SECTION A [40 MARKS]

ANSWER **ALL** QUESTION

Question 1

Direction: For each question, there are FOUR responses: A, B, C and D. Choose the corresponding letter of your response and CIRCLE it neatly. NO score will be awarded if you circle more than ONE letter. **[40]**

i. Two matrices can be added if

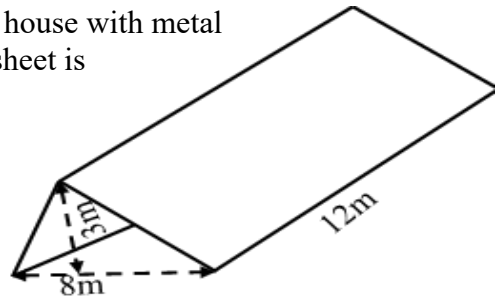
A both have same order.

B both are rectangular matrices.

C number of columns in the first matrix is equal to number of rows in the second matrix.

D number of rows in the first matrix is equal to number of columns in the second matrix.

ii. Yeashi plans to replace the wooden roof of his house with metal sheets as it is more durable. How much metal sheet is required to cover the roof?



A $36\,m^2$

B $60\,m^2$

C $120\,m^2$

D $240\,m^2$

iii. If Pelden borrowed Nu 30,000 and repaided the loan with a single payment of Nu 37,960 at the end of 3 years, with interest compounded semi-annually, the rate of interest would be

A 4%.

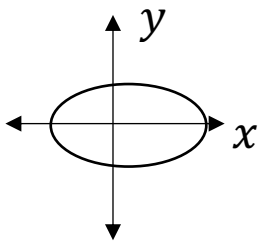
B 8%.

C 9%.

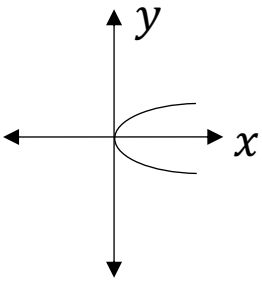
D 12%.

iv. Which of the following graph represents function?

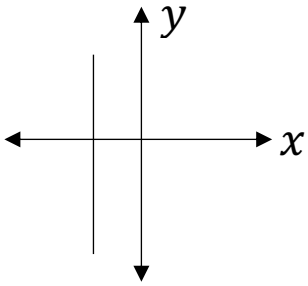
A



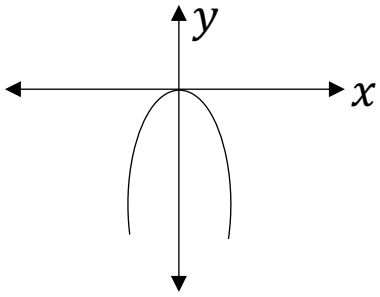
B



C



D



v. There are three paths through a triangular park. Each path goes from the midpoint of one edge to the opposite corner and the paths meet at point P. The point P is known as

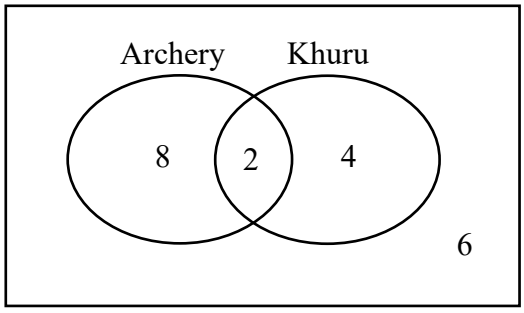
A median.

B altitude.

C centroid.

D orthocentre.

vi. The Venn diagram shows the number of students who like to play indigenous games.



If a student is randomly selected, what is the probability that the student who likes to play archery is selected?

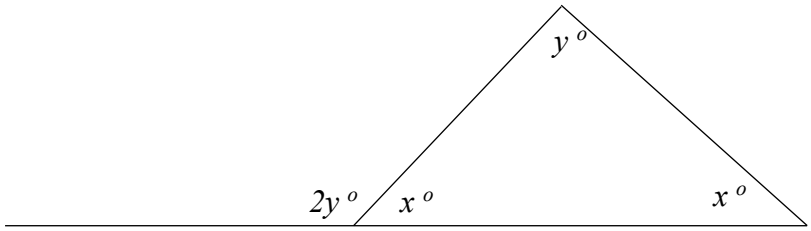
A $\frac{4}{20}$

B $\frac{6}{20}$

C $\frac{8}{20}$

D $\frac{10}{20}$

vii. The value of y in the given diagram is



A 36°.

B 60°.

C 108°.

D 120°.

viii. If $\cot\theta = \frac{4}{3}$, which lies in the first quadrant, what is the value of $\cos ec\,\theta$?

