QB365 Question Bank Software Study Materials

Relations and Functions Important 2 Marks Questions With Answers (Book Back and Creative)

10th Standard

Maths

Total Marks : 60

2 Marks

30 x 2 = 60

1) Let A = {1,2,3} and B = {x| x is a prime number less than 10}. Find A x B and B x A.

Answer : A = {1,2,3} B = {2,3,5,7}

A x B = {(1,2),(1,3),(1,5),(1,7),(2,2),(2,3),(2,5),(2,7),(3,2),(3,3),(3,5),(3,7)}

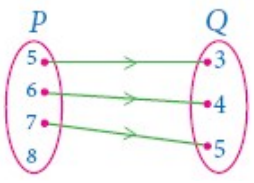
B x A = {(2,1),(2,2),(2,3),(3,1),(3,2),(3,3),(5,1),(5,2),(5,3),(7,1),(7,2),(7,3)}

2) The arrow diagram shows a relationship between the sets P and Q. Write the relation in

(i) Set builder form

(ii) Roster form

(iii) What is the domain and range of R.



Answer : (i) Set builder form of R = {(x,y) | y = x - 2, x ∈ P, y ∈ Q}

(ii) Roster form R = {(5 , 3),(6 , 4)(7 , 5)}

(iii) Domain of R = {5, 6, 7} and range of R = {3, 4, 5}

3) If X = {–5, 1, 3, 4} and Y = {a, b, c}, then which of the following relations are functions from X to Y ?

R_1= {(–5, a), (1, a), (3, b)}

Answer : R_1 = {(–5, a), (1, a), (3, b)}

We may represent the relation R_1 in an arrow diagram

R_1 is not a function as 4 ∈ X does not have an image in y.

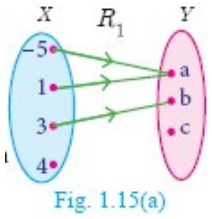


Fig. 1.15(a)

4) Using vertical line test, determine which of the following curves (Fig.1.18(a), 1.18(b), 1.18(c), 1.18(d)) represent a function?

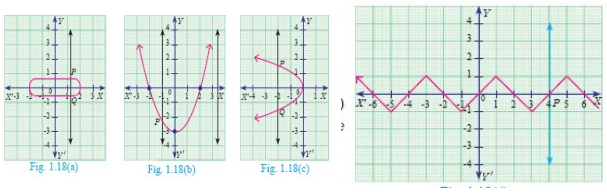


Fig. 1.18(a) Fig. 1.18(b) Fig. 1.18(c)

Answer : The curves in Fig.1.18(a) and Fig.1.18(c) do not represent a function as the vertical lines meet the curves in two points P and Q.

The curves in Fig.1.18(b) and Fig.1.18(d) represent a function as the vertical lines meet the curve in at most one point.

5) Using horizontal line test (Fig.1.35(a), 1.35(b), 1.35(c)), determine which of the following functions are one – one.

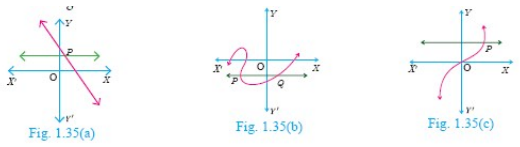


Fig. 1.35(a) Fig. 1.35(b) Fig. 1.35(c)

Answer : The curves in Fig.1.35(a) and Fig.1.35(c) represent a one – one function as the horizontal lines meet the curves in only one point P.

The curve in Fig.1.35(b) does not represent a one–one function, since, the horizontal line meet the curve in two points P and Q.

6) Show that the function f: N ⟶ N defined by f(x) = 2x - 1 is one-one-one but not onto.

Answer : f: N ⟶ N

f(x) = 2x - 1

N = {1,2,3,4,5, ...}

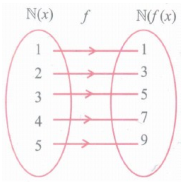
When x = 1, f(1) = 2(1) - 1 = 1

When x = 2, f(2) = 2(2) - 1 = 3

When x = 3, f(3) = 2(3) - 1 = 5

When x = 4, f(4) = 2(4) - 1 = 7

When x = 5, f(5) = 2(5) - 1 = 9



This function maps every element from the domain to element that is twice minus one the original. 2x - 1 is always an odd number when x∈N.

