SECTION A

Answer all questions

Direction: *For each question, there are four alternatives: A, B, C and D. Choose the correct alternative and circle it. Do not circle more than **ONE** alternative. If there are more than one choice circled, **NO** score will be awarded.*

Question 1 **[2 x 10 = 20]**

i. Which of the following pairs of matrix can NOT be added?

A $\begin{bmatrix} 2 & -1 & -3 \end{bmatrix}$ and $\begin{bmatrix} -2 & -1 & -3 \end{bmatrix}$

B $\begin{bmatrix} 2 & 2 \\ -1 & -1 \end{bmatrix}$ and $\begin{bmatrix} 3 & 3 \\ -2 & -2 \end{bmatrix}$

C $\begin{bmatrix} 2 & 3 \\ 5 & -5 \\ 3 & -1 \end{bmatrix}$ and $\begin{bmatrix} 2 & 3 & 5 \\ -5 & 3 & -1 \end{bmatrix}$

D $\begin{bmatrix} 3 & 2 \\ -1 & 5 \\ 2 & 1 \end{bmatrix}$ and $\begin{bmatrix} 2 & 5 \\ 8 & 6 \\ 4 & -1 \end{bmatrix}$

ii. The value of 'm' in the radicals $2\sqrt{2} \times 3\sqrt{2} + \sqrt{27} - 12 = m\sqrt{3}$ is

A 3.

B $3\sqrt{3}$.

C 12.

D $24\sqrt{3}$.

iii. 'y' as a function of 'x' in the equation $2x + 3y = 5$ is

A $f(y) = \frac{5 - 2x}{3}$.

B $f(x) = \frac{5 - 2x}{3}$.

C $f(x) = \frac{5 - 3y}{2}$.

D $f(y) = \frac{5 - 3y}{2}$.

iv. Rounding off 2.032189 correct to five significant figure will be

A 2.0322.

B 2.03218.

C 2.03219.

D 2.0321.

v. Which of the following functions are equivalent?

$f(x) = x^2 + 3x + 2,\ g(x) = (x+2)(x+1), h(x) = (x-2)^2 + 1$ and $i(x) = x^2 - 4x + 5$

I $f(x)$ and $g(x)$

II $f(x)$ and $h(x)$

III $f(x)$ and $i(x)$

IV $h(x)$ and $i(x)$

A *I* and *II*.

B *I* and *III*.

C *II* and *III*.

D *I* and *IV*.

vi. The coordinates of the vertex of the function $3(x+5)^2-1$ is

A (5,1).

B $(-5,-1)$.

C $(-5,1)$.

D $(5,-1)$.

vii. Which of the following is an independent event?

A Drawing a black tile and do not replace it.

B Rolling a 6 consecutively two times when you roll a die.

C Drawing an ace from a deck of cards and do not replace it.

D Drawing a white tile from a bag containing black and white tiles without replacing it.

viii. Karmala travelled 5 km at a bearing of 60° and 12 km at a bearing of 45°. The distance of his two-part trip as a single vector is

A 169.

B 144.

C 25.

D 13.

ix. Which of the following statement is NOT TRUE?

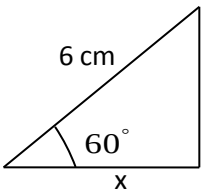
A The turn symmetry of a regular hexagonal pyramid is 6.

B Circum-centre of a right triangle will be on the hypotenuse.

C The ortho-centre is a point of intersection of the medians.

D An altitude of a triangle is a perpendicular line segment from a vertex of a triangle toits opposite sides.

x. What is a value of 'x' in the diagram?