A $-\frac{5}{3}$

B $-\frac{3}{5}$

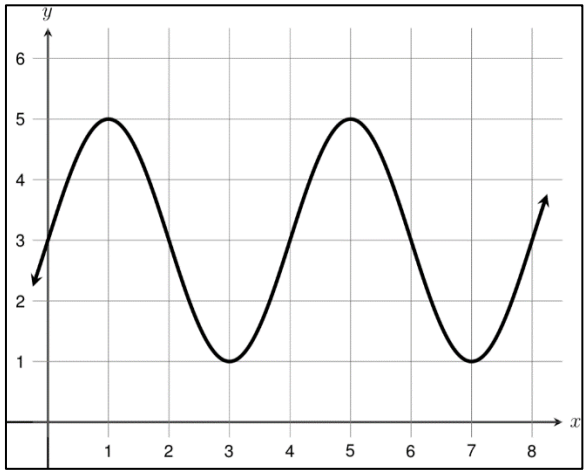
C $\frac{3}{5}$

D $\frac{5}{3}$

ix. The number of reflectional symmetry in the given figure is

A 2.
B 4.
C 8.
D 10.

x. Which of the following relation will result in the curve below?



A Edge of a cube and its volume.
B Side length of a rectangle and its area.
C Time and height of a person on the seesaw.
D Time and height of a cannon ball shot in the air.

xi. Simplify the expression: $\sqrt{8y}+5\sqrt{50y}-2\sqrt{18y}$

A $13\sqrt{2y}$
B $21\sqrt{2y}$
C $294y$
D $\left(8+5\sqrt{50}-2\sqrt{18}\right)y$

xii. Which of the following equation matches the pair of roots -3 and 9?

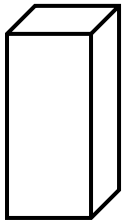
A $x^2 - 6x - 27 = 0$

B $x^2 - 12x - 27 = 0$

C $x^2 - 12x - 9 = 0$

D $x^2 - 6x - 9 = 0$

xiii. A square based rectangular block of wood was cut into eight equal cubes with edges of 4 *cm*. Find the volume of the initial rectangular block of wood.



A $64\,cm^3$

B $128\,cm^3$

C $256\,cm^3$

D $512\,cm^3$

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

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

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

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

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

xv. If A and B are two matrices of order $3 \times p$ and $3 \times q$ respectively and $p = q$ then the order of the matrix $\left(\dfrac{1}{2}A - 2B\right)$ is

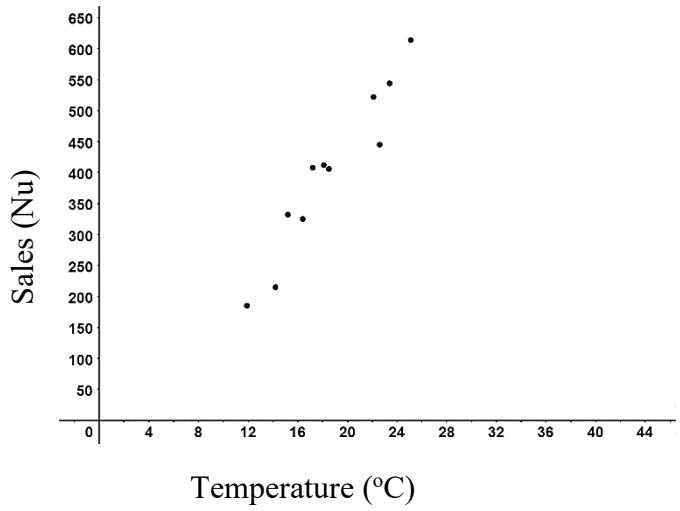
A $q \times 3$

B $p \times 3$

C $3 \times p$

D $p \times q$

xvi. The scatter plot shows the record of ice cream sale versus the noon temperature. What type of correlation coefficient does the given scatter plot show?



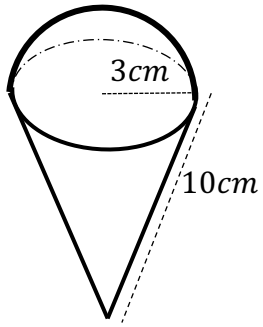
A -1

B 1

C Close to -1

D Close to 1

xvii. The total surface area of the given shape is



A $94.3\,cm^2$.

B $150.8\,cm^2$.

C $179.1\,cm^2$.

D $207.4\,cm^2$.

xviii. Which of the following functions are equivalent?

