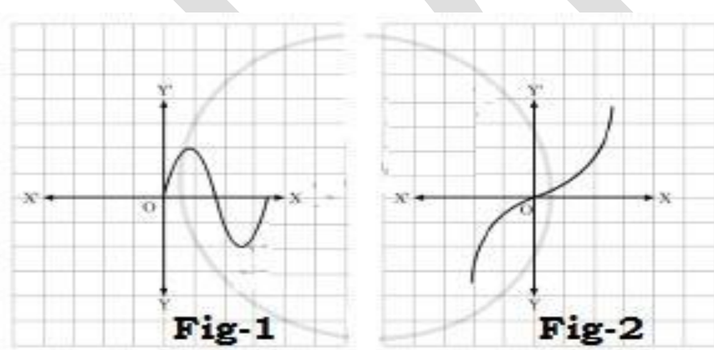
CLASS-XII
CHAPTER-01
RELATION AND FUNCTION
02 MARKS TYPE QUESTIONS

Q. No.	QUESTION	MARK
1	An equivalence relation R in A divides it into three equivalence classes A_1, A_2, A_3. What is the value of the following? (i) $A_1 \cup A_2 \cup A_3$ (ii) $A_1 \cap A_2 \cap A_3$	2
2	Are the following set of ordered pairs functions?. (i) {(x, y): x is a person, y is the mother of x}. (ii) {(a, b): a is a person, b is an ancestor of a} If so, examine whether the mapping is one-one, many-one or onto.	2
3	Let A = {a, b, c} and the relation R be defined on A as follows: R = {(a, a), (b, c), (a, b)}. Then, write the minimum number of ordered pairs to be added in R to make R reflexive and transitive.	2
4	Given A = {2, 3, 4}, B = {2, 5, 6, 7}. Define a function from A to B such that the function is: (a) an injective mapping from A to B (b) a mapping from A to B which is not injective	2
5	Which of the following graph represents one-one function? Fig-1 or Fig-2?  Justify your answer.	2
6	If R = {(a, a3): a is a prime number less than 5} be a relation. Find the range of R	2

7	Let R is the equivalence relation in the set A = {0,1, 2, 3, 4, 5} given by R = {(a, b) : 2 divides (a – b)}. Write the equivalence class .	2
8	If R = {(x, y): x + 2y = 8} is a relation on N, then write the range of R.	2
9	Show that the function f: R → R, defined as $f(x) = x^2$, is neither one-one nor onto.	2
10	Show that the function f:R→(x∈R:−1<x<1) defined by f(x)= x/(1+|x|), x∈R is one one and onto function.	2
11	Let us take an example if suppose we have a set X consisting of exactly 200 elephants in a farm. Are there any chances of finding a relation of getting a rabbit in the poultry farm? 	2
12	Pablo charges $20 an hour to teach salsa dancing. What is the domain and range of how much money Pablo can make off salsa dancing lessons. 	2
13	Curtis hit 5 home runs in his first game and 3 home runs in each game after that. However, he didn't hit a home run in his 4th game. Find the Domain and Range. Hint: There is a hole in the game that he didn't hit a homerun.	2
14	If a car is traveling 35 miles per hour, a function can be used to determine how far they have traveled after 1 hour, 2 hours, 3 hours, etc. Explain?	2
15	Three friends X, Y, and Z live in the same society close to each other at a distance of 4 km from each other. If we define a relation R between the distances of each of their houses. Can R be known as an equivalence relation? 	2
16	Define symmetric relation. Give one example	2

