1. Let \( R \) be a relation defined as \( R = \{ (x,y) : x \text{ and } y \text{ study in the same class} \} \). Show that \( R \) is an equivalence relation.

If \( x \) is a brilliant student and \( y \) is a slow learner and \( x \) helps \( y \) in his studies, what quality does \( x \) possess?

*Expected answers:*
- Concern about fellow students
- Helping others
- Sharing of knowledge
- Empathy

2. Consider the functions \( f \) and \( g \):
   
   \[ f : \{1, 2, 3\} \rightarrow \{a, b, c\} \]
   
   \[ g : \{a, b, c\} \rightarrow \{\text{punctuality, honesty, sincerity}\} \]
   
   defined as \( f(1) = a, f(2) = b, f(3) = c \),

   \[ g(a) = \text{punctuality}, \ g(b) = \text{honesty}, \ g(c) = \text{sincerity} \]. Show that \( f, g, \) and \( g\circ f \) are invertible. If \( a, b, c \) are three students who are awarded prizes for the three values given in the function \( g \), which value would you prefer to be rewarded and why?

*Expected answers: An answer with any of the three values with proper reasoning is correct.*

3. Show that the function \( f :\mathbb{R}_+ \rightarrow \mathbb{R}_+ \) defined by \( f(x) = 3x + 4 \) is an invertible function.

If \( x \) represents the number of systematic hours of study that a student puts in and \( f(x) \) represents the marks scored by him, from the graph of the above function, which value will be rewarded?

*Expected answers:*
• Systematic study
• Quality of hard work
• Study habit
• Time management

4. Let $L$ be the set of all the lines in a plane and $R$ be the relation in $L$ defined by

$$R = \{(L_1, L_2) : L_1 \parallel L_2\}.$$ 

Show that $R$ is an equivalence relation.

$L_1$ represents the ideologies of Gandhiji and $L_2$ represents the ideologies of Netaji Subhash Chandra Bose. Even though their ideologies ran on parallel tracks, both had the common goal to achieve independence for India. Which common value did they both exhibit?

*Expected answer:*

• Patriotism
• Sacrifice
• Pride in our country
• Leadership

5. Let $X$ be a non-empty set. Let $\ast$ be a binary operation on the power set $P(X)$ defined by $A \ast B = A \cup B$. Prove that $\ast$ is commutative and associative. What is the identity element for the operation $\ast$?

If $X$ is a set of people in a locality, $A$ is a set of children and $B$ is a set of citizens aged above 75 years in the same locality, is $\ast$ a binary operation for these sets as defined above?

What qualities would you suggest that elements of $A$ should have towards elements of $B$?

*Expected answer:*

• Respect for elders
• Concern for the aged
• Lending a helping hand

6. Consider a relation \( R \) in the set \( A \) of people in a colony. Defined as \( aRb \iff a \text{ and } b \text{ are members of joint family.} \) Is \( R \) is an equivalence relation?

VBQ: Staying with Grandparents in a joint family imbibes the moral values in us. Can you elicit 2 such values.

(a) Love and concern for grandparents
(b) Respect for Group parents
(c) Tolerance

MATRICES AND DETERMINANTS

1. Assume a hypothetical situation that to promote “Save Environment” awareness a university gives scholarships for those students who take any of the below subjects as an additional subject in first year, second year, third year of graduation. From the table given below form a set of simultaneous equation and check the consistency. Which subject has to be promoted the most and why?

