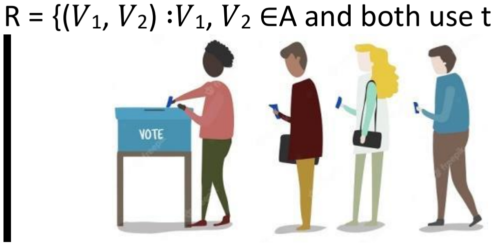
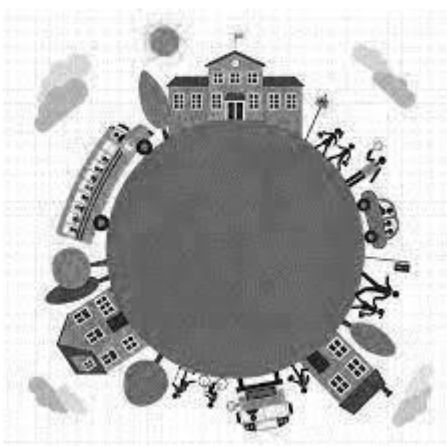
CLASS-XII
CHAPTER-01
RELATION AND FUNCTION
04 MARKS TYPE QUESTIONS

Q. No.	QUESTION	MARK
1	In two different societies, there are some school going students including girls as well as boys. Satish forms two sets with these students, as his college project. Let A= $\{a_{1,}\ a_{2,}\ a_{3,}a_{4,}\ a_{5,}\}$ and B $=\{b_{1,}b_{2,}b_{3,}\ b_{4,}\}$ where a_i's and b_i's are the school going students of first and second society respectively. Satish decides to explore these sets for various types of relations and functions. Using the information given above, answer the following :  (i) Satish wishes to know the number of relations defined in set A. How many such relations are possible? (ii) How many functions are possible from set A to set B? (iii) Among all possible functions from B to A, how many are injections? (iv) How many reflexive relations can be defined in set B?	4
2	In general election of Lok Sabha in 2019, about 911 million people were eligible to vote and voter turnout was about 67%, the highest ever. Let A be the set of all citizens of India who were eligible to exercise their voting right in general election held in 2019. A relation 'R' is defined on A as follows: R = {(V_1, V_2) :V_1, V_2 ∈A and both use their voting right in general election – 2019}  Read the above passage and answer the following questions. **(I)**. Mr.'X' and his wife 'W'both exercised their voting right in general election -2019, Which of the following is true? (A). (X,W) ∈ R but (W,X) ∉ R (B). (X,W) ∈ and (W,X) ∈ R (C). (X,W) ∉ R and (W,X) ∉ R (D). (W,X) ∈ R but (X,W) ∉ R **(II)**. Three friends F1, F2 and F3 exercised their voting right in general election-2019, then which of the following is true? (A). (F1,F2) ∈R, (F2,F3) ∈ R and (F1,F3) ∈ R (B). (F1,F2) ∈ R, (F2,F3) ∈ R and (F1,F3) ∉ R (C). (F1,F2) ∈ R, (F2,F2) ∈R but (F3,F3) ∉ R (D). (F1,F2) ∉ R, (F2,F3) ∉ R and (F1,F3) ∉ R	4

	(III). Mr. John exercised his voting right in General Election – 2019, then Mr. John is related to which of the following? (A). Eligible voters of India (B). Family members of Mr. John (C). All citizens of India (D). All those eligible voters who cast their votes **(IV).** The relation R = {(V_1, V_2) :V_1, V_2 ∈A and both use their voting right in general election – 2019} is ------- (A) symmetric but not reflexive (B) reflexive, symmetric but not transitive (C) equivalence relation (D) neither reflexive nor symmetric nor transitive	
3	Manikanta and Sharmila are studying in the same KendriyaVidyalaya inVisakhapatnam. The distance from Manikanta's house to the school is same as distance from Sharmila's house to the school. If the houses are taken as a set of points and KV is taken as origin, then answer the below questions based on the given information; (M for Manikanta's house and S for Sharmila's house)  i. The relation is given by { (Distance of point M from origin is same as distance of point S from origin } is a) Reflexive, Symmetric and Transitive b) Reflexive, Symmetric and not Transitive c) Neither Reflexive nor Symmetric d) Not an equivalence relation ii. Suppose Dheeraj's house is also at the same distance from KV then a) OM ≠ OS b) OM ≠ OD c) OS ≠ OD d) OM = OS= OD iii. If the distance from Manikanta, Sharmila and Dheeraj houses from KV are same, then the points form a a) Rectangle b) Square c) Circle d) Triangle	4

