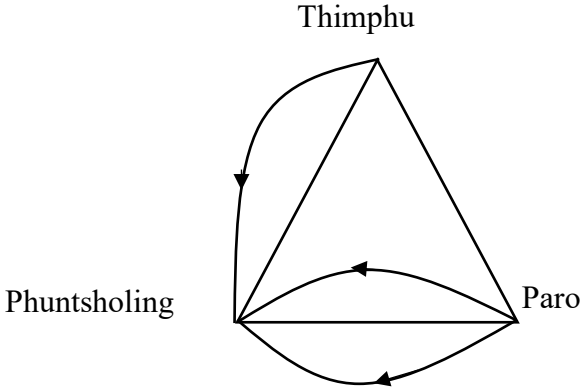
SECTION A [40 MARKS]

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 digraph shows the number of bus services in three stations.



How many bus services are there between Paro to Phuntsholing?

A 2
B 3
C 4
D 5

ii) What is the simplified form of $\sqrt[3]{40}$?

A $10\sqrt[3]{2}$
B $2\sqrt[3]{10}$
C $5\sqrt[3]{2}$
D $2\sqrt[3]{5}$

iii) Yuden wants to invest Nu 5000 in one of her accounts for one year.

Account A: 6.0% p.a. simple interest
Account B: 5.0% p.a. compounded annually
Account C: 3.0% p.a. compounded semiannually
Account D: 2.9% p.a. compounded quarterly

In which account will she earn more money?

A Account A
B Account B
C Account C
D Account D

iv) In a game of dart, Roshan is awarded the following points as shown.

Mode of scoring	Points
Hit target	15
Miss target	−5

After 20 throws, he scored 60 points. How many times did Roshan hit the target?

A 4
B 8
C 12
D 16

v) For the function $f(x)=(2x+3)(4x-2)$, the values of 'p' and 'q' are

A $p=\frac{3}{2} and\ q=-\frac{1}{2}.$
B $p=-\frac{3}{2} and\ q=\frac{1}{2}.$
C $p=3 and\ q=-2.$
D $p=-3 and\ q=2.$

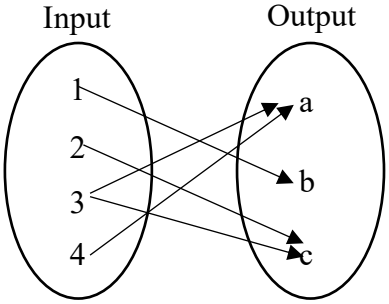
vi) Which pattern best represents the relationship between x and $f(x)$ in the table?

x	***f(x)***
0	5
1	10
2	15
3	20

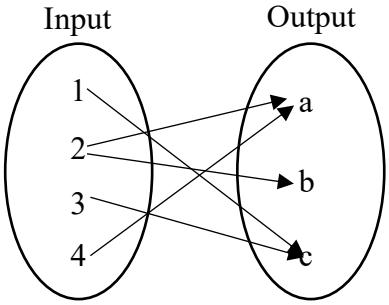
A $f(x)=10x+5$
B $f(x)=10x-5$
C $f(x)=5x+5$
D $f(x)=5x-5$

vii) Which of the following represents a function?

A



B



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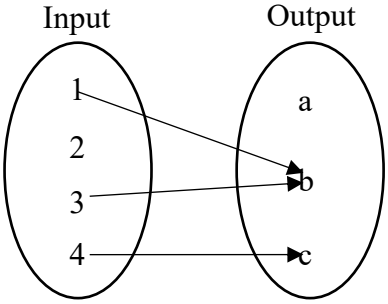
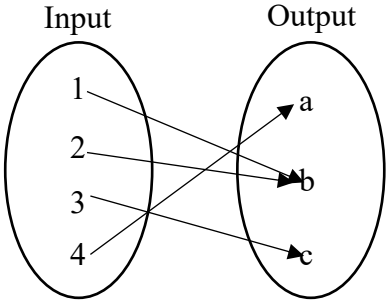


D

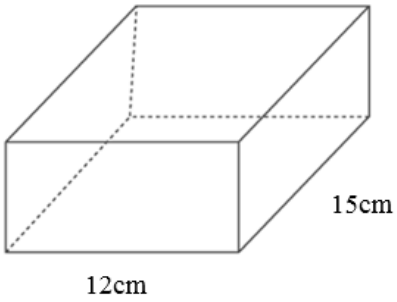


viii) The longer leg of a right angled triangle is 4 cm more than the shorter leg. If the hypotenuse is 20 cm, find the length of the shorter leg.