$f(x)=2x^2+4x-6$ $\quad$ $g(x)=2(x-1)(x+3)$ $\quad$ $h(x)=2(x+1)^2-3$

A $\quad f(x)$ and $g(x)$

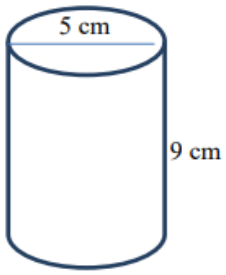
B $\quad f(x)$ and $h(x)$

C $\quad g(x)$ and $h(x)$

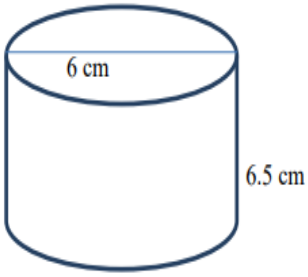
D $\quad f(x),\ g(x)$ and $h(x)$

xix. Four cylinders have the same total surface area but different dimensions. Which is the most efficient cylinder?

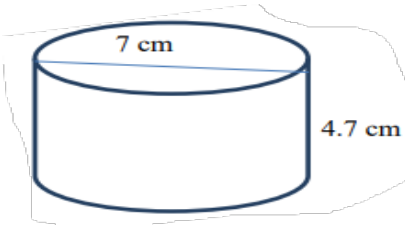
A



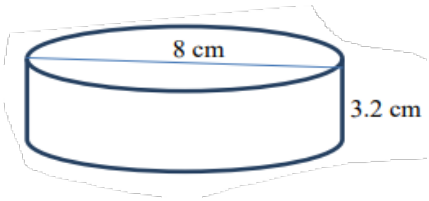
B



C



D



xx. Evaluate the value of: $\sec 30^{\circ} \tan 60^{\circ} + \sin 45^{\circ} \cos ec\, 45^{\circ} + \cos 30^{\circ} \cot 60^{\circ}$.

A $\frac{\sqrt{2}}{\sqrt{3}}$

B $\frac{11}{6}$

C $\frac{16}{6}$

D $\frac{7}{2}$

SECTION B [60 MARKS]

ATTEMPT **ANY SIX** QUESTIONS

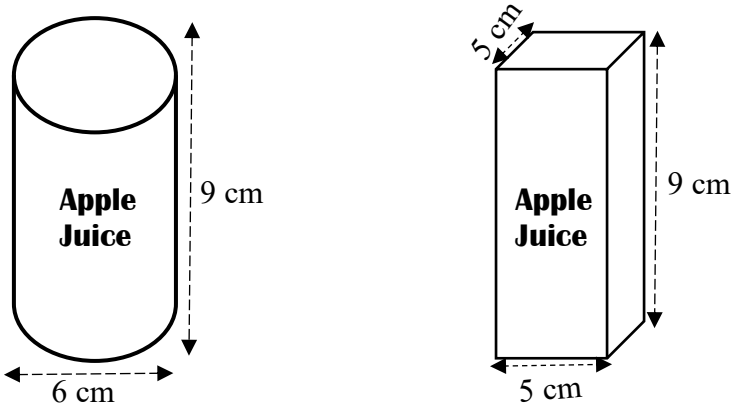
Question 2

a) Create a 2-D shape with turn symmetry of the following order and locate its centre of rotation.

i. 3 **[2]**

ii. 4 **[2]**

b) As Sangay is preparing for a hike, he intends to buy juice from a shop. The shop offers two different packaging options for the same type of juice: one in a can and the other in a tetra pack as shown in the figure. Both packagings have the same price. **[3]**



Which juice pack should Sangay buy? Justify.

c) Jamphel wants to fence his rectangular garden. He has fencing material just enough to cover $144\,m^2$ of the garden. If he wants the length to be $10\,m$ longer than its width, what would be the dimensions of the garden? **[3]**

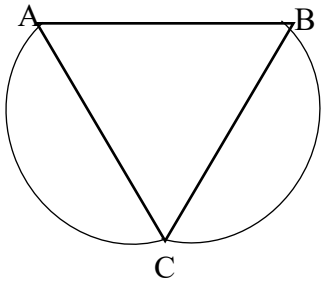
Question 3

a) i. Describe the transformation applied to the function $f(x) = x^2$ for the given mapping notation. **[2]**

$$(x, y) \rightarrow \left(x + 2, -\frac{1}{5}y + 2 \right)$$

ii. Write down the final function that would result from applying the transformation for the mapping notation given in i. **[1]**

b) i. Create an adjacency matrix for the given digraph. **[1.5]**



ii. Find the number of one stop-over trips between each vertices. **[1.5]**

a) Following are the goals scored by two football players in the past ten years.