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Subject</th>
<th>No. of students in A</th>
<th>No. of students in B</th>
<th>No of students in C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Industrial waste</td>
<td>1</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>2.</td>
<td>Organic waste</td>
<td>1</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>3.</td>
<td>e-waste</td>
<td>1</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Amount received</td>
<td>5,000</td>
<td>7,000</td>
<td>35,800</td>
</tr>
</tbody>
</table>

EXPECTED VALUES:

1. Sense of belonging
2. Pollution control
3. About harmful radiation
4. Simple living without electronic gadgets
2. In a legislative assembly election, a political group hired a public relations firm to promote its candidate in 3 ways namely Posters, Pamphlets, Public addressing system. The cost per contract

\[
A = \begin{bmatrix}
40 & \text{posters} \\
100 & \text{pamphlets} \\
50 & \text{public addressing system}
\end{bmatrix}
\]

Number of contracts of each type made by a city X is given as

\[
B = (100 \quad 500 \quad 5000)
\]

Find the amount spent by the city on these ways. Is it a good practice to campaign in such a manner? Suggest an alternative to the above for campaigning.

EXPECTED ALTERNATIVES:

1. Advertise using mass media
2. Through sms

3. There are 2 families A & B. There are 4 men, 6 women and 2 children in family A, 2 men, 2 women and 4 children in family B. The recommended daily allowance for calories is 2400 for men, 1900 for women, 1800 for children and 45gms of proteins for men, 55gms for women and 33gms for children. Represent the above information using matrices. Using matrix multiplication, calculate the total requirement of calories and proteins for each of the 2 families. What awareness can you create among people about the balanced diet?

EXPECTED VALUES:

1. Vegetarianism will help us to control many ailments
2. Should not skip break fast
3. Aerated drinks should be totally avoided
4. Over eating/ eating while watching T.V should be avoided

4. Gaurav donates 3 pens, 2 bags and 1 instrument box worth Rs.41, Dheeraj donates 2 pens, 1 bag and 2 instrument boxes worth Rs29, while Ankur donates 2 pens, 2 bags and instrument boxes to a rural school. Translate the problem into a system of linear equations. Solve
& find the cost of each item. By the act of these three people what values do you learn?

EXPECTED VALUES:

1. Sharing
2. Bring happiness to everybody
3. Bridge the gap between the rich and poor
4. Following the motto “giving more than what we take from the society”

5. There are 3 families. Family A consists of 2 men, 3 women and 1 child. Family B has 2 men 1 woman and 3 children. Family C has 4 men, 2 women and 6 Children. Daily expenses of men, women and children are 200, 155 and 200 respectively. Only men and women earn and children do not. Using matrix multiplication calculate the daily expenses of each family. What impact does having more children in the family create on the society? Comment.

EXPECTED VALUES:

1. Can’t give better standard of living
2. Cannot educate them
3. Good food, clothes and shelter cannot be given by the government
4. Poverty increases

6. The cost of 4 chocolates, 3 samosas and 2 apples is Rs.60 and that of 2 chocolates, 4 samosas, and 6 apples is Rs.90. The cost of 6 chocolates, 2 samosas, 3 apples is Rs.70. Find the cost of each item by matrix method. What do you think is the healthiest diet? Suggest an item that could replace chocolates and samosas to make the diet healthier?

EXPECTED VALUES:

1. fruits
2. sprouts
3. salads
4. fresh juices
7. Last year 1 packet of tea and 3 packets of sugar together cost Rs. 96. This year, the rate of tea increased by 15% and that of sugar by 10%. So, the same amounts of tea and sugar now cost Rs. 108.60. Find the rates of sugar and tea per packet last year and this year using matrix method. What do you think is the impact of inflation on family expenses?

EXPECTED VALUES:

1. People in the family has to be educated
2. They should be made skilled laborers
3. Government should take suitable steps to reduce the inflation
4. The benefits of the government schemes should reach the poor people correctly

8. To promote “Compulsory Education” awareness an NGO awards those who take any of the following subjects as additional subjects. From the table given below, form a set of simultaneous equations and solve using matrix method to find the amount given exactly to each subject. Which subject has to be promoted the most and why?

