## Alternative No:

$\square$ Supervising Examiner's/ Invigilator's initial:

## New Curriculum

## Mathematics

## Writing Time: 3 hours <br> Total Marks : 100

## READ THE FOLLOWING DIRECTIONS CAREFULLY:

1. Do not write for the first fifteen minutes. This time is to be spent reading the questions. After having read over the questions, you will be given Three hours to answer all questions.
2. Write your index number in the space provided on the top right hand corner of this cover page only.
3. In this paper, there are three sections: Section A, Section B and Section C. You are expected to answer ALL the questions in Section A and Section B. Under Section C, there are 8 questions (question numbers $14-21$ ). Each question has two parts, I and II. Attempt either I or II from each question. The intended marks for a question or its parts are stated in the brackets.
4. Read the directions to each question carefully and write all your answers in the space provided in the question booklet itself.
5. Remember to write quickly but neatly.
6. You are not allowed to remove any page from this booklet.
7. Do not leave the examination hall before you have made sure that you have answered all the required number of questions.
8. The use of calculator $f \times 82-f \times 100$ is allowed.

For Chief Marker's and Markers' Use Only

| Section | A | B |  |  |  |  |  |  |  |  |  |  |  | C |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| Award |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Marker's initial |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Answer all questions

## Question 1

(i) One dimension of the product matrix of two matrices is $5 \times 2$. What are the dimensions of the two matrices?
A. $5 \times 2,4 \times 2$
B. $5 \times 4,4 \times 3$

C $\quad 2 \times 5,5 \times 2$
D. $5 \times 2,2 \times 2$

Answer. $\qquad$
(ii) The value of $m$ in the radicals $5 \sqrt{3} \times 4 \sqrt{3}+\sqrt{32}-60=m \sqrt{2}$ is.
A. $4 \sqrt{2}$
B. 5
C. 4
D. $4 \sqrt{3}$

Answer $\qquad$
(iii) $w$ as the function of $x$ in the expression $3 w+8 x=7$ is.
A. $\quad f(x)=\frac{7-8 x}{3}$
B. $\quad f(w)=\frac{7-3 w}{8}$
C. $f(x)=\frac{8 x-7}{3}$
D. $\quad f(w)=\frac{3 w+7}{8}$

Answer
(iv) Which of the following is the most efficient shape with a constant perimeter?
A. Regular Hexagon
B. Regular Octagon
C. Regular Quadrilateral
D. Regular Pentagon

Answer. $\qquad$
(v) The value of $x$ in the quadratic equation $5 x-6=x^{2}$ is.
A. $x=2,3$
B. $x=\frac{5}{6}, 1$
C. $x=5,6$
D. $\quad x=\frac{2}{3}, \frac{1}{2}$

Answer. $\qquad$
(vi) The equation of the parabola that would result from composite transformation of $(x, y) \rightarrow(x+4,-3 y+6)$ to the graph of $y=x^{2}$ is.
A. $\quad y=6(x-4)^{2}-3$
B. $\quad y=3(x-4)^{2}-6$
C. $y=-3(x+4)^{2}+6$
D. $y=-3(x-4)^{2}+6$

Answer. $\qquad$
(vii) The probability of drawing a club and then a heart from a deck of 52 cards, if the first card is replaced would be.
A. $\frac{1}{26}$
B. $\frac{1}{16}$
C. $\frac{1}{4}$
D. $\frac{1}{52}$

Answer.
(viii) The area of the parallelogram given below is


30
A. $\quad 192.8$ sq. units
B. $\quad 229.8$ sq. units
C. $\quad 300$ sq. units
D. 800 sq. units

Answer.
(ix) What is the bearing of the single vector for the trips below?

A. 50 degrees
B. 130 degrees
C. 230 degrees
D. 310 degrees

Answer. $\qquad$
(x) The number of lines of symmetry in a regular hexagon is.
A. 5
B. 6
C. 7
D. 8

Answer $\qquad$

## Section B (32 marks)

## Answer all questions

## Question 2

Find the value of $x, y, z$ in the matrices, $\left[\begin{array}{llll}1 & 2 & 3 & 0 \\ -1 & x & 4 & 1\end{array}\right]\left[\begin{array}{cc}y & 3 \\ 1 & 2 \\ 0 & 1 \\ -1 & 0\end{array}\right]=\left[\begin{array}{cc}6 & z \\ -2 & 7\end{array}\right]$.

## Question 3

Kinley invested Nu 25000 in RICBL shares with a face value of Nu 100 and sold at par.
a. How many shares can he buy?
b. If a dividend of $15 \%$ is paid, find the annual dividend earned by him.
c. What will be the yield percentage on his investment?