Lionel Messi	73	60	58	54	53	51	61	45	41	41
Ronaldo	42	23	42	26	33	42	60	55	51	61

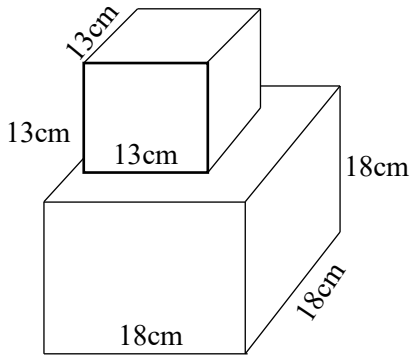
i. Create a double stem and leaf plot for the data. **[2]**

ii. What are the modes of the two sets of data? **[1]**

iii. Calculate the ranges of the two sets of data. **[1]**

Question 4

a) Deki is a carpenter and wants to create and paint a unique plant-stand for an art exhibition. Calculate the surface area of the plant-stand she will have to paint excluding the base. **[3]**



b) Construct ΔABC with $BC = 5.5cm, AB = 6cm$ and $\angle ABC = 120^{\circ}$. **[4]**

Construct circumcircle of the triangle.

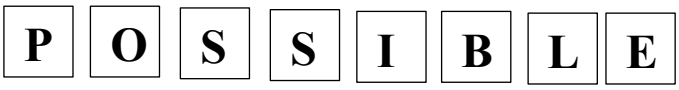
c) A plumber charges Nu 500 for a service call and an additional charge of Nu 150 per hour.

i. Write an equation to show the relation between number of hours and total income. **[1]**

ii. How much will the plumber earn if he works for 8 hours? **[2]**

Question 5

a) Each letter of a word is written on a tile as shown, and placed in a bag.



i. If you drew a vowel and replaced it, what is the probability of drawing a vowel next? **[1]**

ii. If you drew a vowel and did not replace it, what is the probability of drawing a vowel next? **[1]**

b) Kuensang took a test in English and Mathematics. The probability of him passing in both the test is 0.6. The probability of him passing in English test is 0.8. What is the probability of him passing in Mathematics given that he has passed in English? **[2]**

c) Convert the following radical expressions as entire radical and arrange them from the least to the greatest. **[3]**

$3\sqrt{5}$ $5\sqrt{2}$ 13 $2\sqrt{3}$

d) Prove that:

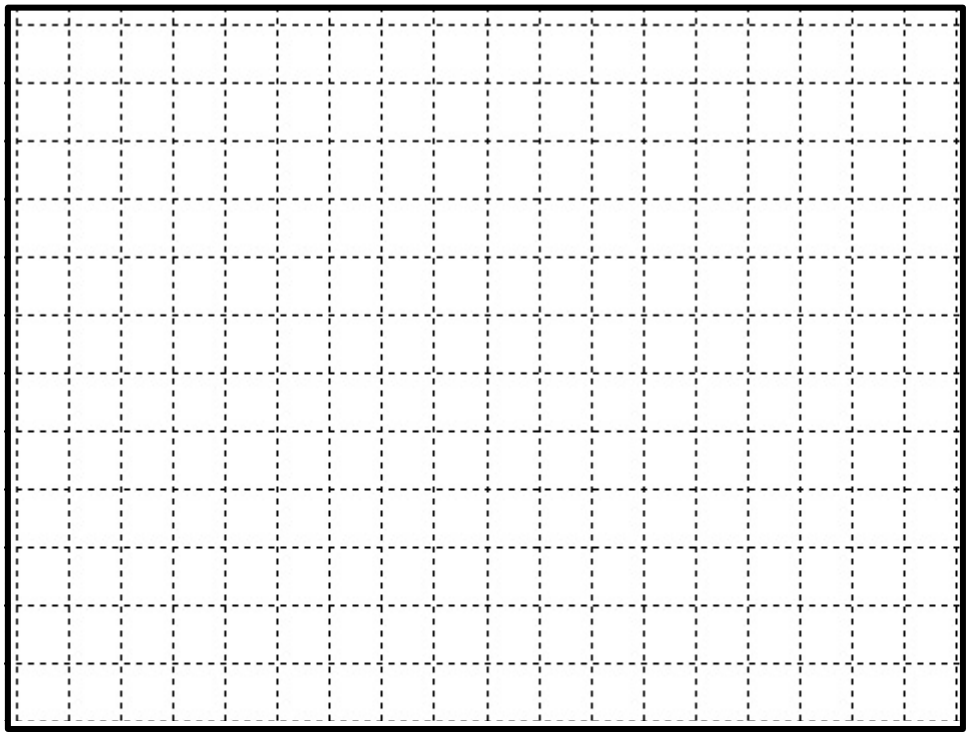
i. $\sec\theta\cot\theta = \cos ec\theta$ **[1]**

ii. $\dfrac{1+\cos\theta-\sin^2\theta}{\sin\theta(1+\cos\theta)}=\cot\theta$ **[2]**