A 12 cm
B 16 cm
C 20 cm
D 24 cm

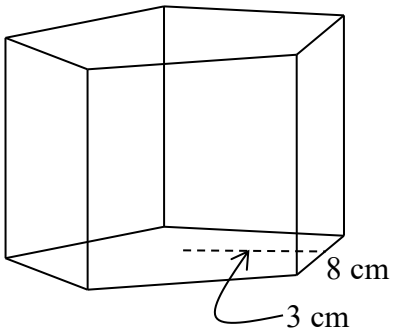
ix) Khamsum made a wooden jewelry box in the shape of a rectangular prism. The jewelry box had the dimensions as given in the figure below. If the surface area of the box is $684\,cm^2$, determine the height of the box.

A 3.0 cm
B 3.8 cm
C 6.0 cm
D 7.6 cm



x) A pentagon based prism with the following dimensions was filled with water to a height of 3 cm. When a stone is immersed, the water level increased to a height of 5 cm. What is the volume of the stone?

A 60 cm^3
B 120 cm^3
C 180 cm^3
D 360 cm^3



xi) Four square based prisms have the capacity of 360 mL each. Which prism with the following base is the most efficient?

A $7\,cm \times 7\,cm$
B $6\,cm \times 6\,cm$
C $5\,cm \times 5\,cm$
D $4\,cm \times 4\,cm$

xii) Which conversion is correct?

A $30° = \frac{\pi}{3} rad$
B $40° = \frac{\pi}{4} rad$
C $60° = \frac{\pi}{6} rad$
D $90° = \frac{\pi}{2} rad$

xiii) If $\sin\theta = \frac{3}{5}$ and θ lies in the first quardant, the value of $\tan\theta + \frac{1}{\cos\theta}$ is

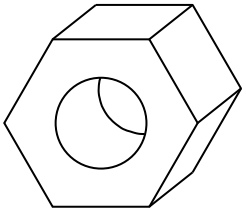
A –3.
B –2.
C 2.
D 3.

xiv) An online delivery company delivers a football packed in a cubical box. If the ball exactly fits in the box, what is the radius of the ball?

A 3.0 cm
B 3.5 cm
C 4.0 cm
D 4.5 cm

$V_{cube} = 343\ cm^3$

xv) Jigme could tighten this nut in three complete rotations. The order of turn symmetry is



A 6.
B 12.
C 18.
D 24.

xvi) Which of the following statement is true?

A The circumcentre of a right triangle will be on the midpoint of the hypotenuse.
B The point of intersection of the medians is called the orthocentre.
C The circumcentre of an obtuse triangle will be inside the triangle.
D The point of intersection of the altitudes is called the centroid.

xvii) The table shows the weekly expenditure of 200 families.

Expenditure (Nu)	Frequency
0 – 1000	28
1000 – 2000	46
2000 – 3000	54
3000 – 4000	42
4000 – 5000	30

What is the median of the weekly expenditure?

A Nu 1478.26
B Nu 2481.48
C Nu 2500.00
D Nu 3523.81

xviii) Which of the following pair of variables are negatively correlated?

A The outside temperature and the cold drink sales.
B The amount of time spent in studying and the exam grades.
C The amount of money you save and your financial security.
D The time elapsed and the distance left to be covered in a marathon.

xix) Anjuli is taking part in two races. The probability of winning the first race is 0.2. The probability of winning the second race, if she has already won the first race is 0.6. Calculate the probability of Anjuli winning both the races.

A 0.12
B 0.40
C 0.80
D 3.00

xx) Which of the following pair of events are independent?