	iv. Let {(0,3),(0,0),(3,0)} , then the point which does not lie on the circle is a) (0,3) b) (0,0) c) (3,0) d) None of these	
4	Priya and Surya are playing monopoly in their house during COVID. While rolling the dice their mother Chandrika noted the possible outcomes of the throw every time belongs to the set { }. Let A denote the set of players and B be the set of all possible outcomes. Then { } { }.Then answer the below questions based on the given information-  Let be defined by {(}, then R is a) Equivalence relation b) Not Reflexive but symmetric, transitive c) Reflexive, Symmetric and not transitive d) Reflexive, transitive but not symmetric ii. Chandrika wants to know the number of functions for to. How many number of functions are possible? a) 6 2 b) 2 6 c) 6 d) 2 12 iii. Let be a relation on defined by {(1,1),(1,2),(2,2),(3,3),(4,4),(5,5),(6,6) }. Then is a) Symmetric b) Reflexive c) Transitive d) None of these Let be defined by Chandrika wants to know the number of relations for A to B . How many number of relations are possible? a) 6^2	4

	b) 2^6 c) 6 d) 2^{12}	
5	"When a computer reads a number, you type in, it converts the number to binary for internal storage, then it prints the number out again onto the screen that you see" – it's utilizing an inverse function. Explain? 	4
6	You work forty hours a week at a furniture store. You receive a \$220 weekly salary, plus a 3% commission on sales over \$5000. Assume that you sell enough this week to get the commission. Given the functions f (x) = 0.03x and g(x) = x – 5000, which of (f ∘ g) (x) and (g ∘ f) (x) represents your commission? 	4
7	Students of class 12, planned to plant saplings along straight lines, parallel to each other to one side of the school ground ensuring that they had enough play area. Let us assume that they planted one of the row of saplings along the line $2x + y = 6$. Let L be the set of all lines which are parallel on the ground and R be relation on L.  (1) Let Relation R be defined by R={(L_1, L_2): $L_1 \parallel L_2$ where $L_1, L_2 \in$ L} what is the type of Relation R? (2) Check whether the function $f: R \to R$ defined by $f(x)$ =6-2x is bijective or not.	4
8	**Let** $f: w \to w$ be defined as $f(n) = \begin{cases} n+1; if\ n\ is\ even. \\ n-1; if\ n\ is\ odd. \end{cases}$ Show that f is One-One onto function.	4
9	Prove that a function f: $[0,\infty) \to [-5,\infty)$ be defined by f(x)= $4x^2$+4x-5 is bijective.	4

10	Show that the function $f:R \to \{x \in R : -1 < x < 1\}$ defined by $f(x) = \frac{x}{1+\|x\|}$,$x \in R$ is one-one onto function.	4
11	Sherlin and Dhanju are playing Ludo at home during Covid-19. While rolling the dice, Sherlin's sister Raji observed and noted the possible outcomes of the throw every time belongs to set $\{1, 2, 3, 4, 5, 6\}$. Let A be the set of players while B be the set of all possible outcomes.  $A = \{S, D\}, B = \{1, 2, 3, 4, 5, 6\}$. Answer the following questions based on the given information: (i) Let $R: B \to B$ be defined by $R = \{(x, y): y \text{ is divisible by } x\}$. Verify that whether R is reflexive, symmetric and transitive. (ii) Raji wants to know the number of functions from A to B. Find the number of all possible functions. (iii) Let R be a relation on B defined by $R = \{(1,2), (2,2), (1,3), (3,4), (3,1), (4,3), (5,5)\}$. Then R is which kind of relation? OR Raji wants to know the number of relations possible from A to B. Find the number of all possible relations.	4
12	Read the following passage and answer the following questions: Dhanush wants to take a test of his son Amit is a student of class XII. Dhanush said to Amit, "Observe the two functions f(x) and g(x) carefully" $f: R \to R$ and $g: R \to R$ such that $f(x) = x$ and $g(x) = x^2$. Dhanush asked some questions related to f(x) and g(x) and Amit answered correctly. Write the correct response given by Amit of the following questions. (i) Check whether f(x) is bijective or not. (ii) Check whether f(x) is bijective or not.	4