## Question 4

Solve the system of linear equations given below.
a. $y=4 x-1$ and $2 x+3 y=11$
[2]

Question 5
a. Sketch the graph of the inequality $3 x-4 y<12$ (use graph r given below)


## Question 6

a. How many significant figures are there in each number?
i. $\quad 48.80$
ii. 23000
b. Write a number for each.
[1]
i. Less than 200 with 3 significant figures.
ii. Greater than 1000000 with 2 significant figures.
c. Round off each number as indicated.
[1]
i. $\quad 16.962$ to 3 significant figures
ii. $\quad 992$ to 1 significant figure

## Question 7

Show that $f(x)$ and $g(x)$ are equivalent, where $f(x)=3 x^{2}-5 x-28$ and $g(x)=(3 x+7)(x-4)$ respectively.

## Question 8

Create an equation with the solution, $x=2$ and $x=3$.

## Question 9

The data below shows the ages of the siblings of students in Pemba's class.

| 6 | 9 | 13 | 18 | 21 | 14 | 26 | 30 | 24 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 26 | 11 | 7 | 14 | 16 | 10 | 23 | 26 | 20 |
| 10 | 17 | 21 | 22 | 24 | 24 | 14 | 22 | 5 |
| 26 | 12 | 23 | 21 | 20 | 17 | 18 | 11 | 9 |

a. Construct a Stem and Leaf plot of the data.
b. Use the data to find the median and the mode.

## Question 10

Wangmo randomly chooses an integer from 1 to 50.
Event A: The integer is even.
Event B: The integer is a multiple of 4.
a. What is the probability of each of the following?
i. Event A happening?
ii. Event B happening?
iii. Event A and B both happening?

## Question 11

Find the values of $x$ and $y$ for the triangle given below.


## Question 12

A ladder leaning against a wall forms a $30^{0}$ angle with the wall at the top of the ladder. If the ladder reaches 3.5 metres up the wall, how long is the ladder.

## Question 13

Using deductive reasoning prove that $\angle A=\angle D$ in the following triangles.


## SECTION C (8 x $6=48$ marks)

Under this section, there are 8 questions (question numbers 14-21). Each question has two pan I and II. Attempt either I or II from each question.

## Question 14 (I)

a. If $A=\left[\begin{array}{cc}2 & 3 \\ 0 & -1\end{array}\right], B=\left[\begin{array}{ll}4 & 2 \\ 0 & 0\end{array}\right]$ and $C=\left[\begin{array}{ll}1 & 0 \\ 0 & 1\end{array}\right]$, then find (i) $2 A+3 B$, (ii) $A(B+C)$.
[3]
b.

i. Make an adjacency matrix for the digraph above.
ii. Make use of your adjacency matrix to find out the number of one-stop over trips between each pair of vertices.

## OR

## Question 14 (II)

a. The coordinates of the three vertices of a triangle are listed in the matrix given below.
i. Plot the points on the grid.

iii. Plot the new coordinates on the same grid.
b. i. Make a digraph for this adjacency matrix.
$\left.\begin{array}{c} \\ A \\ A \\ B \\ C\end{array} \begin{array}{lll}A & C \\ 1 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 2 & 1\end{array}\right]$
ii. Use the adjacency matrix to find out the two-stop over trips between A to C. [2]

## Question 15 (I)

a. Pema is a sales person at a garment store. He is paid Nu 1500 each month plus an additional $5 \%$ commission on his sales amount. His goal is to earn a minimum of Nu 7500 each month. What should be the minimum amount of monthly sales he should make?
b. i. Simplify, $\frac{\sqrt{5 x^{3}} \times \sqrt{9 x^{6}}}{\sqrt{80 x}}$.
ii. Solve for $x, \frac{5 \sqrt{27}-3 \sqrt{12}}{\sqrt{x}}=\sqrt{3}$.
[11/2]

## OR

## Question 15 (II)

a. Ugyen borrowed $\mathrm{Nu} 30,000$ at a certain rate of interest compounded quarterly. The balance was Nu 27,900 after making his first repayment of Nu 3000 . What was the rate of interest?
[3]
b. i. Simplify, $\frac{\sqrt{32}+\sqrt{50}-\sqrt{8}-\sqrt{72}}{\sqrt{2}}$.
[1¹/2]
ii. Solve for $x,(\sqrt{x}+\sqrt{22})(\sqrt{x}-\sqrt{22})=35$.
[1¹/2]

Question 16 (I)
a. Dorji invests some amount earning at $5.2 \%$ interest and some amount earning at 5 . interest.
i. Write an equation to describe the total interest.
i. Write a function that calculates the amount invested at $5.5 \%$ if you know the amount at $5.2 \%$.
b. The perimeter of a rectangle is 148 cm . The length is 12 cm greater than the width. What are the length and the width?

