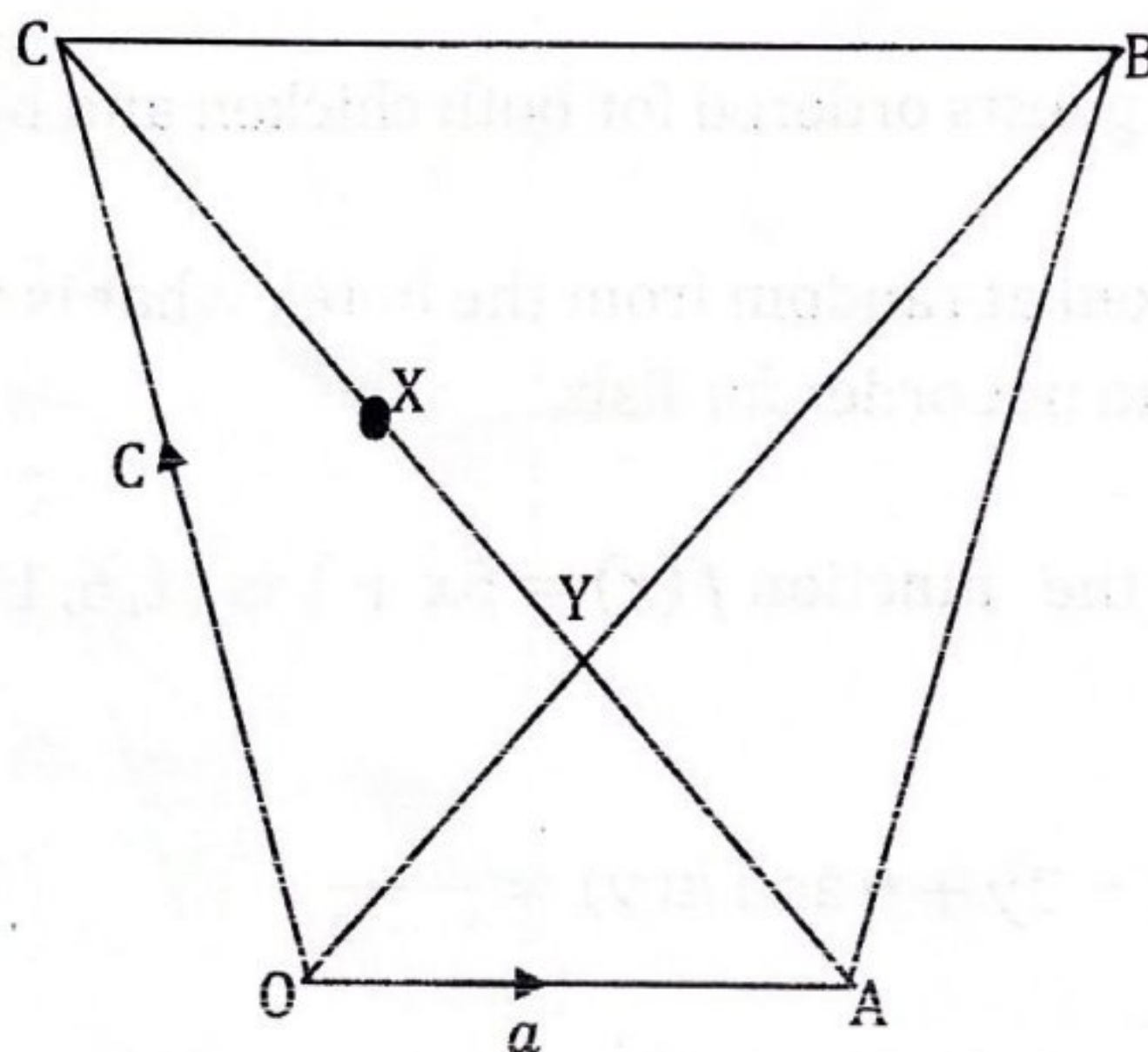
   (a) Express the following vectors in terms of a and c
      (i) $\overrightarrow{AC}$ (ii) $\overrightarrow{OY}$ (iii) $\overrightarrow{OX}$ (iv) $\overrightarrow{AB}$ (v) $\overrightarrow{AY}$

   (b) Show that O, Y and B are collinear points.

16. (a) Ali deposited shs.270,000 in a bank at a compound interest of 10% per annum. After n years, his money accumulated to shs.326,700. Calculate the value of n.