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Subject</th>
<th>No. of students in A</th>
<th>No. of students in B</th>
<th>No of students in C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Compulsory education</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>Adult literacy</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Amount received</td>
<td>6,000</td>
<td>7,000</td>
<td>12,000</td>
</tr>
</tbody>
</table>

EXPECTED VALUES:

1. Compulsory education upto 14 years
2. Education alone can create a positive impact on the society
3. Young Indian future leaders should not become child laborers
4. Education for all should be motto
5. Education alone can make country more stronger and a super power

9. A part of the monthly expenses of a family is constant while the remaining varies with the price of rice, fuel etc., When the price of rice
is Rs 25/Kg the monthly expenses of the family is Rs.1000. when it is Rs 24/Kg the monthly expenses is Rs 980. Find the total monthly expenses of the family when the cost of rice is Rs 35/Kg. Is this family below poverty line? Give some suggestions to improve their standard of living.

EXPECTED VALUES:

1. Government should take suitable steps to reduce the inflation
2. The benefits of the government schemes should reach the poor people correctly
3. Price of essential commodities should be reduced.
4. The corruption menace has to be curbed.

Continuity and differentiability

1. The path of a moving bike is given by \( x = \begin{cases} 2x - 1 & \text{if } x < 0 \\ 2x + 1 & \text{if } x \geq 0 \end{cases} \). Find the dangerous point on the path. Whether the rider should pass that point or not ?. Justify your answers.
2. The edge of a cubical gold is measured as 8 cm with an error of 0.03 cm. Find the approximate error in its volume. What is the loss to the buyer of the gold if the cost of 1 cubic cm of gold is Rs. 3000. What lesson do you get?
3. The bottom of a rectangular fish tank is 30 cm X 15 cm. Water is pumped into the tank either by man-made pump at the rate of 50 cubic cm/minute or by motor pump at the rate of 75 cubic cm/minute. Find the rate at which the level of the water in the tank is rising when water is pumped by motor pump. Which pump would you prefer and why?
4. A jet of an enemy is flying along the curve \( y = x^2 + 7 \). A solider is placed at the point (3,7). Find the nearest distance between the solider and the jet. The soldier is refused to fire the jet when it is nearest to him? Is this act of the solider justifiable. Discuss.
5. Find the volume of the largest cylinder that can be scooped out from a given wooden solid cone. Give a valued method of using the left out wood and justify?
1. A parking lot in an IT company as an area bounded by the curve $y = 4 - x^2$ and the lines $y = 0$ and $y = 3$. The line $y = 3$ divides the area into two parts out of which the greater area is allotted for car owners who practice car pooling. Find this area using integration.

VBQ : Write any two benefits of carpooling.

Ans : (a) Fuel saving (b) less pollution (c) space management

2. VBQ : Integrity is an integral part of a student’s life. Elucidate. Similarly find the value of the integral $\int_{-2}^{2} (2x + 7) \, dx$.

Ans : Honesty, goodness, discipline

3. A construction company is constructing a gated community in a plot of 10 grounds. When he decides to allocate sufficient space for a park and gym in an area given by $\int_{a}^{3a+4} 3x \, dx$. Find ‘a’ using $\int_{0}^{a} \sqrt{x} \, dx = 2a \int_{0}^{\pi/2} \sin^3 x \, dx$.

VBQ : Highlight the values reflected by the gesture of the company.

Ans : (a) Social responsibility (b) Environmental friendly (c) less pollution.
4. Evaluate using limit as a sum:
\[ \int_{1}^{3} (2x^2 + 5x + 1) \, dx \]

**VBQ:** Mention two suitable situations in your everyday life (be it food, travel, matters, media, etc.) where limiting yourself will help you evolve as a better human being.

5. Using integration find the area of the bounded region
\[ y = 1 + |x + 1|; \quad x = -3, \quad x = 3 \quad \text{and} \quad y = 0. \]

**VBQ:** The required area is divided into two regions and the students are asked to put a poster on “Child Labour” and “Education for all” in those two. Which theme according to you deserves a bigger space? Justify.

6. Integrate \( e^x \sin 2x \) with respect to \( x \).

What values are integrated and instilled in children with the singing of the National Anthem?