A 0.5 cm

B 1.2 cm

C 3 cm

D 5.2 cm

SECTION B (32 marks)

*Answer **all** questions.*

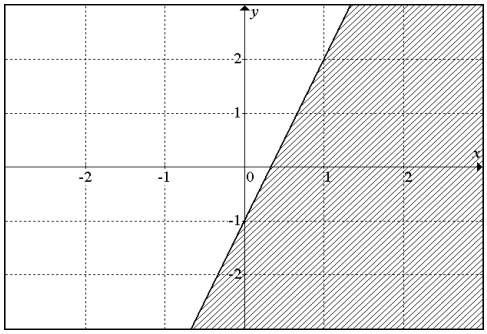
2. The matrix below describes Lethro's and Sonam's savings in their piggy banks in Ngultrum notes. Who has more savings? Show your work. **[3]**

$$\begin{array}{c} \\ \textit{Lethro} \\ \textit{Sonam} \end{array} \begin{array}{c} \begin{array}{cccc} 10 & 20 & 50 & 100 \end{array} \\ \begin{bmatrix} 6 & 5 & 2 & 1 \\ 1 & 2 & 2 & 2 \end{bmatrix} \end{array}$$

3. a) Dorji asked Tenzin to help him sell his car at a price of Nu 200,000. Mean while Tenzin wants to make a profit of Nu 20,000 from the sale. Determine the percent markup? **[2]**

b) What values for 'a' if any, would make the expression $2^9 \times 3^6 \times 5^a$ a perfect cube? Explain your thinking. **[2]**

4. Write the inequality statement of the graph? **[3]**

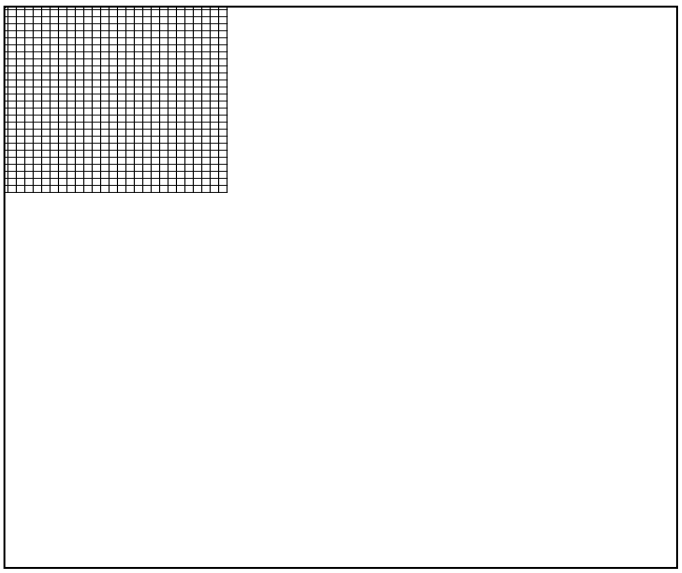


5. Solve the system of linear equations given below.

$\frac{1}{2}x = 6 - \frac{2}{3}y$ and $\frac{3}{4}x - \frac{1}{3}y = 1$ **[3]**

6. Phensum is using fabric to cover a rectangular prism box. The box has a volume of 0.8 m^3 and the fabric costs Nu 20 for 1 m^2. What is the least it could cost to cover the box with fabric? **[3]**

7. a) Sketch the graph of function $f(x) = x^2 - 2x - 3$. **[3]**



b) When the squares of two consecutive odd integers are added, the sum is 290.
What are the integers? **[2]**

8. The data shows the marks scored by 20 students in a Mathematics weekly test.

25	30	12	8	11	22	20	35	15	33
19	24	38	9	13	26	22	30	34	15

a) Construct a stem and leaf plot for the data above. **[2]**

b) Write the median mark. **[1]**

9. In a group of 10 families, 2 families have both cats and dogs, 5 families have only dogs and one family has no pets.

a) What is the probability of selecting a family that has dogs only? **[1/2]**

b) What is the probability of selecting a family that has cats only? **[1/2]**

c) What is the combine probability of both the events happening in part a) and b)? **[1]**

10. Calculate the area of a regular hexagon with a perimeter of 60 cm. **[2]**

11. For safety reasons the maximum angle at which a ladder can be sloped with the ground is 75^{o}. Could a ladder with a slope of $\frac{5}{12}$ be used for a climbing? Explain. **[2]**