17	A Mathematics teacher is going to conduct a test of class-12 students, teacher put the question in front of the students such that  Let A=**R**-{2},B=**R**-{1}. Let $f: A \to B$ be defined by $f(x) = \frac{x-1}{x-2} \forall\, x \in A$ .Show that $f(x)$ is One-one function.	2
18	Let R be the relation defined on the natural number N as follow: R={(x,y): x, $y \in$ N and 2x+y=24}. Find the domain and range of the relation	2
19	A traffic light is indicated according to the range of the function as given bellow $f(x) = \frac{\lvert x-1 \rvert}{x-1}; x \neq 1$. Then find the range of the function  	2
20	Define one-one function. Give one example	2
21	Check whether the relation R defined on the set A = { 1,2,3,4,5,6} as R ={(a,b) : b = a+1} is reflexive.	2
22	Show that the modulus function f:R → R ,given by f(x) = |x| is neither one one nor onto.	2
23	State the reason for relation R in the set {1,2,3} given by R ={ (1,2), (2,1) } not to be transitive.	2
24	Let f:R → R be defined by $\begin{cases} 3x & , if\ x > 3 \\ x2 & , if\ 1 < x \leq 3 \\ x & , if\ x \leq 1 \end{cases}$,then find f(-2)+ f(0)+ f(2) +f(5)	2
25	Find the range of $f(x) = \frac{x-1}{x+1}$	2
26	Show that the relation R in the set {1,2,3} given by R = {(1, 1), (2, 2), (3, 3), (1, 2), (2, 3)} is reflexive but neither symmetric nor transitive.	2
27	Show that the modulus function $f : R \to R$, given by $f(x) = \lvert x \rvert$ is neither one-one nor onto. $f : R \to R$, given by $f(x) = \lvert x \rvert$	2
28	Prove that the function f is surjective, where $f: N \to N$ such that $f(n) = \begin{cases} \frac{n+1}{2}, if\ n\ is\ odd \\ \frac{n}{2},\ if\ n\ is\ even \end{cases}$. Is the function injective? Justify your answer.	2

29	Show that the function $f: R_+ \to [4, \infty)$ given by $f(x) = x^2 + 4$ is a bijective function.	2
30	Write the inverse relation corresponding to the relation R given by $R = \{(x, y): x \in N, x < 5, y = 3\}$. Also write the domain and range of inverse relation.	2

ANSWER

CHAPTER-01

RELATION AND FUNCTION

Q.No	**ANSWERS**	**Mark**
1	(i) $A_1 \cup A_2 \cup A_3 = A$ (ii) $A_1 \cap A_2 \cap A_3 = \emptyset$	1+1
2	(i) {(x, y): x is a person, y is the mother of x}. It is a function and it is many-one as each person has only one biological mother and two or more person may have same mother. (ii) {(a, b): a is a person, b is an ancestor of a}. It is not a function as a person has more than one ancestor.	2
3	To make reflexive minimum two order pairs i.e. (b, b) and (c, c) must be added. To make transitive (a,c) must be added. So to make reflexive and transitive minimum three ordered pair must be added. Those are (b, b), (c, c) and (a,c).	2
4	(a) an injective mapping from A to B. Ex: $f = \{(a, b): b = a + 3, for\ all\ a \in A\ and\ b \in B$. Here $f = \{(2,5), (3,6), (4,7)\}$ (b) a mapping from A to B which is not injective. Ex: $f = \{(a, b): b = a^2 - 6a + 5, for\ all\ a \in A\ and\ b \in B$. Here (-3) is the image of both 2 and 4.	2
5	Fig-2 is one-one as when a line is drawn parallel to x-axis, it will intersect the curve at only one point. That means for each x there is unique y. But in Fig-1, a line drawn parallel to x-axis will intersect at two points. It means for two values of x, there is one image. Hence not one-one.	2
6	Given, R = {{a, cd): a is a prime number less than 5} We know that, 2 and 3 are the prime numbers less than 5. So, a can take values 2 and 3. Thus, R = {(2, 23), (3, 33)} = {(2, 8), (3, 27)} Hence, the range of R is (8, 27}.	2
7	Given, R = {(a, b):2 divides(a − b)} and A = { 0,1, 2, 3, 4, 5} Clearly, [0] = {b ∈ A : (0, b) ∈ R} = {b ∈ A: 2 divides (0 − b)}	2