**Value Points:** Patriotism, Brotherhood, Unity, Pride, Sense of belonging

7. Find the area of the region enclosed by the curve \( y = x^2 \), and the lines \( x = 0, y = 1 \) and \( y = 4 \).

A farmer plans to construct an electrical fence around this bounded region to protect his crop. But his son rejects this idea and wants a wooden fence to be erected. Who would you favour? Mention two values demonstrated by the son.

**Value Points:** concern for animals, kind hearted, not being cruel, bold, decision making

8. Draw the graph and evaluate the integral \( \int_{1}^{3} |x - 3| \, dx \).

What geometric property does the shaded region exhibit about the line \( x = 3 \). Write any two values you in real life that you can correlate with this property.

**Geometric property:** Symmetry

**Value Points:** Equality, Sharing, No favouritism, Caring, helping
9. Prove \[ \int_{a}^{\alpha} f(x)dx = \int_{a}^{\alpha} f(a-x)dx \]

Hence evaluate \[ \int_{\theta}^{10} \sqrt{10-x}dx \]

If the variable x denotes a measure of honesty, suggest a value for the upper limit ‘a’ that you would like to have. Why?

Value points: Infinity, to be honest and not tread the wrong path.

10. Evaluate as the limit of a sum:

\[ \lim_{n \to \infty} \sum_{i=1}^{n} \left(2x^2 + 3x + 1\right) \]

Mr. X. crossed the limit while speaking at a public function by using abusive language. What values should one possess while speaking in a public forum. Mention any two.

Value Points: Self-control, Sensitivity to others feelings, Humility, Decency, Dignity and decorum

**Differential Equations:**

1) Form the differential equation of the family of circles touching y axis at origin.

What are the values conveyed by the family of circles formed?

Ans: \[ y^2 - x^2 - 2x \frac{dy}{dx} = 0 \]. Bond, integrity, inter relationship, understanding.

2. The temperature T of a cooling object drops at a rate which is proportional to the difference T-S, where S is the constant temperature of the surrounding medium. Thus \[ \frac{dT}{dt} = -k (T - S) \], where \( k > 0 \) is a constant and \( t \) is the time. Solve the differential equation if it is given that \( T(0) = 150 \).

What are the demerits of global warming?

Ans: \[ T-S/150-S = e^{-kt} \]. Abnormal weather conditions, frequent occurrence of tremors, earthquakes and tsunami.
3. Form the differential equation of the family of parabolas having vertex at the origin and axis along positive y-axis. Mosquito bite is the origin for 'Dengue'. Suggest two methods to curb the breeding of mosquitoes.
   Ans: \(xy^{1.5} - 2y = 0\). To avoid stagnation of water.
   To keep the environment hygienic.

4. Show that the given differential equation is homogeneous and solve it.
   \[x^2 \, dy + y \, (x+y) \, dx = 0.\]
   Which is advantageous to life homogeneity or heterogeneity? Justify your answer.
   Ans: \(y + 2x = 3x^2y.\)
   Homogeneity: equal rights, uniformity, oneness.
   Heterogeneity: independently thinking and acting individuals who work for the society.
   Unity in diversity.

5. Solve the differential equation
   \[x \, (x^2 - 1) \, \frac{dy}{dx} = 1 + y = 0 \text{ when } x = 2\]
   If `y` is distance and x is the time. \(dy/dx\) is velocity.
   Ravi rides a vehicle beyond the limit in a highway. What suggestions would you give him to help him understand the risks of overspeeding?
   Ans: \(y = \frac{1}{2} \log \left[\frac{x^2 - 1}{x^2} + \frac{1}{2} \log \frac{3}{4}\right].\)
   Ravi would be told about the road safety and traffic regulations. Also should be made understand that `speed thrills but kills`.
THREE DIMENSIONAL GEOMETRY

1. Two groups of students representing ‘SAVE MOTHER EARTH’ and ‘GO GREEN’ are standing on two planes represented by the equations \( \vec{r}.(\hat{i} + \hat{j} + 2\hat{k}) = 5 \) and \( \vec{r}.(2\hat{i} - \hat{j} + \hat{k}) = 8 \). What is the angle between the 2 planes? Name few activities which should be taken up to save mother earth.