A Event A: Rolling a die and getting a 3
Event B: Getting a total of 4 or more for both rolls
B Event A: Rolling an odd number in the first roll of a die
Event B: Rolling a second time and getting a difference of 1 for both rolls
C Event A: Rolling a 3 or 4 on the first roll of a die
Event B: Rolling a number less than 5 on the second roll
D Event A: Rolling an even number in the first roll of a die
Event B: Rolling a number such that the product of the first and second rolls are greater than 4

SECTION B [60 MARKS]
ATTEMPT ANY SIX QUESTIONS
[Under this section, there are 8 questions (Question 2 – 9)]

Question 2

a) Given $K = 2^9 \times 3^6 \times 5^y$. What values of *'y'* if any, would make *'K'* a perfect cube? Explain. **[2]**

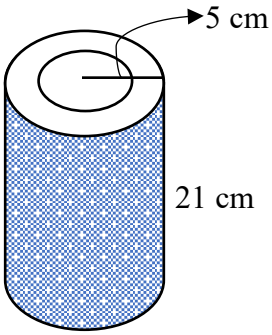
b) Palden bought some pens and pencils for a total sum of Nu 600. A pen costs Nu 75 and a pencil costs Nu 15.

i. Write an equation to model the situation. **[1]**

ii. Write a function to calculate the number of pens if you know the number of pencils he bought. **[1]**

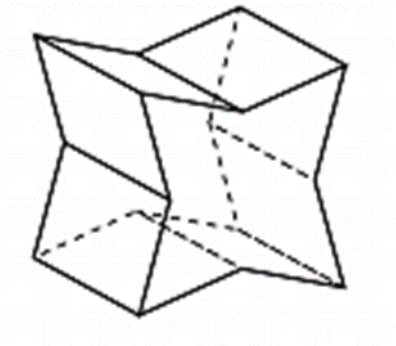
iii. Use the function to calculate the number of pens if Palden bought 10 pencils. **[1]**

c) This cylindrical tube has 20 rounds of wrapping paper. **[3]**



Kuenga can wrap 8 cubical boxes of the same dimension using all the wrapping papers. What could be the dimension of the cubical box? (Use $\pi = \frac{22}{7}$)

d) Describe the turn symmetry of the 3D shape. **[2]**



Question 3

a) In a high school, the boys and girls basketball teams had their heights measured. The following data was recorded for their heights (in cm).

Girls			
165	155	170	154
164	155	145	160
157	171	162	168

Boys			
177	165	170	172
180	162	165	172
167	160	179	176

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

ii. Make a conclusion based on the graph. **[1]**

b) The perimeter of a rectangular swimming pool is 160 m. Its length is 2 m more than twice its width. What are the length and width? **[3]**

c) Draw ΔXYZ: $XY = 6.9$ cm, $YZ = 8.3$ cm and $\angle Y = 65°$, and locate the centroid of the triangle. **[4]**

Question 4

a) The length of a rectangular garden is 4 m more than its width. The area of the garden is 60 m^2. Determine the dimensions of the rectangle. **[4]**

b) The table shows the data of three teams in 2023 season of BoB Bhutan Premier League. A win is worth 3 points, a draw is worth 1 point and a loss means no points.

Team	Win	Draw	Loss
Paro FC	14	3	1
Druk Lhayul FC	10	3	5
Gelephu FC	2	1	15

i. Create a matrix for the above situation. **[1]**

ii. Use matrix multiplication to calculate the points secured by each team. **[2]**

c) Prove that $\tan A + \cot A = \dfrac{1}{\sin A \cos A}$. **[3]**

Question 5

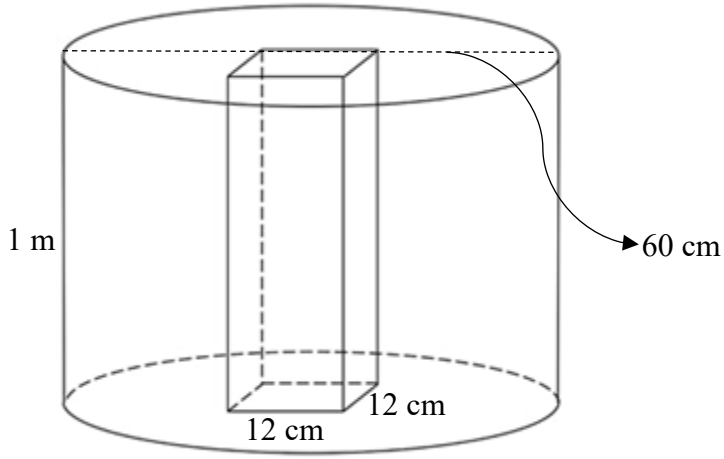
a) Sonam purchased 300 shares with a face value of Nu 200 each from the market at Nu 225 per share. A dividend rate of 24% is declared at the end of the year. Calculate:

i. rate of premium [**1**]

ii. dividend amount **[1]**

iii. yield percentage **[2]**

b) A cylindrical container is fitted with a heating element. The dimensions of the container and heating element are as given. **[3]**



How much water can the container hold?

c) In a class, 17 students play cricket, 12 students play football, 5 students play both the games and 2 students play neither. A student is randomly selected. What is the probability that the student plays

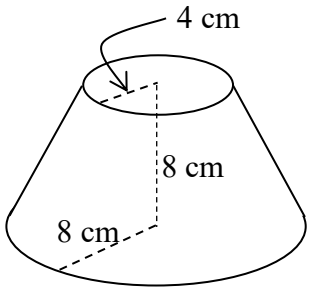
i. only cricket? **[1]**

ii. only football? **[1]**

iii. cricket and football? **[1]**

Question 6

a) A pastry bag is a tool used to decorate cakes and cupcakes. It takes the form of a truncated cone. What is the volume of this pastry bag? **[4]**

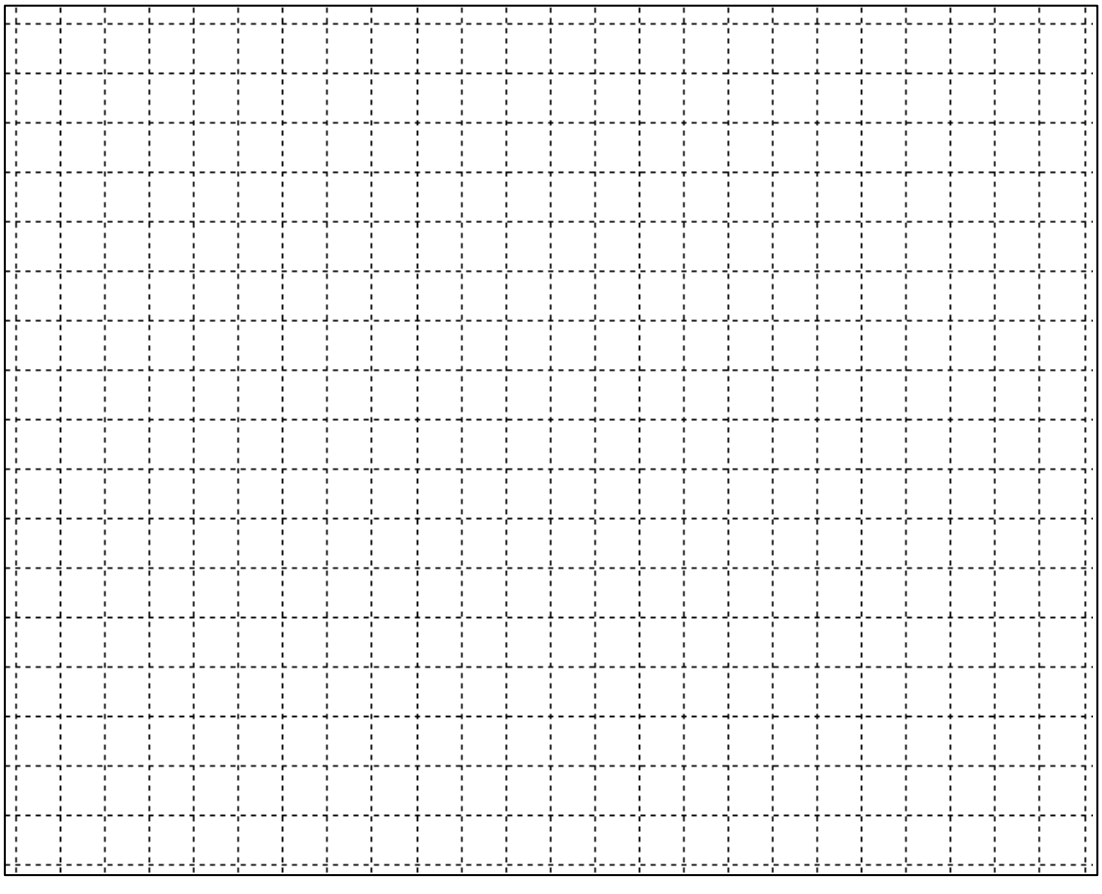