	= {b ∈ A : 2divides (−b)} = {0, 2, 4} Hence, equivalence class of [0] = {0,2,4}.	
8	Given, the relation R is defined on the set of natural numbers, i.e. N as R= {(x, y) : x + 2y = 8} To find the range of R, x + 2y = 8 can be rewritten as y = 8−x2 On putting x = 2, we get y = 8−22 = 3 On puttmg x = 4, we get y = 8−42 = 2 On putting x = 6, we get y = 8−62 = 1 As, x, y ∈ N, therefore R = {(2, 3), (4, 2), (6, 1)}. Hence, the range of relation R is {3,2,1}. Note: For x = 1, 3, 5, 7, 9, ……… we do not get y as natural number.	2
9	Given the function f:R→R defined as f(x)=x2. Now we have 2,−2∈R but f(2)=f(−2)=4. This gives that the function f(x) is not one-one.	2
10	f:R⇒(x∈R:−1<x<1) f(x)=x/(1+ |x|),x∈R Lets check it for ±1/2∈(−1,1) ⇒f(1/2)= (1/2)/(1+1/2)=1/3 And f=(-1/2)=(−1/2)/ (1 − 1/2) = −1 f(x) is different for each x∈(−1,1) ⇒f is one - one. And f(x) exists and gives real value for ∀x∈(−1,1) ⇒f is onto. ⇒f is one-one onto.	2
11	Let us consider, X= {set containing 200 elephants in a farm} Y= {set of rabbits} When we consider the relation R between X and Y such that R= {(X, Y): X contain elephants}, we observe that the relation R is void or empty relation since there is only 200 elephants in the farm and no rabbit can be found.	2
12	The number of hours he teaches will go on the x-axis and the amount of money Pablo makes goes on the y axis. The least amount of money he can make is $0 dollars because he can only make money and he can't go in debt. The equation is y=20x because it costs $20 an hour and x represent the number of hours he teaches. Hence, The domain is [0, ∞) and the range is also [0, ∞).	2
13	The number of home runs Curtis hit in a game can be represented by the Function f(x) So, f(x) = 5 if x = 1, and f(x) = 3 if x > 1.	2

	However, there is a hole at x = 1, where Curtis did hit a home run. So, we need to remove that point from the domain. Therefore, the domain of the function is {x | x > 1}, and the range is {3,5}. Alternatively, we can write the function as: f(x) = {5, if x = 1, 3, if x > 1 and x is an integer, undefined, otherwise} In this case, the domain is all real numbers except for x = 1, and the range is still {3, 5}.	
14	Car is traveling 35 miles per hour. We have to determine how far they travel after 1, 2, 3, etc... hour. According to the question, This function would look like: Miles driven= 3x, where x is equal to the number of hours. If this person drove for 1 hours, then the output would be 35 miles. If this person drove for 2 hours, then the output would be 70 miles. If this person drove for 3 hours, then the output would be 105 miles. If this person drove for 1.5 hours, then the output would be 52.5 miles.	2
15	We know that for an equivalence Relation, R must be reflexive, symmetric, and transitive. R is not reflexive as X cannot be at a distance of 4 km away from itself. The relation, R can be said as symmetric as the distance between X and Y is 4 km which is the same as the distance between Y and X. R is said to be transitive as the distance between X and Y is 4 km, the distance between Y and Z is also 4 km and the distance between X and Z is also 4 km. Therefore, this relation is not an equivalence relation.	2
16	SYMMETRIC RELATION: -.A relation R on a set A is called symmetric relation if aRb. For every a,b ∈ A ⇒b,a ∈ A also (1) Example:-A={1,2,3} A×A=[(1,2), (2,1), (1,1),(2,2),(3,3),(1,3),(2,3),(3,1),(3,2)] ∈ R Since (a,b) ∈ R ⇒(b,a) ∈ R for every a,b∈ A (1)	2
17	ONE-ONE FUNCTION: - $f(x_1) \neq f(x_2)$ or $(\frac{x_1-1}{x_1-2})=\frac{x_2-1}{x_2-2})$ $\Rightarrow x_1 = x_2$ $\therefore$ $f(x)$ is one one function (2)	2
18	R ={(1,22), (2,20), (3,18),(4,16),(5,14),(6,12),(7,10),(8,8),(9,6),(10,4),(11,2)} Domain={1,2,3,4,5,6,7,8,9,10,11} (1) Range={2,4,6,810,12,14,16,18,20,22} (1)	2
19	Range of the function Give that $f(x) = \frac{\lvert x-1 \rvert}{x-1}; x \neq 1$ this function can be written as $f(x) = \begin{cases} \frac{x-1}{x-1}; if\ x > 1. \\ -\frac{x-1}{x-1}; if\ x < 1. \end{cases}$ Or $f(x) = \begin{cases} 1; x > 1 \\ -1; x < 1 \end{cases}$ Hence the range of $f(x)$ is {1,-1} (2)	2