EXPECTED ANSWER:
We should be concerned about not wasting natural resources, having development in a planned manner.

2. Find the coordinates of the foot of the perpendicular drawn from the point A(1,8,4) to the line joining the points B(0,-1,3) and C(2,-3,1). Represent foot of the perpendicular with one life skill.

EXPECTED VALUES:
I. Honesty
II. Punctuality
III. Integrity
IV. Unity

3. Find the image of the point (1,2,3) in the plane \( x+2y+4z=38 \). Represent the image of the point with one life skill.

EXPECTED VALUES:
I. Truthfulness
II. Honesty

4. Three hoardings are displayed at the points A,B and C displaying A(Do not litter), B(Keep your place clean) and C(Go green). If these 3 points form a triangle ABC, find the area of the triangle ABC using method of vectors if points A,B and C are (0,2,1),(4,8,2) and (8,4,3) respectively. Give your views in two lines about “GO GREEN”.

EXPECTED VALUES:
I. Plant more trees
II. stop deforestation
5. If \( \vec{a}, \vec{b}, \vec{c} \) are position vectors of vertices A, B, C of a triangle ABC, show that the area of the triangle is \( \frac{1}{2} |\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}| \). A student takes honesty, truthfulness and complacency as the three sides of the triangle. Which side of the triangle do we prefer to take? Give your suggestion.

EXPECTED ANSWER:
I. Honesty
II. Truthfulness

6. Let A and B be two points whose position vectors are \( 3\hat{i} - 4\hat{j} + 8\hat{k} \) and \( 4\hat{i} - 7\hat{j} + 4\hat{k} \) respectively. Find \( \overrightarrow{AB} \) and \( \overrightarrow{BA} \).

If point A represents a person who is regular and systematic and B represents a lazy person, which vector \( \overrightarrow{AB} \) or \( \overrightarrow{BA} \) would you choose for your success?

EXPECTED ANSWER:
\( \overrightarrow{BA} \) = systematic – laziness = success.

7. Two groups of students representing ‘SAVE MOTHER EARTH’ and ‘GO GREEN’ are standing on two planes represented by the equations \( \vec{r} \cdot (\hat{i} + \hat{j} + 2\hat{k}) = 5 \) and \( \vec{r} \cdot (2\hat{i} - \hat{j} + \hat{k}) = 8 \). What is the angle between the 2 planes? Name few activities which should be taken up to save mother earth.

EXPECTED ANSWER:
We should be concerned about not wasting natural resources, having development in a planned manner.

8. Find the coordinates of the foot of the perpendicular drawn from the point A(1,8,4) to the line joining the points B(0,-1,3) and C(2,-3,1). Represent foot of the perpendicular with one life skill.

EXPECTED VALUES:
V. Honesty
VI. Punctuality
VII. Integrity  
VIII. Unity  

9. Find the image of the point (1,2,3) in the plane x+2y+4z=38. Represent the image of the point with one life skill.

EXPECTED VALUES:  
III. Truthfulness  
IV. Honesty  

10. Three hoardings are displayed at the points A,B and C displaying A(Do not litter), B(Keep your place clean) and C(Go green). If these 3 points form a triangle ABC, find the area of the triangle ABC using method of vectors if points A,B and C are (0,2,1), (4,8,2) and (8,4,3) respectively. Give your views in two lines about “GO GREEN”.