ANSWER CHAPTER-01

RELATION AND FUNCTION 04 MARKS TYPE QUESTIONS

Q.No	ANSWERS	Mark
1	(i) 2^{25}relations are possible on A. (ii) 4^5 functions are possible from A to B (iii) 5_{P_4}=120 one-one functions from B to A. (iv)2^{12} reflexive relations are possible on B.	4
2	(I) (B). (X,W) ∈ and (W,X) ∈ R (II) (A). (F1,F2) ∈R, (F2,F3) ∈ R and (F1,F3) ∈ R (III) (D). All those eligible voters who cast their votes (IV) (C) equivalence relation	4
3	(i) A ii) D iii) C iv) B	4
4	(i) A ii) A iii)D iv)D	4
5	We all know that computer only reads binary numbers i.e., only 1 and 0. In order for the computers to read any alphabets, all the alphabets, including numbers, special characters were assigned with a number which we call as ASCII value. The ASCII value of a= 65 1=49 In binary form, a= 01000001 1= 00110001 Let us consider a function, f(x) = {x: x belongs to the set of alphabets, numbers, special character} g(x) = {y: y belongs to the set of binary numbers of alphabets, number, special character} According to the question, let the number of two function be: f(x) = {A, 1} g(x) = {01000001, 00110001} Let us consider the composition of function., So, (f ∘ g) (x) = f (g(x)) =f (01000001, 00110001) = f (01000001), f (00110001) = {A, 1} On the other hand, (g ∘ f) (x) = g (f (x)) = g (A, 1) = g(A), g (1) = {01000001, 00110001} We can see that, when we input alphabets to the computer (f(x)), the computer will read the data in binary form(g(x)) and the same alphabets will show in the screen. Similarly, when we inverse the process of inputting the information, we can see that while inputting the binary digit to the computer (g(x)), the computer will convert the digit into alphabets (f(x)) and then show the alphabets to the screen. Hence, even when we change the sequence of inserting the information, the result will be the same. This shows the inverse function.	4

6	Given the functions f (x) = 0.03x and g(x) = x − 5000 Well, (f ∘ g) (x) = f (g(x)) would mean that I would take my sales x, subtract off the $5000 that didn't get the commission, and then multiply whatever is left by 3%. i.e., (f ∘ g) (x) = f (g(x)) = f(x-5000) = 0.03* (x-5000) = 0.03* (220-5000) = 0.03* - 4780 = 143.4 On the other hand, (g ∘ f) (x) = g (f (x)) would mean that I would take my sales x, multiply by 3%, and then subtract $5000 from the result. Not only is this not how the commission is calculator, this could land me in negative numbers! i.e., (g ∘ f) (x) = g (f (x)) = g (0.03x) = 0.03*x - 5000 = 0.03 * 220 – 5000 = 6.6 – 5000 = - 4993.4 So (f ∘ g) (x) is the composition that does what I need it to do. Hence, (f ∘ g) (x) represents my commission.	4
7	Given relation R is defined by R={(L_1, L_2): $L_1 \parallel L_2$ where $L_1, L_2 \in$ L} **Reflexive:-** let $L_1 \in L$ since $L_1 \parallel L_1 \Rightarrow (L_1, L_1) \in$ R Hence R is reflexive relation. . **Symmetric:-** let $L_1, L_2 \in L$ and let $(L_1, L_2) \in R$ since $L_1 \parallel L_2 \Rightarrow L_2 \parallel L_1 \Rightarrow (L_2, L_1) \in$ R Hence R is symmetric relation **Transitive Relation:-** let $L_1, L_2, L_3 \in L$ and let $(L_1, L_2) \in R$ and $(L_2, L_1) \in$ R ∴ $L_1 \parallel L_2$ and $L_2 \parallel L_3$ $\Rightarrow L_1 \parallel L_3 \Rightarrow (L_1, L_3) \in$ R ∴ R is Transitive relation .∵ R is Reflexive Symmetric and Transitive relation. ∴ R is Equivalence relation. (1) ($\boldsymbol{b}$) Given Function $f: R \to R$ defined by $f(x) = 6 - 2x$. $\boldsymbol{Injective}$: − Let $x_1, x_2 \in$ R such that $x_1 \neq x_2$ $\Rightarrow 6 - 2x_1 \neq 6 - 2x_2 \Rightarrow f(x_1) \neq f(x_2)$ ∴ f is injective. $\boldsymbol{Sujective}$: − Let y=$6 - 2x$ ⇒ x =$\frac{6-y}{2}$ $for\ every\ y \in R\ (co-domain)\ \ there\ exist$ x=$\frac{6-y}{2}$ $(co-domain)$ ie co-domain =Range ∴ f is Surjective. (2) ∴ f is Bijective function.	4
8	**. One-One function** Let x,y ∈ W	4