(b) The income tax rates of a certain country are as follows

Income (shs)	Rates (%)
0 – 394,000	Tax free
394,001 – 694,000	30
694,001 and above	36

(i) Find the income of an employees who paid shs. 385,200 of tax.

(ii) Express the income tax paid as a percentage of her income.

17. The cone in the figure below is exactly full of water by volume
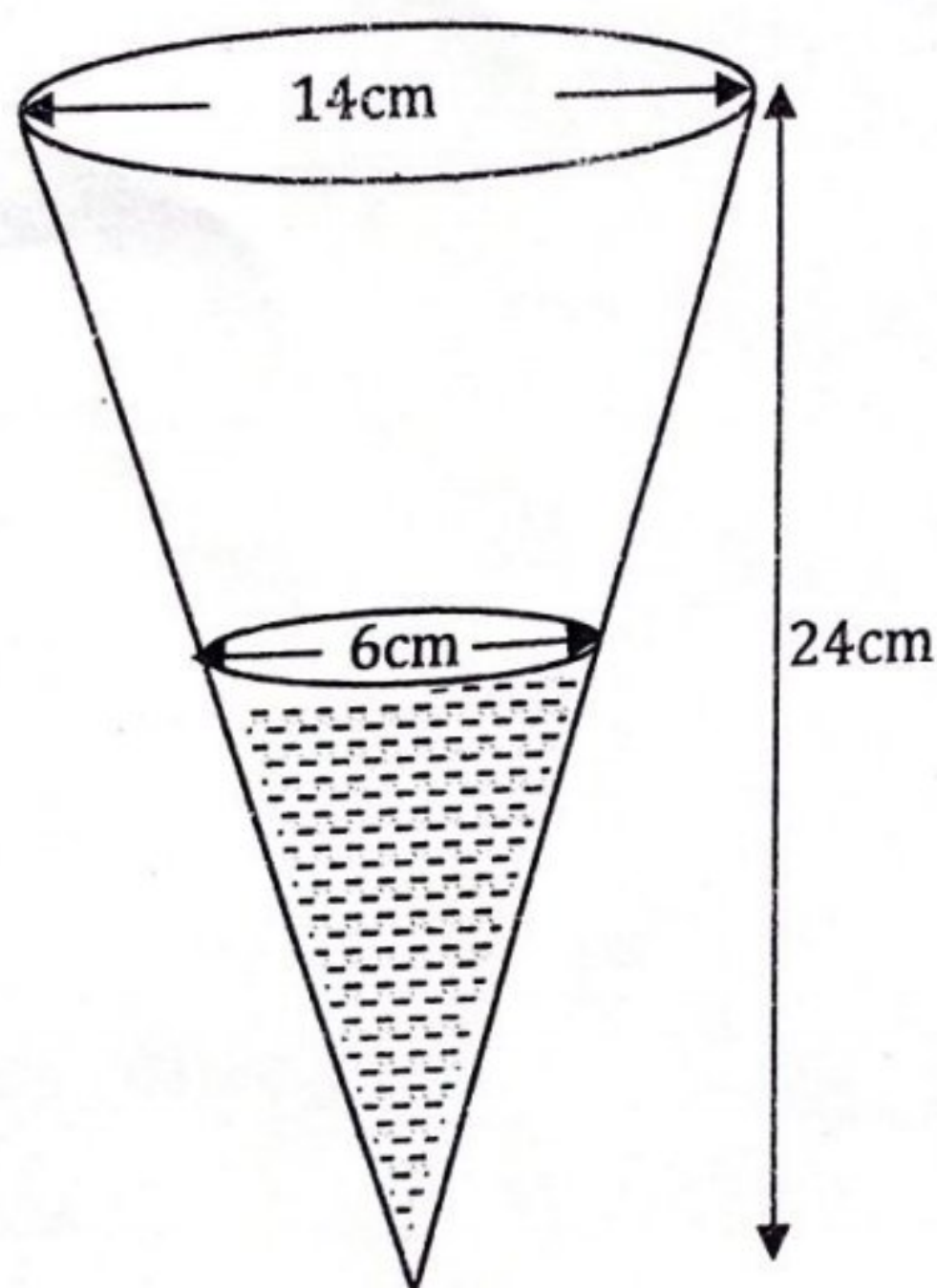
(a) How deep is the water in the cone?

(b) If the water in the cone is drawn out at a rate of 10cm³ per second, find the time taken to empty the come (take $\pi = 3.14$)

END

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