## Question 16 (II)

a. A rectangle has these vertices, $\mathrm{A}(1,1), \mathrm{B}(1,5), \mathrm{C}(3,5)$ and $\mathrm{D}(3,1)$. Determine the equation of the diagonal BD.
b. Write an inequality to the graph given below:


Question 17 (I)
a. The following two triangles have the same area, but different perimeter.

3.4 cm

i. Find the perimeters of the two triangles.
ii. Which triangle is more efficient?
[1]
b. Two cylinders are of equal volume of $785 \mathrm{~cm}^{3}$. The diameters of their bases are 10 cm and 12 cm respectively. Find the heights of the two cylinders and determine which is more efficient.

## OR

## Question 17 (II)

a. The two polygons given below have same perimeter of 36 cm .

Regular rectangle

Regular Hexagon
i. Find the areas of the two polygons.
[2]
ii. Which of the two shapes is more efficient? Why?
[1]
b. i. What is the total surface area of a cube with an edge length of 3.5 cm ? [1]
ii. Determine the radius of a sphere with the same surface area as that of the cube above.
[2]

Question 18 (I)
a. i. Plot the graph of the function, $f(x)=\frac{1}{2}(x-4)(x+2)$.


## OR

## Question 18 (II)

a. The hypotenuse of a right triangle is 18 units longer than its base. The height is 3 units longer than the 3 times the base. How long is the hypotenuse?
b. Solve the quadratic equation, $4 x^{2}-17 x=15$
[2]

## Question 19 (I)

Use the stem and Leaf plot given below to answer the questions that follow.
a. Vehicle speed on Japanese highways ( $\mathrm{Km} / \mathrm{hr}$ )

| STEM | LEAF |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ---: | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 8 | 0 | 2 | 2 | 6 | 6 | 6 | 8 | 8 | 8 | 8 | 8 |  |  |  |  |
| 9 | 1 | 2 | 2 | 3 | 4 | 5 | 5 | 5 | 7 | 7 | 8 | 8 | 8 | 9 | 9 |
| 10 | 0 | 1 | 1 | 2 | 2 | 4 | 6 | 7 | 8 | 8 | 9 |  |  |  |  |

i. How many vehicles had their speeds measured?
ii. How many vehicles were travelling under 90 Km per hour?
iii. If the maximum speed limit was $90 \mathrm{Km} / \mathrm{hr}$, how many vehicles were exceeding the limit?
iv. What is the range of speed?
v. What is the median speed?
b. The table below shows the age of some people and the number of hours they spend in physical activity each week.

| Age | 20 | 22 | 30 | 30 | 34 | 26 | 26 | 18 | 36 | 36 | 28 | 30 | 40 | 35 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Hours | 15 | 11 | 6 | 7 | 6 | 14 | 8.5 | 16 | 3 | 6 | 11 | 9 | 3 | 4 |

i. Create a scatter plot of the data.

ii. What type of correlation is shown?
iii. Estimate the value of the correlation coefficient.

## OR

## Question 19 (II)

a. A manufacturer of batteries for lap top computers tested a sample of lap tops to see how long the charges in the batteries would last. Here are the results of the test.

| Battery life (in minute) | Frequency |
| :---: | :---: |
| $260-270$ | 2 |
| $270-280$ | 3 |
| $280-290$ | 5 |
| $290-300$ | 7 |
| $300-310$ | 5 |
| $310-320$ | 4 |

i. Create a histogram and a frequency polygon

ii. What is the distribution from the shape of the frequency polygon?
b. Examine the scatter plots I to IV below.



I
II


III


IV
i Which scatter plot shows the strongest correlation?
ii. Which scatter plot shows negative correlation?
iii. Which scatter plot shows no correlation?
iv. Which scatter plot shows a weak negative correlation?
v. Which scatter plot shows strong positive correlation?

Question 20 (I)
a. From the top of a cliff, the angle of depression towards a car is $30^{\circ}$. If the cliff is 0 metres high, how far is the car from the base of the cliff?
b. What is the value of $x$ ?


## Question 20 (II)

a. i. Calculate the area of the regular hexagon using trigonometric ratios

ii. Represent the trip from A to D by a single vector, and find its bearing and distance.

[2]
b. If the sine ratio of an angle is 0.5 , answer the following questions.
i. What is the value of the angle?
ii. What would be its Cosine and Cotangent values?
a. Draw a triangle, and construct two circles in such way that one of the circles touch vertices and the other circle touches all its edges.
b. How many planes of symmetry does a regular pentagon based prism have? How many such planes of symmetry would a sphere have?

## OR

Question 21 (I)
a. Draw any triangle, and construct its centroid.
b. i. Which has got more axes of rotation, a sphere or a cylinder?
iii. How many lines of symmetry does a circle have?

