SECTION A [40 MARKS]

ANSWER **ALL** QUESTIONS

Question 1 **[40]**

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.

i) The element 'G' is at

$$\begin{bmatrix} A & B & C & D \\ E & F & G & H \\ I & J & K & L \end{bmatrix}$$

A (1, 3).
B (2, 3).
C (3, 1).
D (3, 2).

ii) Sonam has the following notes:

Type of notes (Nu)	Number of notes
50	3
100	5
500	2
1000	1

The total value of his notes will be

A Nu 4650.
B Nu 3650.
C Nu 2650.
D Nu 1650.

iii) What is the simplified form of $\sqrt{12}+\sqrt{48}+\sqrt{75}$?

A $13\sqrt{3}$
B $11\sqrt{3}$
C $9\sqrt{3}$
D $7\sqrt{3}$

iv) Yuden invested Nu 4800 for 18 months. She earned one eighth of the invested amount as interest. What was the rate of interest?

A 8.03%
B 8.13%
C 8.23%
D 8.33%

v) How many terms are there in: 20, 25, 30, ……,140?

A 25
B 24
C 23
D 22

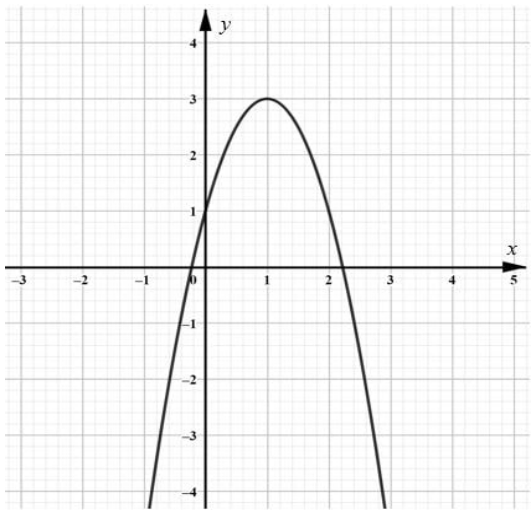
vi) Which of the following represents a function?

A $(2, a)(3, b)(3, c)$
B $(2, a)(3, b)(4, c)$
C $(2, a)(4, b)(4, c)$
D $(2, a)(2, b)(4, c)$

vii) Jigsel has 6 more years of teaching experience than Wangmo, and the two of them have 16 years of teaching experience altogether. How many years of teaching experience does Wangmo have?

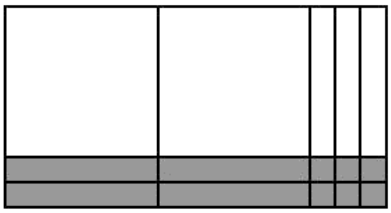
A 5 years
B 6 years
C 10 years
D 11 years

viii) Determine the equation of the parabola.



A $y = 2(x+1)^2 - 3$
B $y = 2(x-1)^2 + 3$
C $y = -2(x-1)^2 + 3$
D $y = -2(x+1)^2 - 3$

ix) The product of the model is



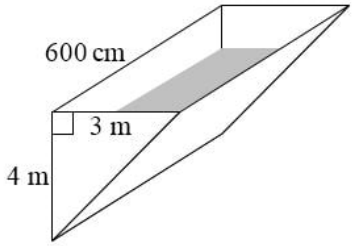
A $2x^2 + x - 6.$

B $2x^2 + x + 6.$

C $2x^2 - x + 6.$

D $2x^2 - x - 6.$

x) How many square metres of metal would be needed to make this water trough?



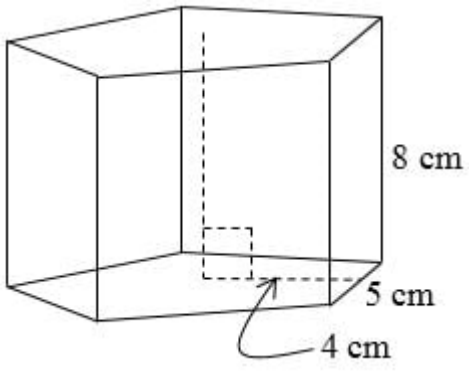
A 78 m^2

B 96 m^2

C 114 m^2

D 132 m^2

xi) The amount of rice grain this container can hold is



A 160 cm^3.

B 200 cm^3.

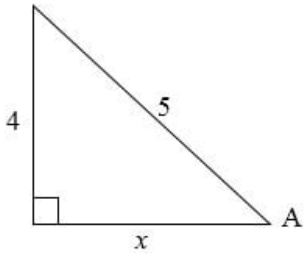
C 400 cm^3.