b) Determine the point of intersection of the lines $\frac{3}{4}x-\frac{2}{3}y=3$ and $\frac{1}{2}x-\frac{1}{2}y=3$. **[3]**

c) This table shows the age of a sample of people and how many hours each person engages in physical activity each week.

Age	Hours of Activity
20	15
22	11
30	6
30	7
34	6
26	14
26	8
18	16
36	3
40	3

i. Create a scatter plot of the data. **[2]**



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

Question 7

a) Simplify $\frac{\sqrt{5x^3} \times \sqrt{9x^4}}{\sqrt{80x}}$. **[2]**

b) Write the mapping notation for the following functions.

i. $f(x) = 2x^2 - 0.5$ **[1]**

ii. $f(x) = -3(x+1)^2 - 4$ **[1]**

iii. $f(x) = (x-3)^2 + 6$ **[1]**

c) The data represents points scored by Bikram in ten basketball matches. **[2]**

17, 11, 9, 11, 14, 22, 20, 18, 20, 19

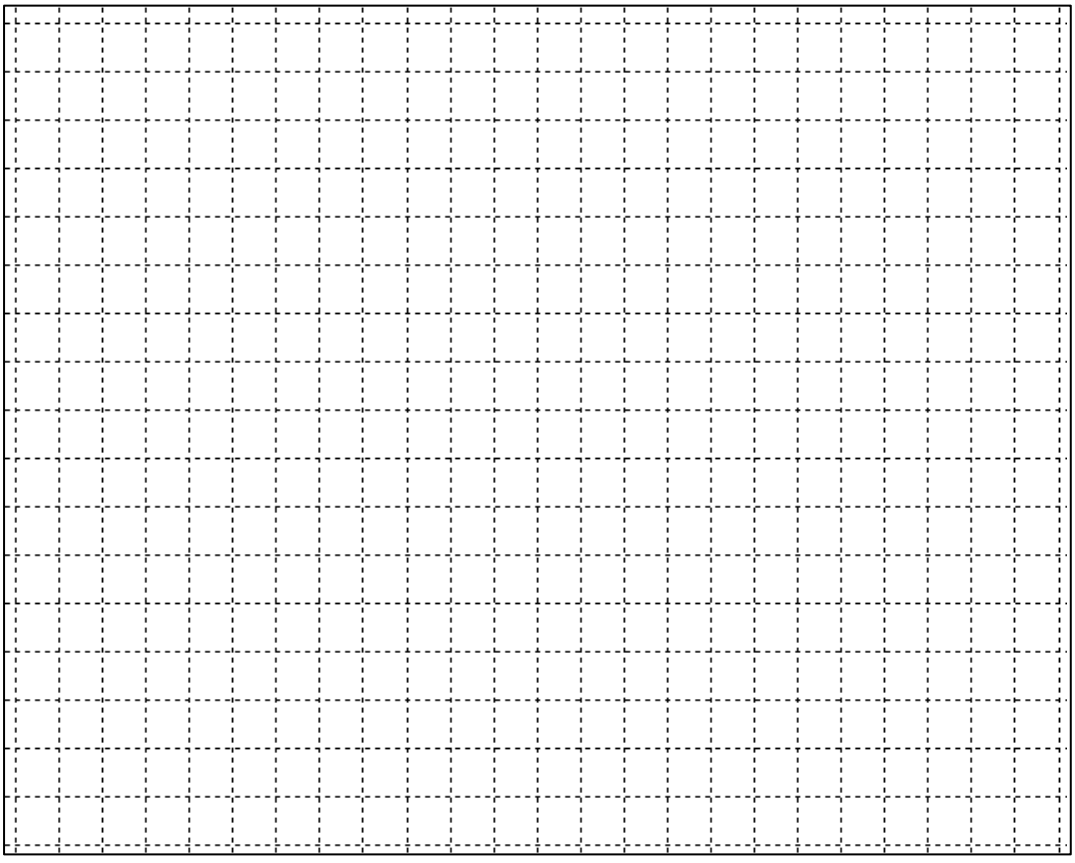
Calculate 5 number summary of the data.