12. Penjor designs a flower garden in the shape of a triangle. Further, to improve the design he wants to have a circular garden within it so that the circle touches all the edges of the triangle. Draw Penjor's design (use geometrical instruments). **[2]**

SECTION C [48 marks]

Under this section, there are 8 questions (question 13 – 20).
*Each question has **two** parts, I and II. Attempt **either** I or II from each question.*

Question 13 (I)

a.

$$\begin{array}{c} \\ A \\ B \\ C \\ D \end{array} \begin{array}{c} \begin{array}{cccc} A & B & C & D \end{array} \\ \begin{bmatrix} 2 & 2 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \end{bmatrix} \end{array}$$

i. Draw a digraph for the above matrix. **[2]**

ii. Find the number of one-stop over between A to C. **[1]**

b. $\mathbf{A} = \begin{bmatrix} 2 & -1 & 0 \\ 1 & 2 & 1 \end{bmatrix}$ $\mathbf{B} = \begin{bmatrix} -1 & 0 & 2 \\ 3 & 5 & -2 \end{bmatrix}$ and $\mathbf{C} = \begin{bmatrix} 3 & 2 & 0 \\ 1 & 3 & 3 \\ -1 & 2 & 2 \end{bmatrix}$

Calculate:

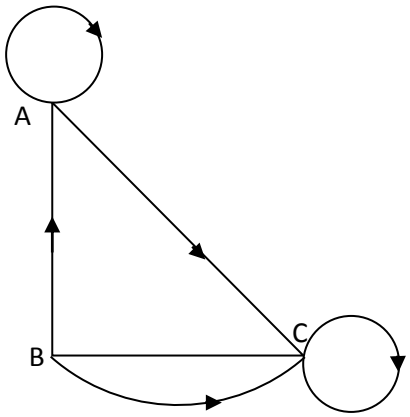
i. $2A - B$ **[1 ½]**

ii. $2A + BC$ **[1 ½]**

OR

Question 13(II)

a.



i. Create an adjacency matrix for the above digraph. **[1]**

ii. Find the number of two-stop overs between each pair of vertices. **[2]**

b. Find the value of *a*, *b* and *c* in the given matrix.

$$\begin{bmatrix} a & 2 \\ 1 & -1 \end{bmatrix} \times \begin{bmatrix} 5 & b & -1 \\ -1 & 2 & 2 \end{bmatrix} = \begin{bmatrix} 8 & 10 & 6 \\ 6 & 1 & c \end{bmatrix}$$ **[3]**

Question 14(I)

a. Yoezer bought 25 shares that had a face value of Nu 100 but were selling at a discount of 5%. A 15% dividend rate was paid at the end of one year. He then sold the stock at a 5% premium.

i. Find the amount of his investment. **[1]**

ii. Calculate his total profit. **[2]**

b. Simplify:

i. $(3\sqrt{5}+\sqrt{10})(2\sqrt{2}-\sqrt{5})$ **[2]**

ii. $\dfrac{\sqrt{45}\times\sqrt{3}}{\sqrt{15}}$ **[1]**

OR

Question 14(II)

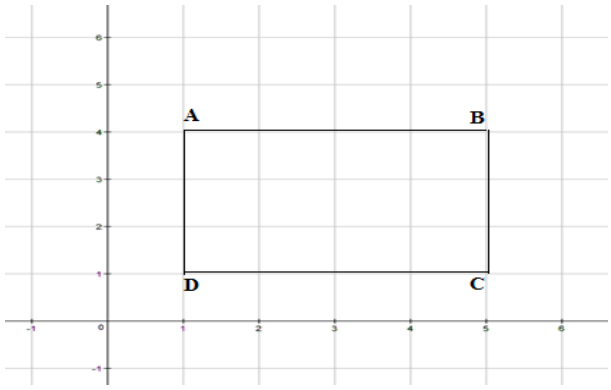
a. Ghem Lham borrowed Nu 25000 from T-Bank at an interest rate compounded quarterly. He repaid the loan at the end of 5 years with a single payment of Nu 42000. What interest rate was charged? **[3]**

b. Find the value of n.