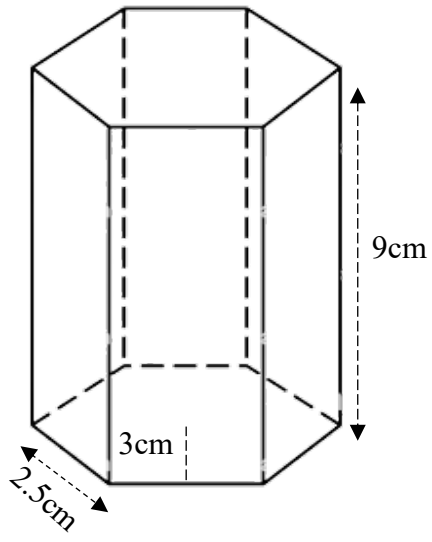
Question 6

a) i. Convert $5x+2y=12$ into slope and y- intercept form. **[1]**

i. Sketch the graph of the resulting equation. **[2]**



b) Tashi, who works as a manager in Cottage and Small Industry (CSI) has created a container for packaging coffee beans grown in Bhutan as shown below.



i. If the cost of printing a label is Nu 0.25 per cm^2, what would be the cost of printing a label to cover the entire lateral face of the container? **[2]**

ii. What is the maximum volume of coffee beans it can hold? **[2]**

c) Punjab National Bank declared 15% dividend rate on its stock this year. Karma owns 150 shares, each with a face value of Nu 100.

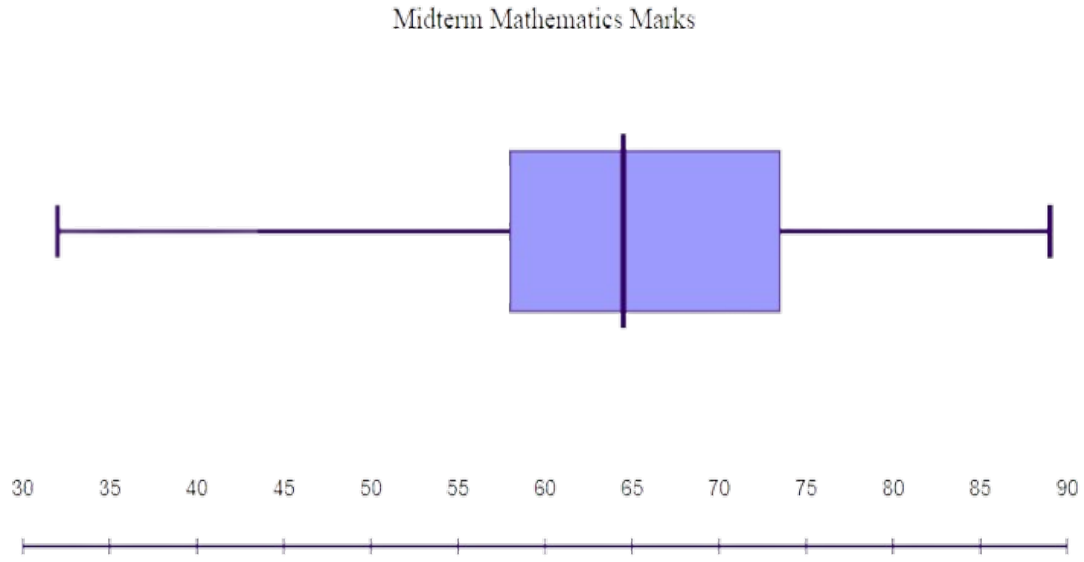
i. What dividend amount did Karma receive? **[1]**

ii. If he had bought the shares at a premium of 25%, what is the yield percentage? **[1]**

iii. Would he have benefited more by investing his money in a saving account that offered 7.25% simple interest? Explain. **[1]**

Question 7

a) The following box and whisker plot shows the Mathematics marks of midterm examination for 20 students.