d) If $\cot A = \frac{13}{5}$, calculate five other t-ratios. **[3]**

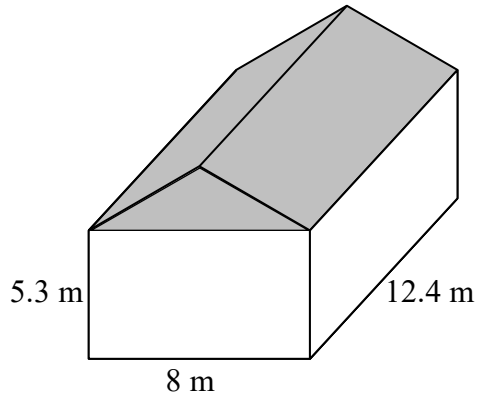
Question 8

a) Sangla invested Nu 25,000 in an account. After three years, the amount of money has grown by Nu 4,450. What was the rate of interest compounded monthly? **[2]**

b) Sketch the graph of the function $f(x) = -2(x+1)(x-2)$. **[3]**

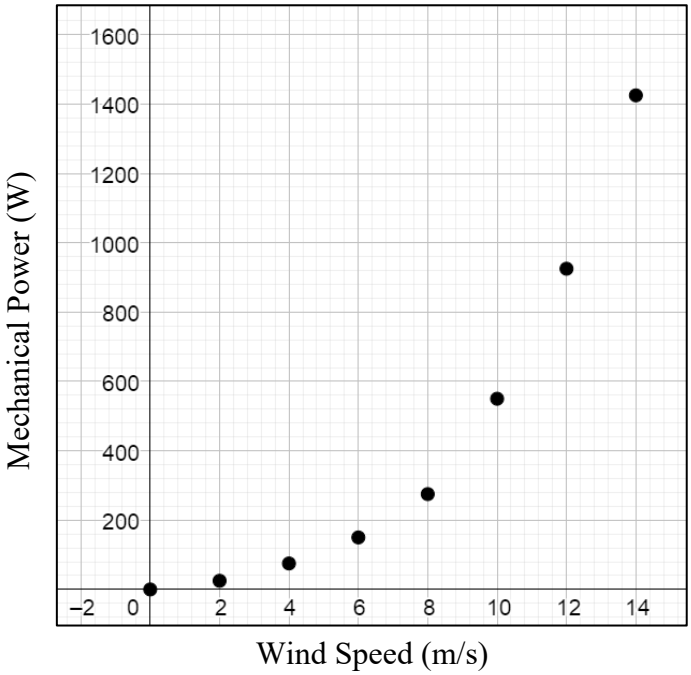


c) Tashi is asked to paint the exterior walls of a structure with the following dimensions. **[3]**



If he is offered Nu 55 per m^2, determine the amount he will be paid for painting the walls.

d) The graph shows the relation between wind speed and the mechanical power in a power station.



i. Identify the independent and dependent variables. **[1]**

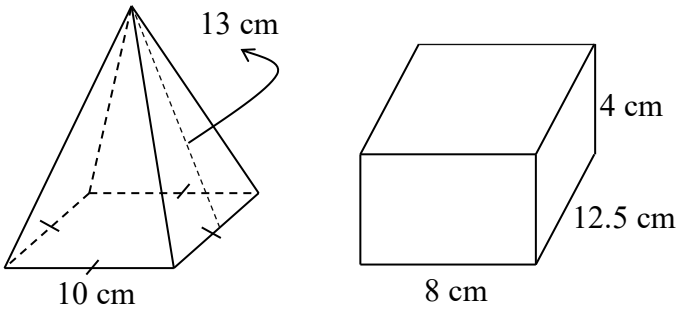
ii. What kind of relationship is it? **[1]**