D 800 cm^3.

xii) Meto wants to cover a rectangular prism box with a cloth. The box has a volume of 8 m^3 and the cloth costs Nu 30 per m^2. What is the least amount it could cost to cover the box?

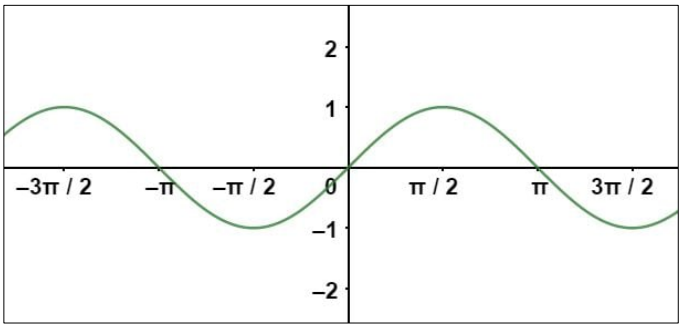
A Nu 960
B Nu 720
C Nu 480
D Nu 240

xiii) Calculate the value of 5cos A – 3tan A for the given figure.



A – 1
B – 0.5
C 0
D 0.5

xiv) Study the graph and identify the function it represents.



A $\sin\theta$
B $\cos\theta$
C $\tan\theta$
D $\cot\theta$

xv) What is the order of turn symmetry for the given figure?

A 5
B 4
C 3
D 2

xvi) The line segment that joins a vertex to the midpoint of the opposite side is called the

A median.
B altitude.
C bisector.
D perpendicular.

xvii) The table shows weekly savings by a group of people.

Savings (Nu)	Frequency
0 – 200	5
200 – 400	10
400 – 600	12
600 – 800	9
800 - 1000	4

The mean of the data is

A 799.
B 500.
C 485.
D 445.

xviii) The table shows the population of Bhutan in the past 6 years.

Year	Population
2015	727,876
2016	736,708
2017	745,563
2018	754,388
2019	763,092
2020	771,608

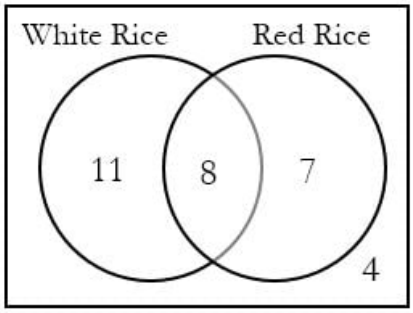
What is the type of distribution?

A normal
B uniform
C positively skewed
D negatively skewed

xix) A correlation coefficient close to -1 means data values are

A perfectly linear and as one variable increases, the other variable increases.
B perfectly linear and as one variable increases, the other variable decreases.
C loosely clustered and as one variable increases, the other variable increases.
D loosely clustered and as one variable increases, the other variable decreases.

xx) The Venn diagram shows the type of rice preferred by a group of students.



If a student is randomly selected, what is the probability that the student likes white rice?

A $\frac{11}{26}$
B $\frac{11}{30}$
C $\frac{19}{26}$
D $\frac{19}{30}$

SECTION B [60 MARKS]

ATTEMPT **ANY SIX** QUESTIONS

[Under this section, there are 8 questions (Question 2 – 9)]

Question 2

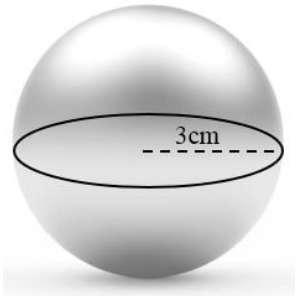
a) The matrix below describes the average temperatures for the first three weeks in the month of July for three different locations.

Week 1	Week 2	Week 3	
16	17	17.5	Haa
30	30.8	31	Phuntsholing
22.2	22.5	23	Gasa

i. Multiply the matrix by 0.5. What do the elements in the resulting matrix describe? **[1.5]**

ii. Multiply the matrix by 2. What do the elements in the resulting matrix describe? **[1.5]**

b) A metal ball is melted and transformed into a cylinder of the same radius. How tall would the cylinder be? **[2]**



c) This set of data shows the mathematics test scores awarded to 36 students in a midterm examination.