i. Identify the type of data distribution. **[1]**

ii. What was the median mark? **[1]**

iii. Write down any **TWO** observations from the given box and whisker plot. **[2]**

b) In a test, marks were awarded for the correct answers and deducted for the incorrect answers. Mipham received 40 points by answering 12 questions correctly and 8 questions incorrectly. Neeshar received 60 points by answering 16 questions correctly and 4 questions incorrectly. How many points were deducted for each incorrect answer? **[3]**

c) Find the missing value of

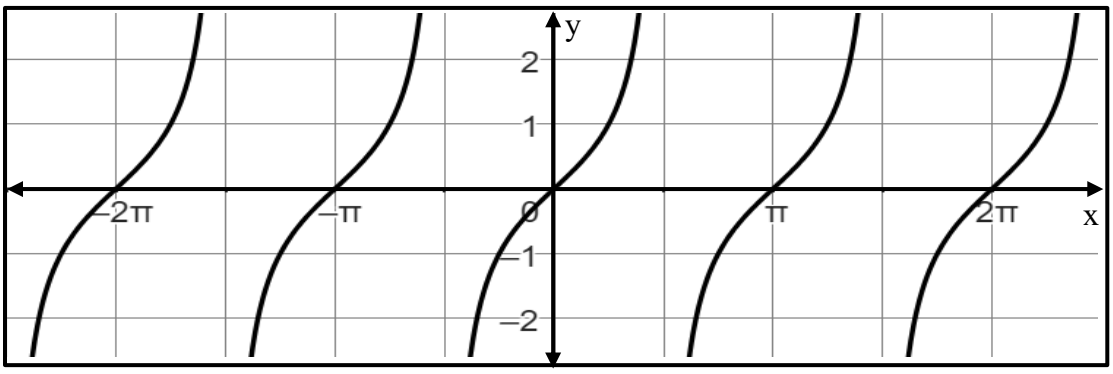
i. $1+\sqrt{2m+3}=6$. **[1.5]**

ii. $\sqrt{36x^a}\times\sqrt{48}=24x^7\sqrt{3x}$. **[1.5]**

Question 8

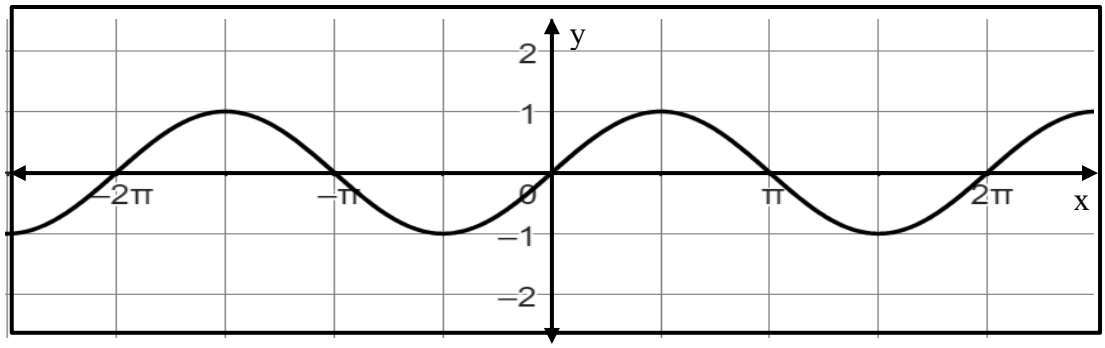
a) Identify the following graphs of trigonometric functions.

i.



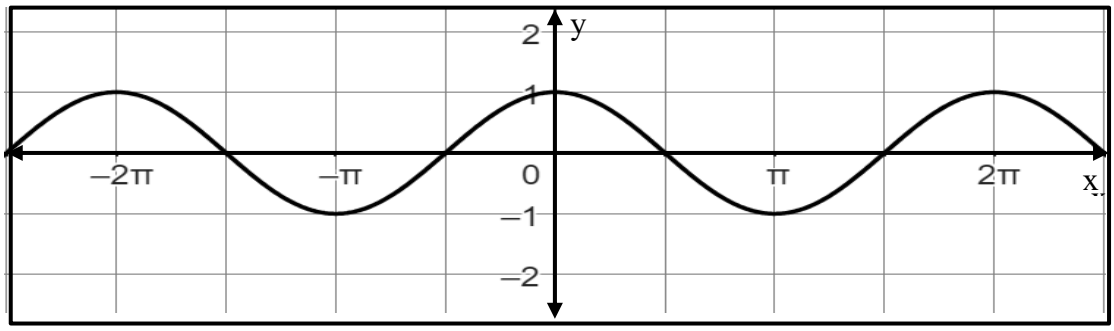
[1]

ii.



[1]

iii.