Question 9

a) Find the values of 'a' and 'b'. **[2]**

$$\begin{bmatrix} a & 2 \\ -3 & 4 \end{bmatrix} + \begin{bmatrix} -4 & 3 \\ 2 & -1 \end{bmatrix} - \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix} = \begin{bmatrix} -5 & 4 \\ b & 0 \end{bmatrix}$$

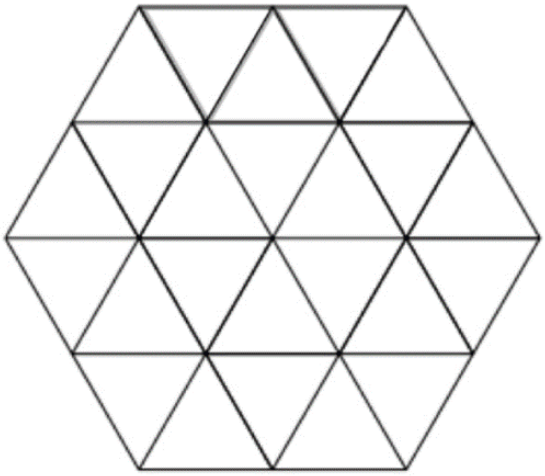
b) Two regular based 3D shapes have a volume of 400 cm^3 each.



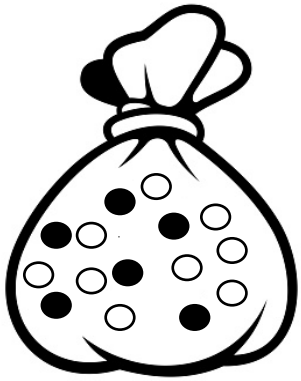
i. Calculate the surface area of each shape. **[3]**

ii. Which 3D shape is more efficient? Why? **[1]**

c) Shade six triangles to make a pattern with order of turn symmetry 6. **[2]**



d) From a bag of counters, a counter is drawn but not replaced, then a second counter is drawn. What is the probability of drawing a black counter, than a white counter? **[2]**



FORMULAE

Strand A : Numbers and Operations

$\text{Discount\%} = \dfrac{\text{discount}}{\text{MP}} \times 100\%$ $\quad$ $\text{Discount} = MP - SP$

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

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

$\text{DA} = fv \times r \times n$ $\quad$ $\text{Yield\%} = \dfrac{DA}{OI} \times 100\%$

Strand B : Patterns and Algebra

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

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

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

Strand C : Measurement

Volume:

$\text{V}_{\text{rectangular prism}} = \text{lwh}$ $\quad$ $\text{V}_{\text{cube}} = \text{e}^3$

$\text{V}_{\text{any prism}} = \text{Ah}$ $\quad$ $\text{V}_{\text{pyramid}} = \dfrac{\text{Ah}}{3}$

$\text{V}_{\text{cylinder}} = \pi \text{r}^2\text{h}$ $\quad$ $\text{V}_{\text{cone}} = \dfrac{\pi \text{r}^2\text{h}}{3}$

$\text{V}_{\text{sphere}} = \dfrac{4}{3}\pi \text{r}^3$

Surface Area:

$\text{SA}_{\text{rectangular prism}} = 2(\text{lw} + \text{wh} + \text{lh})$ $\quad$ $\text{SA}_{\text{cube}} = 6\text{s}^2$

$\text{SA}_{\text{any prism}} = 2\text{A} + \text{hP}$ $\quad$ $\text{SA}_{\text{pyramid}} = \text{A} + \text{Area of lateral faces}$

$\text{SA}_{\text{cylinder}} = 2\pi \text{r}^2 + 2\pi \text{rh}$ $\quad$ $\text{SA}_{\text{cone}} = \pi \text{r}^2 + \pi \text{rs}$

$\text{SA}_{\text{sphere}} = 4\pi \text{r}^2$

Strand E : Data management and probability

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

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

Rough Work

Rough Work

Rough Work