56	55	71	71	57	75
90	45	41	57	94	63
82	31	56	41	96	55
65	48	72	95	47	40
66	25	47	57	60	95
56	54	18	34	19	44

i. Create a frequency table and construct a histogram for the data. **[4]**

ii. Draw a conclusion based on the histogram. **[1]**

Question 3

a) Khamsum sells green chillies. If he sells 1 kg for Nu 120, he expects to sell about 52 kg per day. For every increase in price of Nu 5, he expects his daily sales to decrease by 2 kg.

i. Write a function representing Khamsum's total sales for each price increase of Nu x. **[1]**

ii. Determine the $x-$intercepts of the function. **[1]**

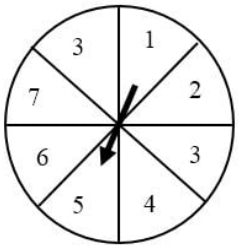
iii. Find the price that will result in the greatest daily sales. **[2]**

b) Without using a calculator, find the value of:

i. $\cos 300^0$ **[1.5]**

ii. $\sin 405^0$ **[1.5]**

c) When you spin a spinner twice, the following is observed:
Event A: First spin is an odd number
Event B: Second spin is an even number



i. Calculate the probability of Event A. **[1]**

ii. Calculate the probability of Event B. **[1]**

iii. Are the events independent or dependent? Explain. **[1]**

Question 4

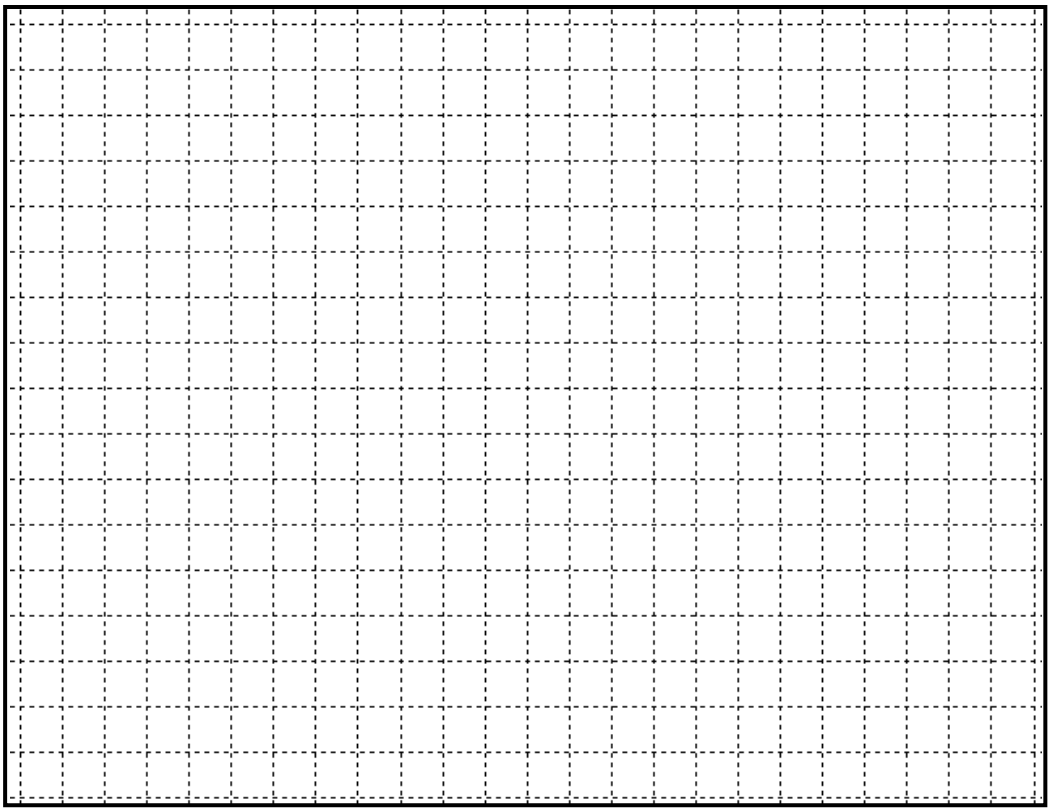
a) Sanjana made 14 cards using one letter each from the word **HYPOTHETICALLY** and placed them in a bag.