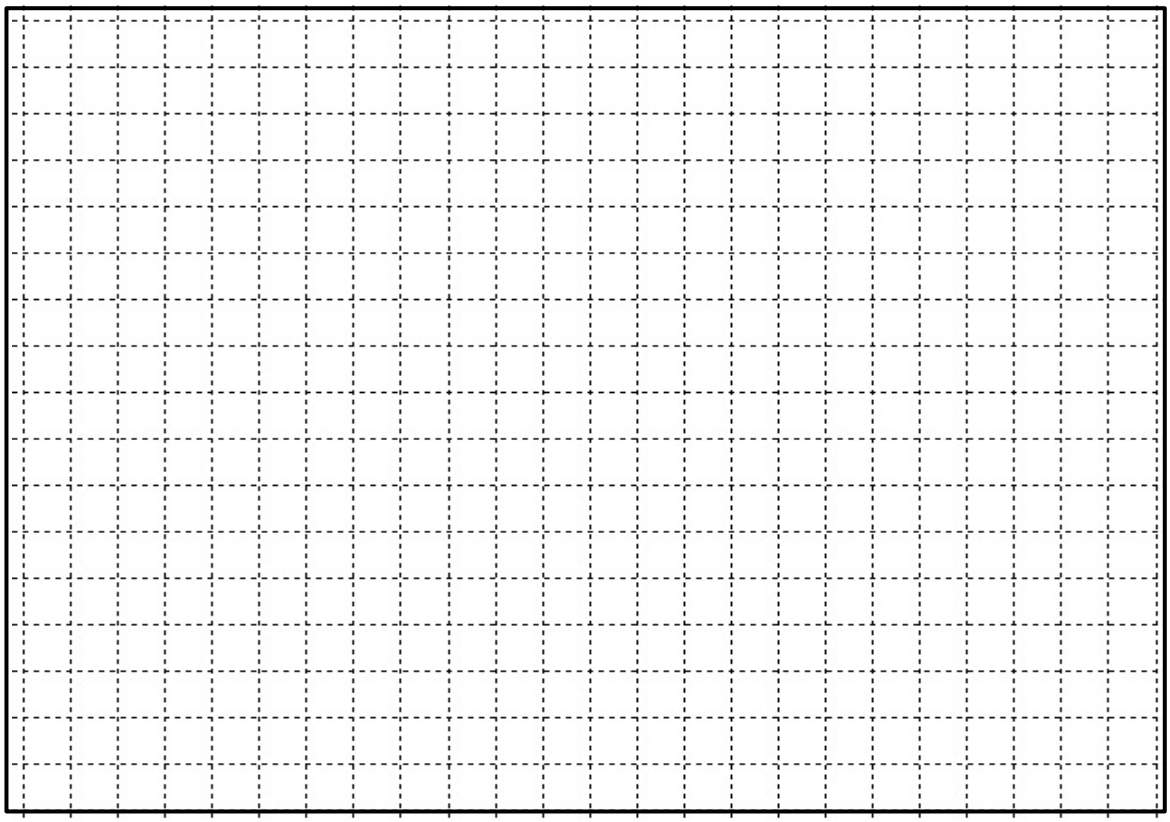
[1]

b) Darshan purchased a gift for his sister and wants to wrap it in a rectangular prism box. The box has a volume of $729\,cm^3$ .What is the least amount of gift wrapper required to wrap the box? **[3]**

c) Tsheten sells 50 cucumber per day at a price of Nu 20 per cucumber. She expects that for every increase in price of cucumber by Nu 1, her daily sale decreases by 1.

i. Create a function that represents her total sale based on the number and price increase of Nu 1. **[1]**

ii. Sketch the graph of function. **[3]**



Question 9

a) Bhutan Development Bank Limited offers a loan with a choice of two rates **[3]**