EXPECTED VALUES:  
III. Plant more trees  
IV. Stop deforestation  

11. If $\mathbf{a}, \mathbf{b}, \mathbf{c}$ are position vectors of vertices A,B,C of a triangle ABC, show that the area of the triangle is $\frac{1}{2} |\mathbf{a} \times \mathbf{b} + \mathbf{b} \times \mathbf{c} + \mathbf{c} \times \mathbf{a}|$. A student takes honesty, truthfulness and complacency as the three sides of the triangle. Which side of the triangle do we prefer to take? Give your suggestion.

EXPECTED ANSWER:  
III. Honesty  
IV. Truthfulness  

12. Let A and B be two points whose position vectors are $3\mathbf{i} - 4\mathbf{j} + 8\mathbf{k}$ and $4\mathbf{i} - 7\mathbf{j} + 4\mathbf{k}$ respectively. Find $\overrightarrow{AB}$ and $\overrightarrow{BA}$.

If point A represents a person who is regular and systematic and B represents a lazy person, which vector $\overrightarrow{AB}$ or $\overrightarrow{BA}$ would you choose for your success?
EXPECTED ANSWER:

\[ \overrightarrow{BA} = \text{systematic – laziness = success.} \]

LINEAR PROGRAMMING-VALUE BASED QUESTIONS.

1. A firm manufactures jute bags and cloth bags. The total number of items it can manufacture is at most 24. A Jute bag requires 1 hour to be made while a cloth bag requires only half an hour. The maximum number of hours available per day is 6 hours. If the profit on a jute bag is Rs.30 and on a cloth bag is Rs.20, how many bags of each type must be made for maximum profit? Solve it graphically.

The manufacturer wants to replace cloth bags by plastic bags to increase his profit margin. Is it a good idea? If not, give reasons.

Cloth bags are biodegradable while plastic is not. Also cloth bags can be reused.

2. A manufacturer makes cycles and scooters. Processing of these products is done on two machines A and B. The cycle parts need 2 hours on machine A and 6 hours on machine B. Parts of a scooter needs 4 hours on machine A and 2 hours on machine B.

Machine A is available for 16 hours per day and Machine B is available for 30 hours per day. Profit gained by the manufacturers from a cycle and a scooter is Rs.1000 and Rs.3000 respectively. Find with the help of a graph what should be the daily production of each of the two products to maximize the profit? Which of the above modes of transport is a better option and why?

Using cycles is a better option since it is environment friendly and reduces pollution.

It is also a good exercise option.

3. There are two types of fertilizers that a farmer uses in his farm namely A and B. A consists of 10% of nitrogen and 6% phosphoric acid while B contains 5% nitrogen and 10% phosphoric acid. The farmer needs at least 14 kg of nitrogen and 14 kg of phosphoric acid. If A costs Rs. 8/kg and B costs Rs. 6/kg, determine how much of each type of fertilizer
should be used by the farmer so that the required nutrient levels are met at minimum cost. What is the minimum cost? The farmer is considering the option of using pesticides to increase his yield. What is your opinion? Can he convert it into an organic farm?

Pesticides may increase the yield but are harmful to mankind. Organic farming is a good option as it is free of use of any chemicals.

1. A farmer decides to plant upto 10 hectares with cabbages and potatoes. He decides to grow at least 2 but not more than 8 hectares of cabbages and at least 1 but not more than 6 hectares of potatoes. He can make a profit of Rs. 1500 per hectare on cabbages and Rs.2000 per hectare on potatoes. How should he plan his farming so as to maximize his profit.

**Keeping in mind the nutritional value of both vegetables, do you think the farmer’s production will help the community? Mention one value point the farmer display?.**

Ans: Potatoes are produced more and the farmer’s production will help the community as the potatoes have high protein value than cabbages. So the farmer promotes **health awareness**.

6. A manufacturer produces two types of disposable plates, one using plastic and the other using bamboo. Three machines are required to produce the plates and the time in minutes is given below.