i. She drew a card with a letter L and then replaced it. What is the probability that she will draw a card with the letter L on the second draw? **[1]**

ii. She drew a card with a letter L and did not replace it. What is the probability that she will draw a card with the letter L on the second draw? **[1]**

iii. Which of the two events in part (i) or part (ii) are dependent? Explain. **[2]**

b) Sketch the graph of the inequality $3x - 5y \leq 15$. **[4]**



c) Mention and describe the planes of symmetry for the given shape. **[2]**

Question 5

a) Pem borrowed Nu 100,000 from a Bank. Calculate the amount of interest she will pay in one year at:

i. 14% p.a. compounded monthly. **[1]**

ii. 14% p.a. compounded annually. **[1]**

iii. Which option would be better for her? Why? **[1]**

b) What are the coordinates of the vertex for the graph of each function? **[1]**

i. $f(x) = 2x^2 - 5$

ii. $f(x) = -\frac{2}{3}(x+1)^2 + 3$ **[1]**

c) Two square based prisms have a total surface area of $136\,cm^2$ each. What is the height of a prism with square base

i. $4\,cm \times 4\,cm$? **[1.5]**

ii. $5\,cm \times 5\,cm$? **[1.5]**

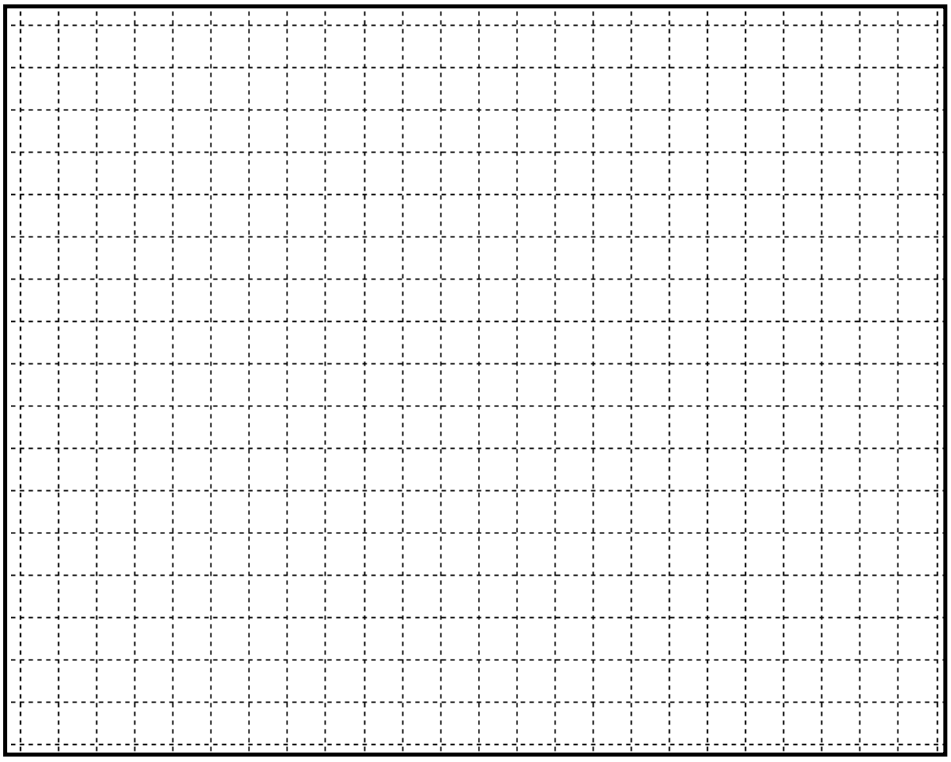
iii. Which of the above prisms is more efficient? Justify. **[2]**

Question 6

a) The winning women's Olympic high jump record for the years 1988 to 2016 are shown in the table.

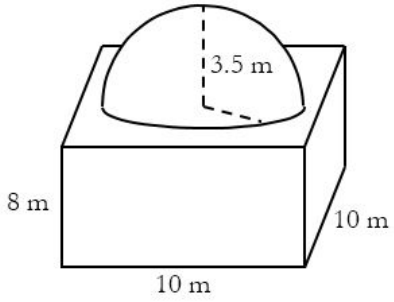
Year	Height(cm)
1988	2.03
1992	2.02
1996	2.05
2000	2.01
2004	2.06
2008	2.05
2012	2.05
2016	1.97

Create a scatter plot for the data. Is the line of best fit appropriate? Justify. **[3]**



b) If a stock is sold at 15% premium, calculate the market price of 150 shares that has a face value of Nu 100. **[2]**

c) Binod wants to paint the exterior of the structure given below. Calculate the surface area that he needs to paint (nearest to hundredth). What will be the cost of painting the structure, if $50\,m^2$ costs Nu 2500? **[5]**



Question 7

a) A shape has one axis of rotation that passes through the centres of the bases with the order of turn symmetry 3. It also has three axes of rotation that passes through the centre of a lateral face to the midpoint of the opposite lateral edge each with the order of turn symmetry 2. Create the shape showing the axes that fits the description and name the shape. **[3]**

b) Kezang makes two grades of recycled paper using scrap paper and cloth. One batch of each grade requires a different combination of paper and cloth as shown. **[4]**

Grade	Scrap cloth	Scrap paper
Deluxe	8.8 kg	39.6 kg
Fine	2.2 kg	33 kg

Kezang has 22 kg of scrap cloth and 145.2 kg of scrap paper. How many batches of each grade can she make?

c) The following are the points scored by two National Basketball Association (NBA) teams in 14 games.

