ST.MARY'S SEMINARY-VIRIKA

END OF YEAR EXAMINATION, 2022

MATHEMATICS S.3

Time $\mathbf{2\frac{1}{2}}$ ***hours***

SECTION A: (40 MARKS)

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

1. Three students Joseph, Salim and Reagan shared shs51,300,000 in the ratio 4:6:9 respectively. How much money did each get?

2. Given two sets A and B such that n(A)=12, n(B)=13, n(AuB)=20 and n(Ɛ)=24. Find;

(a) $(AuB)^I$

(b) (AuB^I), where Ɛ is the universal set and B^I is the complement of B.

3. Given that $f(x) = \frac{2}{5x+3}$, find ;

(i) $f^{-1}(x)$

(ii) $f^{-1}(-1)$.

4. Express $\frac{1}{\sqrt{20}} + \frac{1}{\sqrt{5}}$ in the form $\frac{a}{b}\sqrt{C}$.

5. Determine the inverse of the matrix $\begin{pmatrix} -6 & 7 \\ 1 & 2 \end{pmatrix}$.

6. Under a translation, point A(-2, 3) is mapped onto point $A^I(5,7)$.
Determine the translation vector.

7. Solve foy y; $\frac{y+6}{5} - \frac{2y-5}{15} = \frac{1-y}{3}$

8. Study the table below and use it to find the value of A if the mean mark is 34.6

Marks	30	32	34	36	38	40
Frequency	5	6	7	A	3	5

9. Given that $\underset{\sim}{a} = \begin{pmatrix} 2 \\ 6 \end{pmatrix}$, $\underset{\sim}{b} = \begin{pmatrix} 4 \\ 9 \end{pmatrix}$ and $\underset{\sim}{c} = \begin{pmatrix} 14 \\ 36 \end{pmatrix}$, find the value of k if $k\underset{\sim}{a} + 2\underset{\sim}{b} = \underset{\sim}{c}$

10. Without using tables or calculators, evaluate $\frac{1}{2}\log 16 - 2\log\left(\frac{a}{5}\right) + \log a^2$

SECTION B: (60 MARKS)

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

11. In a class of 56 students, 28 students play Football(**F**), 24 play Netball(**N**) and 32 play Basketball(**B**). 10 students play football and Netball. 6 play Football and Basketball. 4 play all the three games.

(a) Represent the given information on a Venn diagram.

(b) Find the number of students who play Netball only.

(c) If a student is picked at random, what is the probability that the student plays at least two games.

12. 40 students sat for an exam of mathematics and scored the following;

32	27	23	46	28	29	36	47
49	39	45	34	17	17	11	14
20	37	33	38	18	31	36	28
31	31	16	33	26	33	40	35
32	43	35	44	41	29	32	48

(a) Draw a frequency distribution table starting with 10-14.

(b) Calculate the;

(i) Mean

(ii) Median of the data.

13.(a) Given that $g(x) = 27(x - b^2)$ and $g(4) = 0$, find;

(i) The possible values of b

(ii) $g(-8)$.

(b) If $f(x) = px^2 + q$, $f(3)$=11 and $f(2)$=16, determine the;

(i) Values of p and q

(ii) $f(x)$.

14. Triangle PQR with vertices $P(4,1), Q(4,4)$ and $R(2,1)$ is mapped onto triangle $P^IQ^IR^I$ by a transformation whose matrix is $\begin{pmatrix} 2 & 1 \\ 1 & -2 \end{pmatrix}$.

Triangle $P^IQ^IR^I$ is then mapped onto triangle $P^{II}Q^{II}R^{II}$ by a transformation whose matrix is $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.

Determine the;

(a) Coordinates of P^I, Q^I and R^I

(b) Coordinates of P^{II}, Q^{II} and R^{II}

(c) Single matrix of transformation that maps PQR onto $P^{II}Q^{II}R^{II}$.

15. Four traders Asiimwe, Mugume, Robert and Gerald bought commodities as given below;

Asiimwe bought 1 bag of posho, 5 bags of potatoes, 2 bags of sorghum and 2 bags of rice.

Mugume bought 5 bags of posho, 3 bags of potatoes, and 4 bags of rice.

Robert bought 4 bags of posho and 8 bags of rice

Gerald bought 2 bags of posho, 3 bags of potatoes, 4 bags of sorghum and 3 bags of rice.

The table below shows the cost per bag

Commodity	COST (UGX)
Posho	100,000
Potatoes	75,000
Sorghum	60,000
Rice	200,000

(a) Write the matrix for the;
   (i) Commodities.
   (ii) Costs.

(b) Using matrix multiplication, find how much each trader spent on the commodities.

(c) The traders sold all the commodities and got the following amounts;

Name	AMOUNT (UGX)
Asiimwe	1,145,000
Mugume	1,725,000
Robert	2,300,000
Gerald	1,445,000

Determine the profit of each trader using matrices.

16. Using a ruler, pencil and a pair of compasses only,

(i) Construct triangle PQR in which $\overline{PQ} = 6cm$, $\overline{RQ} = 8cm$ and angle PQR=60^0.

(ii) Inscribe a circle in the triangle and measure its radius.

(iii) Find the area of the circle.

17. (a) Copy and complete the table below for the graph $y = x^2 + 2x - 3$

x	-4	-3	-2	-1	0	1	2	3
x^2	16				0			
$2x$	-8				0			
-3	-3				-3			
y	5				-3			

(b) On the same axes, draw the graphs of $y = x^2 + 2x - 3$ and $y = x - 1$

(use a scale of 2cm: 1 unit on X-axis and 1cm: 1units on y-axis).

(c) Use your graph to solve the equations

(i) $x^2 + 2x - 3 = 0$

(ii) $x^2 + x - 2 = 0$.

END