	If x and y both are even number then $f(x) = f(y)$ Or x+1=y+1 or x=y If x and y both are odd number then x-1 = y-1 or x=y If x is odd and y is even ie .$x \neq y, x-1$ *is even* , $y+1$ *is odd* $x \neq y$ or $f(x) \neq f(y)$ similarly x is even and y is odd .f is one-one function. **Onto function Range of f={** $f(0), f(1), f(2), \dots \dots .$} ={1,0,3,2,…….}=Co-domain. ∴ **f** is onto function	
9	**One-One** Let x_1 ,x_2 ∈[0,∞) such that $x_1 \neq x_2$ $4x_1^2+4x_1-5 = 4x_2^2+4x_2-5$ $x_1 = x_2$ therefore f is one one **onto :** X ∈[0,∞) $4x^2+4x-5 \geq -5$ F(x)≥-5 R(f) =$[-5, \infty)$ F is onto, f is bijective.	4
10	f(x) = $\frac{x}{1+\|x\|} = \begin{cases} \frac{x}{1+x} & if\ x \geq 0 \\ \frac{x}{1-x} & if\ x < 0 \end{cases}$ **two cases arise**: **(i) x≥0** $y = \frac{x}{1+x}$ $x = y$; f *is one one* $\frac{x}{1+x} \geq 0$ $x = \frac{y}{1-y} \geq 0$ such that f(x)=y f *is onto* (ii) x<0 Now we will prove it similarly as above.	4
11	(i) Given $R: B \to B$ be defined by $R = \{(x, y): y\ is\ divisible\ by\ x\}$. **Reflexive:** Let $x \in B$, since x is always divisible by x itself. Therefore $(x, x) \in R$ It is reflexive.	1

	Symmetric: Let $x, y \in B$ and $(x, y) \in R$ $\Rightarrow y$ is divisible by x $\Rightarrow \frac{y}{x} = k_1$, where k_1 is an integer $\Rightarrow \frac{x}{y} = \frac{1}{k_1} \neq$ integer. $\therefore (y, x) \notin R$ It is not symmetric. **Transitive:** Let $x, y, z \in B$ and let $(x, y) \in R \Rightarrow \frac{y}{x} = k_1$, where k_1 is an integer and $(y, z) \in R \Rightarrow \frac{z}{y} = k_2$, where k_2 is an integer $\therefore \frac{y}{x} \times \frac{z}{y} = k_1 . k_2 = k$ (integer) $\Rightarrow \frac{z}{x} = k \Rightarrow (x, z) \in R$ It is transitive. Hence, relation is reflexive and transitive but not symmetric. (ii) We have, $A = \{S, D\} \Rightarrow n(A) = 2$ and $B = \{1, 2, 3, 4, 5, 6\} \Rightarrow n(B) = 6$ $\therefore$ Number of functions from A to $B = 6^2 = 36$. (iii) Given R be a relation on B defined by $R = \{(1,2), (2,2), (1,3), (3,4), (3,1), (4,3), (5,5)\}$. **Reflexive**: R is not reflexive since $(1,1), (3,3), (4,4) \notin R$. **Symmetric**: R is not symmetric since $(1,2) \in R$ but $(2,1) \notin R$. **Transitive**: R is not transitive as $(1,3) \in R$ *and* $(3,1) \in R$ but $(1,1) \notin R$. $\therefore R$ is neither reflexive nor symmetric nor transitive. **OR** Since $n(A) = 2$ and $n(B) = 6 \Rightarrow n(A \times B) = 12$. $\therefore$ Total number of possible relations from A to $B = 2^{12}$.	1 2 2
12	(i) We have $f: R \to R$ such that f(x) = x **One-One**: Let $x_1, x_2 \in R$ (domain) such that $f(x_1) = f(x_2) \Rightarrow x_1 = x_2$	1

		$\Rightarrow$ f is one-one.	1
		Onto: Let $y \in R$ (co-domain) such that $f(x) = y \Rightarrow x = y$	
		Now $f(x) = f(y) = y$.	
		So for $y \in R$ (co-domain), there exists $x = y \in R$ (domain) such that $f(x) = y$.	
		$\Rightarrow$ f is onto.	
		As f is one-one and onto $\Rightarrow f$ is bijective.	
	(ii)	We have $g: R \to R$ such that $g(x) = x^2$	
		One-One: Since $1, -1 \in R$ (domain) such that	1
		$g(1) = 1$ and $g(-1) = 1$	
		Therefore $g(1) = g(-1)$ but $1 \neq -1$	
		$\Rightarrow g$ is not one-one.	
		Onto: Since $g(x) = x^2 \geq 0$ for all $x \in R$	1
		Range of $g = [0, \infty) \neq R$ (co-domain)	
		$\Rightarrow g$ is not onto.	
		As g is neither one-one nor onto $\Rightarrow g$ is not bijective.	