456/2
MATHEMATICS
PAPER 2
August, 2023
2 ½ hrs.

UNNASE MOCK EXAMINATIONS

UGANDA CERTIFICATE OF EDUCATION

MATHEMATICS

PAPER 2

2 HOURS 30 MINUTES

INSTRUCTIONS TO CANDIDATES

- *Answer **all** the questions in section **A** and any **five** from section **B**.*
- *Any additional question(s) will **not** be marked.*
- ***All** necessary calculations must be shown clearly with the rest of the answers.*
- *Squared paper is provided.*
- *Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.*

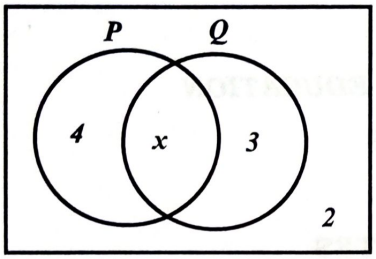
SECTION A: (40 MARKS)

*Answer **all** questions in this section.*

1. Express **2.53939...** as a fraction in its simplest form. **(4marks)**

2. Points **A** and **B** have coordinates $(3, y)$ and $(0,7)$ respectively. Given that the length of **AB** is **5** units, find the possible values of **y**. **(4marks)**

3. Study the venn diagram below:



Given that $n(P \cup Q) = 18$, find;

(i) the value of **x**. **(2marks)**

(ii) $n(P \cup Q^1)$ **(2marks)**

4. A salesman gets a commission of **10%** on the first **shs 200,000** of his total sales and **15%** on sales in excess of **shs 200,000**. Find his commission for sales worth **shs 425,500**. **(4marks)**

5. Find the equation of a line segment with end points **A (-2, 4)** and **B (1,-1)**. **(4marks)**

6. Given that $f(x) = x^2 - 1$, find the values of $f^{-1}(8)$. **(4marks)**

7. Two similar tanks **A** and **B** are such that the height of **A** is twice that of **B**. If tank **B** has a capacity of **1250** litres, find the capacity of **A**. **(4marks)**

8. Given that $\begin{pmatrix}5\\3\end{pmatrix} - y\begin{pmatrix}2\\-1\end{pmatrix} = \begin{pmatrix}-1\\x\end{pmatrix}$, find the values of x and y. **(4marks)**

9. Given that $241_x = ax^2 + bx + c$, find the values of a, b and c. **(4marks)**

10. Find the length of a **cube** whose total surface area is **180cm²**, correct your answer to **two** significant figures. **(4marks)**

SECTION B: (60 MARKS)

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

11. (a) use mathematical tables **only** to evaluate;

$\frac{5.147\times\sqrt{62.1}}{0.00409}$ **(7marks)**

(b)Express $\frac{4-\sqrt{3}}{\sqrt{3}-1}$ in the form$p+q\sqrt{r}$, where $\boldsymbol{p}$, $\boldsymbol{q}$and$\boldsymbol{r}$ are integers with $r>0$. Hence evaluate $\frac{4-\sqrt{3}}{\sqrt{3}-1}$where $\sqrt{3}$=**1.732**. **(5marks)**

12. During **Loritah's** birthday party, **25** guests attended. The available drinks were water (W), soda (S) and juice (J). **9** took soda, **12** took juice, **1** took water and soda **only**, **3** took water and juice while **4** took soda and juice. **15** did not take water.

The number of guests who took **all** the **three** types was **equal** to those who **did not** take any of the three drinks.

(a) Represent the given information on a venn diagram. **(7marks)**

(b) Find the number of guests who took;

(i) all the three types of drinks. **(2marks)**

(ii) water. **(1mark)**

(c) If a guest is selected at random from the guests, find the probability that he took two drinks only. **(2marks)**

13. (a) The function $f(x)=ax+b$and$g(x)=bx-12$. Given that $g(-1)=-4$and$f(-3)=-11$, find the values of $\boldsymbol{a}$ and $\boldsymbol{b}$. **(6marks)**

(b)Given that $X\rightarrow x^2-x$. Determine the range if the domain is$\{-2,-1,0,1,2\}$. **(6marks)**

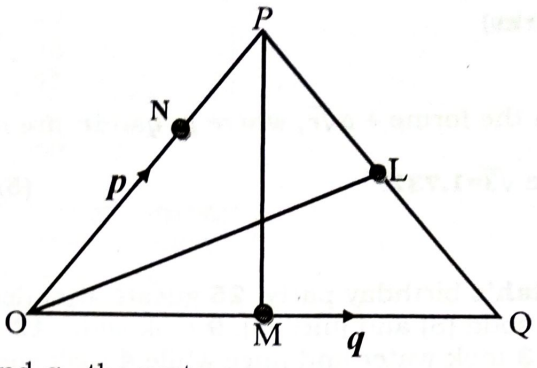
14. **Mukono** and **Sironko** are **200 km** apart. At **6:30amCynthia** left **Mukono** for**Sironko** driving at a steady speed of **50kmh**$^{-1}$. Two hours later, **Betty** left **Sironko** for **Mukono** along the same road driving at a constant speed reaching **Mukono** at **12:00noon**.

Determine ;

(i) when and where from **Sironko** where the two met. **(9marks)**

(ii) the difference in the time of arrival at their destinations. **(3marks)**

15. In figure below , vector $OP = \boldsymbol{p}$, $OQ = \boldsymbol{q}$, $PL = \frac{1}{2}LQ$, $ON:OP = 2:3$ and $MQ = 2OM$

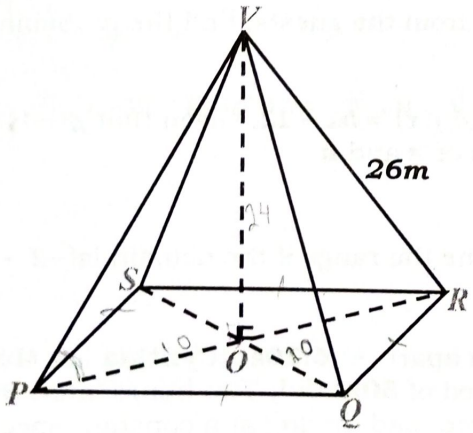


(a) Find in terms of $\boldsymbol{p}$ and $\boldsymbol{q}$, the vectors;

(i) **NL(4marks)**
(ii) NM(3marks)

(b) Find the ratio**ON:ML** **(5marks)**

16. The diagram below shoes a right pyramid with a square base **PQRS**. **OV=24cm** and **VR=26cm.**



Find the;

(a) lengths ;

(i) **PR** **(4marks)**
(ii) **PQ** **(3marks)**

(b) angle between **PV** and base **PQRS**. **(3marks)**

(c) volume of the pyramid. **(2marks)**

17. The table below shows the tax structure on taxable income of employees in a certain country.

Income (shs) per month	Tax rate (%)
1,000,0001-2,000,000	15
2,000,001-3,000,000	25
3,000,001-4,000,000	40
Above 4,000,000	45

The following allowances are given:

Marriage : 5% of gross monthly income
Housing : shs 1,200,000 per annum
Insurance : shs 45,000 per month
Transport : shs 120,000 per month

Family allowance for **two** children **only** in the following age bracket.

Age (yrs)	Amount (sh) per month
0-9	80,000
10-15	70,00

Given that, **Gloria** earns a gross annual income of shs 48,000,000 and has three children who are aged **1** ,**10** and **12** years.

(a) Calculate her;
(i) taxable income **(5marks)**
(ii) income tax **(5marks)**
(b) Express her income tax as a percentage of her gross monthly income. **(2 marks)**

END