$$\sqrt{25x^n} \times \sqrt{20} = 10x^5\sqrt{5x}$$ **[3]**

Question 15 (I)

a. For the graph below, determine the equation of the diagonal AC. **[3]**

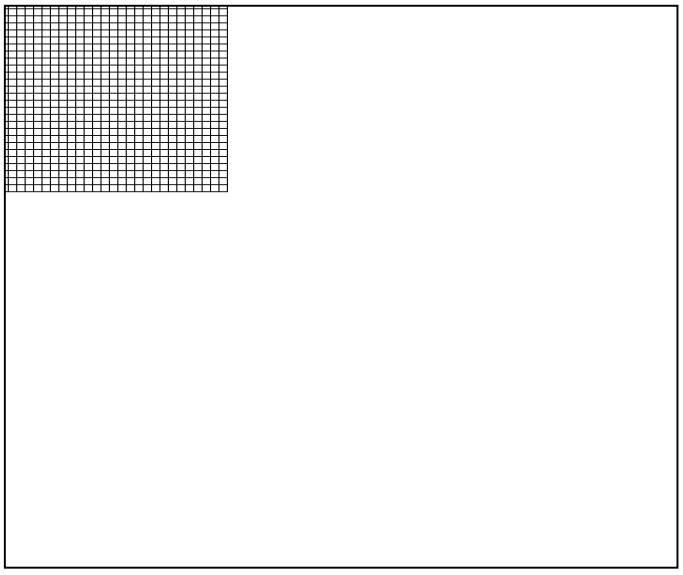


b. The school bought 27basketballs for a total of Nu 15,600. Practice balls cost Nu 400 and official balls cost Nu 800. How many of each type of ball they Bought? **[3]**

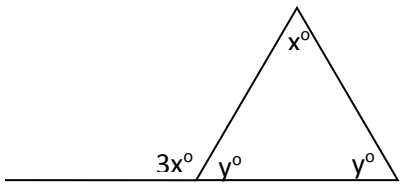
OR

Question 15(II)

a. Draw a graph for the inequalty $2y + 3 \leq 5x$. **[3]**



b. Determine the unknown values in the given diagram. **[3]**



Question 16(I)

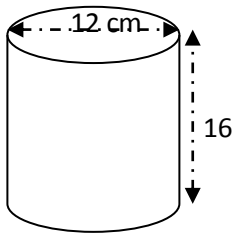
a. Write a number for each: **[3]**

i. Seven digits with 1 SFs.

ii. Less than 100 with 4 SFs.

iii. Three zeros with 5 SFs.

b. i) Find the total surface area of a cylinder given below. **[1]**



ii) Determine the radius of a sphere with the same total surface area. **[2]**

OR

Question 16(II)

a. Fill in the blanks with equivalent values. **[3]**

i. 30 L =_____cm^3

ii. 3.2 m^2 =_____cm^2

iii. 5.5 ml =_____L

b. If the cost for each meter of border for a rectangular area is Nu 30. What is the greatest area Jimba can enclose by spending Nu 6000? **[3]**

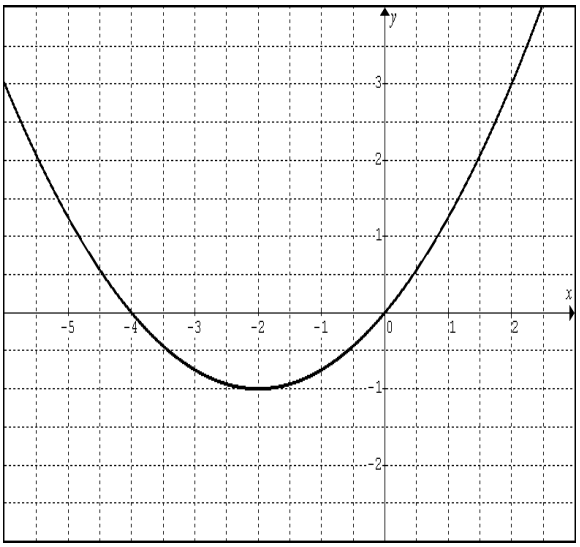
Question 17(I)