20	ONE-ONE FUNCTION:- A function $f: A \rightarrow B$ is said to be one one if a≠b $\Rightarrow$ $f(a) \neq f(b)$ for all a,b ∈ A or $f(a) = f(b)$ ⇒ a=b for all a,b ∈ A (1) Example:- Let $f: R \rightarrow R$ be a function such that $f(a)$ =x+1 is one-one function (1)	2
21	Let a ∈ A a≠a+1 → $(a, a) does\ not\ belongs\ to\ A$ so R is not reflexive.	2
22	**ONE-ONE :** Let x_1 =1, x_2 = -1 be the two elements belongs to R F(x1) = f(x2) =1 F is many one. **ONTO:** let f(x) =-1 , |x| = -1 ∈ R which is not possible. So not ONTO	2
23	R is not transitive as (1,2) ∈ R , (2,1) ∈ R but (1,1) does not belongs to R	2
24	f(-2)+ f(0)+ f(2) +f(5) = -2 + 0 + 2^2 + 3 * 5 = -2 + 4+ 15 =17	2
25	Given R = {(1,1),(2,2),(3,3),(1,2),(2,3)} defined on R : {1,2,3}→{1,2,3} **<u>For reflexive</u>**: As (1, 1), (2, 2), (3, 3) ∈ R. Hence, reflexive **<u>For symmetric</u>**: (1, 2) ϵ R but (2, 1) ∉ R. Hence, not symmetric. **<u>For transitive</u>**: (1, 2) ϵ R and (2, 3) ∈ R but (1, 3) ∉ R. Hence, not transitive.	$\frac{1}{2}$ $\frac{1}{2}$ 1
26	Given f : R→R, given by $f(x) = \|x\|$ Take $x = 2$ and $x = -2$ then $f(2) = 2$ and $f(-2) = 2$ that is image of two distinct elements is same. Therefore f is not one-one. Also negative real numbers in co-domain have no pre-image in the domain. Therefore f is not onto.	1 1
27	**<u>Surjectivity</u>**: Let n be an arbitrary element of N. If n is an odd natural number , then $2n - 1$ is also an odd natural number such that $f(2n-1) = \frac{2n-1+1}{2} = n$. If n is an even natural number , then $2n$ is also an even natural number such that $f(2n) = \frac{2n}{2} = n$. Thus for every $n \in N$(whether even or odd) there exists its pre-image in N. So f is surjective. **<u>Injectivity</u>**: 1, 2∈ $N(domain)$ such that $f(1) = 1 = f(2)$. Hence f is not injective.	1 1
28	**One-One:** Let $x_1, x_2 \in R_+$ $(Domain)$ $f(x_1) = f(x_2) \Rightarrow {x_1}^2 + 4 = {x_2}^2 + 4$	1

	$\Rightarrow {x_1}^2 = {x_2}^2$ $\Rightarrow x_1 = x_2$ [x_1 & x_2 are positive real numbers]. Hence f is one-one function. **Onto:** Let $y \in [4, \infty)$ such that $y = f(x) \quad \forall\, x \in R_+$ $\Rightarrow y = x^2 + 4$ $\Rightarrow x = \sqrt{y - 4}$ [x is a positive real number] Obviously, $\forall\, y \in [4, \infty)$, x is a real number $\in R_+$ $(Domain)$ *i.e.* all elements of codomain have pre-image in domain. $\Rightarrow f$ is onto. Hence f is a bijective function.	1
29	Given, $R = \{(x, y): x \in N, x < 5, y = 3\}$ $\Rightarrow R = \{(1,3), (2,3), (3,3), (4,3)\}$. Hence required inverse relation is $R^{-1} = \{(3,1), (3,2), (3,3), (3,4)\}$. Domain of $R^{-1} = \{3\}$. Range of $R^{-1} = \{1, 2, 3, 4\}$.	1 $\frac{1}{2}$ $\frac{1}{2}$