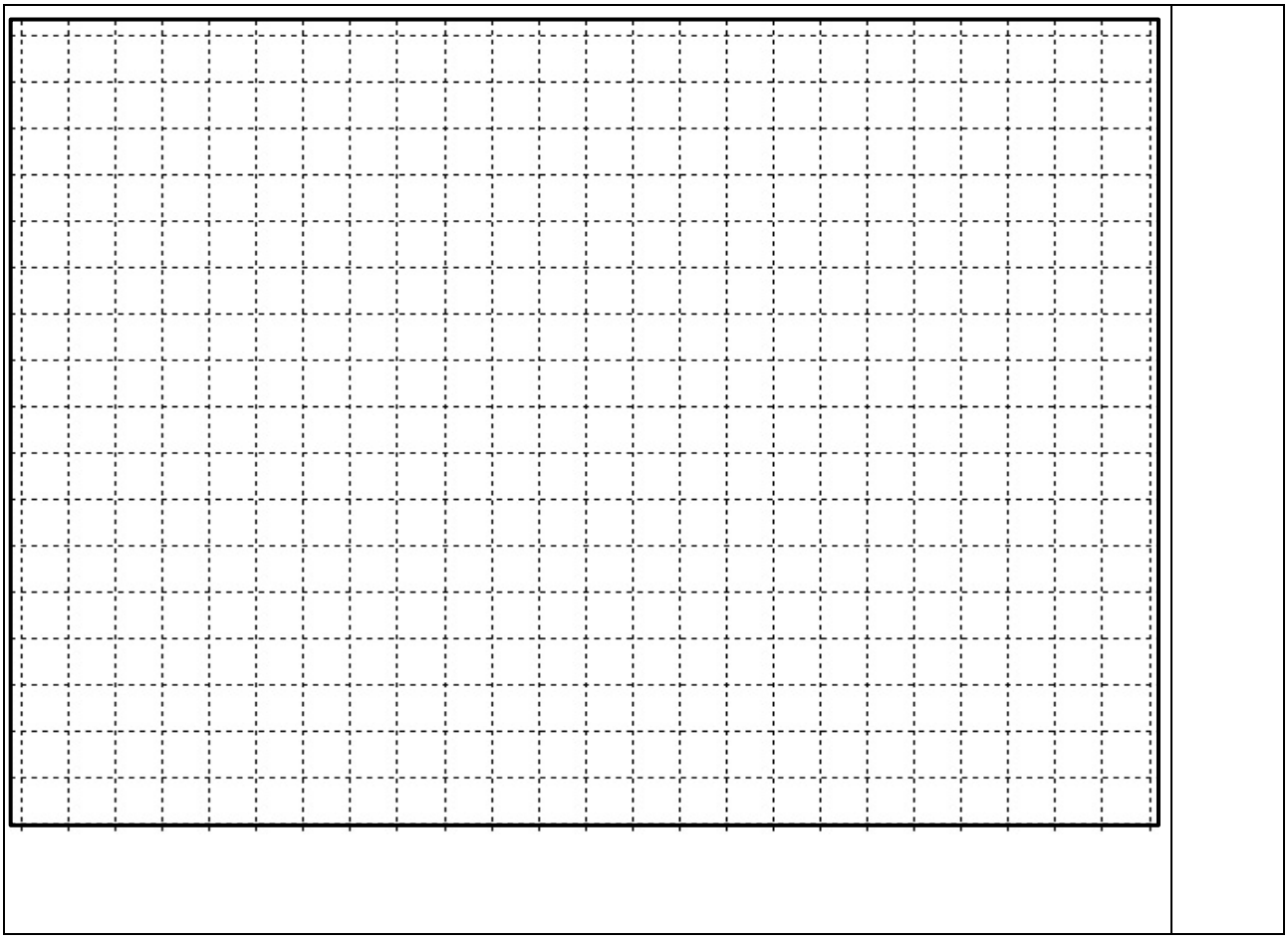
- 14.7% p.a compounded monthly.
- 15% p.a compounded semi annually.

Which rate would you choice? Why?

b) The table below shows the amount of time a group of students spent revising for the end of year exam and the scores they achieved.

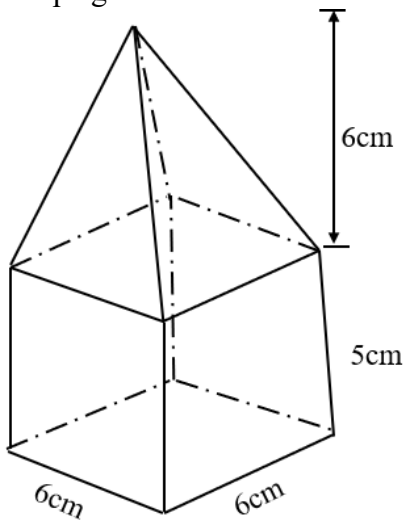
Hours of revision	0	2	5	6	8	10	13	14	15	16	18	25
Exam Score	20	28	23	45	32	63	52	60	58	68	69	80

i. Draw a scatter plot to represent the above information. **[2]**



ii. Describe the relationship between the time spent revising and the score achieved in the exam. **[1]**

c) For the composite shape given below:



Calculate the volume. **[2]**

d) Solve the system of linear equation **[2]**

$2x + 3y = 6$

$4x - y = 5$

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% $= \frac{DA}{OI} \times 100\%$

Strand B : Patterns and Algebra

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

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

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

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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	$V = \pi r^2 h$
sphere	$V = \pi r^3$		

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 $= \frac{\sum fx}{\sum f}$ $Q_1 = L + \frac{i}{f}\left(\frac{n}{4} - c\right)$

$Q_2 = L + \frac{i}{f}\left(\frac{n}{2} - c\right)$ $Q_3 = L + \frac{i}{f}\left(\frac{3n}{4} - c\right)$

Rough Work

Rough Work

Rough Work