a. Solve:

i. $5+|x|=8$ **[1]**

ii. $|2x+1|+3=7$ **[2]**

b. What is the equation of the parabola given below? **[3]**



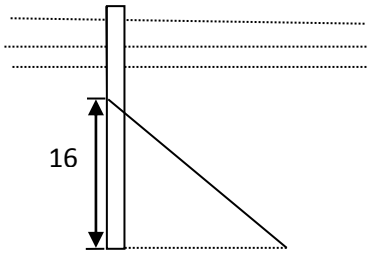
OR

Question 17(II)

a. i) Determine the x-intercepts and the coordinates of the vertex of the function $f(x) = 2x^2 - 5x - 25$. **[2]**

ii) What will be the equation of the parabola that would result from applying $(x, y) \rightarrow (x + 4, -3y + 6)$ transformation to the graph of $y = x^2$. **[1]**

b. A support wire is attached to an electric pole at a height of 16 m. The wire is 8 m shorter than thrice the distance from the electric pole's base to the place where the wire is anchored to the ground. Determine the distance from the base of the pole to the place where the wire is anchored to the ground. **[3]**



Question 18(I)

a. A group of students were surveyed about the amount of time they spent in games and sports in each week.

Hours	Number of students
2 – 4	27
4 – 6	30
6 - 8	40
8 – 10	15
10 – 12	3

i. Estimate the 5-number summary. **[2]**

ii. Construct box and whisker plot. **[1]**

b. Ongmorolled a die thrice. **[3]**

i. What is the probability that Ongmo roll a number greater than 3 the first time?

ii. What is the probability that the total of the three rolls is 8?

iii. Are the events in part i) and ii) independent? Explain.

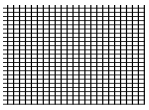
OR

Question 18(II)

a. The frequency table shows the number of space shuttle launches over the 16 years.

Year	Number of launches
1994 – 1997	20
1997 – 2000	35
2000 – 2003	37
2003 – 2006	27
2006 - 2009	15

i. Construct a histogram. **[2]**



ii. Identify the type of distribution. **[1]**

b. Tshewang randomly chooses an integer number from 1 to 30**.** **[3]**

Event A the number is an even.
Event B the number is multipleof 3.
What is the probability of each?

i. Event A happening

ii. Event B happening

iii. Event A and B both happening

iv. Are events A and B dependent or independent?

Question 19(I)

a. Complete each **[3]**

i. Sin_____ = Cos53^{o}

ii. Tan_____=1.2

iii. Cos (90^{o}-x) =_____

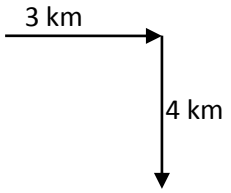
b. From the top of the building, the angle of depression towards a car is 30^o. If the building is 24 m high, how far is the car from the base of the building? **[3]**

OR

Question 19(II)

a. Determine the other five trigonometric ratios if Cosx=0.4. **[3]**

b. Represent each trip as a single vector. What is its bearing and distance? **[3]**



Question 20(I)

a. Construct a triangle ABC and locate its centroid in which AB= 7 cm, BC=8 cm and AC = 5cm. **[3]**

b. Describe the reflectional symmetry and rotational symmetry of cone. **[3]**

OR

Question 20 (II)

a. Identify each statement as an example of inductive or deductive reasoning. **[3]**

i. "The sun has shone every Monday this month, so I know that next Monday will be sunny".

ii. "The angles in a triangle always sum up to 180^o, so the non-right angles in a right triangle will also sum up to 90^o".

iii. "I have observed thatTshering's father is a good football player, therefore I can confidently say thatTshering will be good player in future".

b. Create a 2-D shape with turn symmetry of order 4 which is not a square. **[3]**