Bucks: 105,123,103,120,108,105,118,123,88,113,125,113,115,104

Suns: 98,119,103,100,118,118,107,130,102,84,92,104,120,125

Create a double stem and leaf plot for the data. **[3]**

Question 8

a) In a class-wise beautification competition, Yonten made a square flower garden with an edge length of 5 m and within it he designed the largest circular garden. Construct Yonten's design $(\text{Scale } 1\text{m}=1\text{cm})$. **[3]**

b)

i. Simplify: $\left(4\sqrt{3}+\sqrt{3}\right)\left(3\sqrt{2}-\sqrt{3}\right)$ **[3]**

ii. Find the missing value: $\frac{-\sqrt{42n} \times \sqrt{n}}{\sqrt{6}} = -\sqrt{63}$ **[2]**

c) What are the roots of the function $f(x) = 2(x-1)(x+3)$? **[2]**

Question 9

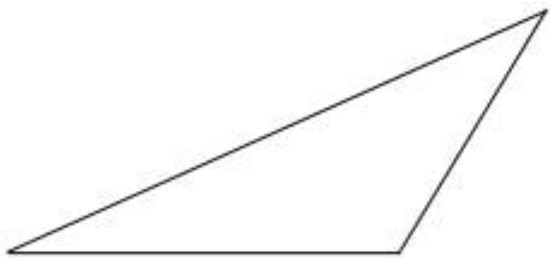
a) Calculate the amount of glass required to make a cylindrical glass rod of length 4 m with an outside diameter of 7 cm and an inside diameter of 5 cm. **[3]**

b)

i. Find the sum of all the numbers between 100 and 200 that are divisible by 9. **[3]**

ii. The first three terms of a Geometric Progression (G.P.) are x, $x+2$ and $x+6$. **[2]**
Find the value of x.

c) For the shape given, locate the orthocentre. **[2]**



FORMULAE

Strand A : Numbers and Operations

Discount% $= \frac{\text{SP}}{\text{MP}} \times 100\%$ Discount $= MP - SP$

Markup=MP-CP %markup $= \frac{\text{markup}}{\text{CP}} \times 100\%$

SI=prt or $\frac{PRT}{100}$ A $= p\left(1+\frac{r}{n}\right)^{nt}$ or $p\left(1+\frac{R}{n\times 100}\right)^{nt}$

DA $= fv \times r \times n$ Yield% $= \frac{DA}{OI} \times 100\%$

$T_n = a + (n-1)d$ $S = \frac{n}{2}(a+b)$

$S = \frac{n}{2}\left[2a + (n-1)d\right]$ $t_n = ar^{n-1}$

$S_n = \frac{a\left(r^n - 1\right)}{r-1} or \frac{a\left(1-r^n\right)}{1-r},\ r \neq 1$ $S_n = \frac{lr-a}{r-1}$

$S_\infty = \frac{a}{1-r}$ A.M.$= \frac{(a+b)}{2}$ G.M.$= \sqrt{ab}$

Strand B : Patterns and Algebra

$f(x) = ax^2 + bx + c$

$f(x) = a(x-p)(x-q)$

$f(x) = a(x-h)^2 + v$

Strand C : Measurement

Volume:

rectangular prism	V = lwh	cube	$V = e^3$
any prism	V = Ah	pyramid	V = Ah
cylinder	$V = \pi r^2 h$	cone	$V = \frac{1}{3}\pi r^2 h$
sphere	$V = \frac{4}{3}\pi r^3$		

Surface Area:

rectangular prism	SA = 2(lw + wh + lh)	cube	$SA = 6s^2$
any prism	SA = 2A + hP	pyramid	SA = A + Area of lateral faces
cylinder	$SA = 2\pi r^2 + 2\pi rh$	cone	$SA = \pi r^2 + \pi rs$
sphere	$SA = 4\pi r^2$		

Strand E : Data management and probability

Mean$= \frac{\sum fx}{\sum f}$

Rough Work

Rough Work

Rough Work