<table>
<thead>
<tr>
<th>TYPE OF PLATE</th>
<th>MACHINES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td>PLASTIC</td>
<td>12</td>
</tr>
<tr>
<td>BAMBOO</td>
<td>6</td>
</tr>
</tbody>
</table>

Each machine is available for a maximum of 6 hours per day. If the profit on each plate of plastic is 75 paise and profit on bamboo plate is 50 paise, how many plates of each type should the factory produce to maximize the profit.
Which type of plates do you think should be promoted more and mention one value point as the reason.

Ans: **Bamboo plates should be promoted more as they are biodegradable and eco friendly.**

3. A principal decides to buy colour boxes and books as prizes for children. A colour box costs Rs.5 and a book costs Rs. 10. He wants to buy at least 4 of each of them. How many of each should he buy so that the expenditure does not exceed Rs.100 and at the same time can give maximum number of prizes?

Which of the two , do you think will benefit the children more and mention one value point as the reason.

Ans: **Books can benefit more as it promotes reading habit of the children.**

Or

**Colour Boxes helps to improve their creativity.**

**Probability** - Examples of value based questions (Answers are provided for value based questions only)

Q1) An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accident involving a scooter driver, car driver and a truck is 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver?

Write down any two practices that would enhance road safety.

Ans – 1) Obeying traffic signals 2) Not using cell phones while driving

3) Proper maintenance of vehicles. 4) Moving within the speed limit

Q2) In a test, an examinee either guesses or copies or knows the answer to a multiple choice question with four choices. The probability that he makes a guess is 1/3 and the probability that he copies the answer is 1/6. The probability that his answer is correct, given that he
copied it, is 1/8. Find the probability that he knew the answer to the question, given that he correctly answered it.

Copying is akin to using a painkiller. Explain the analogy.

Ans – Painkillers do not provide cure for the infection. They merely relieve us of the pain (a symptom). Similarly copying in exams will not help us sort out our trouble in the subject. It only postpones it for another day.

Q3) In a group consisting of equal number of men and women, 10% men and 45% women are unemployed. What is the probability that a person selected at random is employed?

Suggest 2 steps to enhance employability of youth.

Ans - 1) Education up to class 12\textsuperscript{th} (minimum) 2) Acquiring soft skills 3) Acquiring linguistic skills 4) Cultivating working qualities like responsibility and team work 5) enrolling in vocational courses

Q4) A group contains 10 men and 4 women. A three member committee is formed from the group, containing at least 1 woman. Find the probability that the committee so formed has more women than men.

Write any 2 benefits of including more women in Panchayat committees.

Ans – 1) Family needs will be addressed faster 2) Gender bias and social evils targeted at women will wane 3) Needs of women will come to the fore and improve self confidence amongst them

Q5) Three rifle men take one shot each at the same target. The probabilities of the first, second and third rifle men hitting the target are 0.4, 0.5, 0.8 respectively. Find the probability that exactly 2 of them hit the target.

The National Cadet Corps (NCC) provides opportunities for training in gun firing. Write 2 benefits of students joining NCC.

Ans – 1) Personal discipline 2) acquiring survival skills 3) team spirit and learning to work as a team 4) patriotism 5) Care for others and social service
Q6) A lot of 100 bulbs from a manufacturing unit is known to contain 10 defective and 90 non-defective bulbs. If a sample of 8 bulbs is selected at random, what is the probability that a) the sample has 3 defective and 5 non-defective bulbs. b) The sample has at least 1 defective bulb.

Write two advantages of using CFL (Compact fluorescent lamp) bulbs over incandescent bulbs.

Ans – 1) Uses energy more efficiently (saves energy) 2) lower price 3) Brighter 4) Releases lesser amount of heat.

Q7) A shopkeeper has 5 customers who rent his cycles. He has 3 cycles and the probability that a customer will hire a cycle for a day is 3/4. If he charges Rs. 2 as rent for a cycle, find the probability that he earns exactly Rs. 6 per day.

Give 2 advantages of using bicycles.

Ans – 1) Eco-friendly (no pollution) 2) health benefits of individual 3) lower price 4) Relieves parking menace 5) Saves energy