Clearly, each element from the domain is mapped to different element in the co-domain. So, the function is one-to-one. On the other hand, there are no elements in the domain that would map to even numbers. So, the function is not onto.

Hence f is one one but not onto.

7) Find f o g and g o f when f(x) = 2x + 1 and g(x) = x^2 - 2

Answer : f(x) = 2x + 1, g(x) = x^2 - 2

f o g(x) = f(g(x)) = f(x^2 - 2) = 2(x^2 - 2) + 1 = 2x^2 - 3

g o f(x) = g(f(x)) = g(2x + 1) = (2x + 1)^2 - 2 = 4x^2 + 4x - 1

Thus f o g = 2x^2 - 3, g o f = 4x^2 + 4x - 1. From the above, we see that f o g ≠ g o f.

8) Find k if f o f(k) = 5 where f(k) = 2k - 1.

Answer : f o f(k) = f(f(k))

= 2(2k - 1) -1 = 4k - 3

Thus, f o f(k) = 4k - 3

But, it is given that f o f(k) = 5

Therefore 4k - 3 = 5 ⇒ k = 2

9) If f(x) = 2x - 1, g(x) = $\frac{x+1}{2}$, show that f o g = g o f = x.

Answer : f(x) = 2x - 1, g(x) = $\frac{x+1}{2}$

f o g(x) = f(g(x)) = f$\left(\frac{x+1}{2}\right) = 2\left(\frac{x+1}{2}\right) - 1 =$ x + 1 - 1 = x

gof(x) = g(f(x)) = g(2x - 1) = $\frac{2x-1+1}{2}$

$= \frac{2x}{2} = x$

f o g = g o f = x

Hence proved.

10) Find A x B, A x A and B x A

A = B = {p,q}

Answer : A = B = {(p,q)

A x B = {p,q} x {p,q}

= {(p, p), (p, q), (q, p), (q, q)}

A x A = {p,q} x {p,q}

= {(p, p),(p,q),(q,p),(q, q)}

B x A = {p,q} x {p,q}

= {(p, p),(p,q),(q,p),(q, q)}

A x B = A x A = B x A

Since A = B

11) Using the functions f and g given below, find f o g and g o f. Check wheather f o g = g o f

f(x) = $\frac{2}{x}$, g(x) = 2x^2- 1

Answer : f(x) = $\frac{2}{x}$, g(x) = $2x^2$ - 1

fog(x) = f(g)x)) = f($2x^2$ - 1) = $\frac{2}{2x^2-1}$ ..(1)

gof(x) = g(f(x)) = $g\left(\frac{2}{x}\right) = 2\left(\frac{2}{x}\right)^2$ -1

= $2\left(\frac{4}{x^2}\right) - 1 = \frac{8-x^2}{x^2}$

fog ≠ gof

12) Using the functions f and g given below, find f o g and g o f. Check wheather f o g = g o f

f(x) = $4x^2$ - 1, g(x) = 1 + x

Answer : f(x) = $4x^2$ - 1, g(x) = 1 + x

f o g = f(g(x)) = f(1 + x) = $4(1 + x)^2$ - 1

= $4(1 + 2x + x^2)$ - 1

= $4 + 8x + 4x^2$ - 1

= $4x^2 + 8x + 3$

g o f = g(f(x)) = $1 + 4x^2$ - 1

= $4x^2$

f o g ≠ g o f

13) Let A = {3,4,7,8} and B = {1,7,10}. Which of the following sets are relations from A to B?

R_3 = {(3,7), (4,10), (7,7), (7,8), (8,11), (8,7), (8,10)}

Answer : A x B = {(3,1), (3,7), (3,10), (4,1), (4,7), (4,10), (7,1), (7,7), (7,10), (8,1), (8,7), (8,10)}

Here, (7,8) ∈ R_3, but (7,8) ∉ A x B. So, R_3 is not a relation from A to B.

14) If X = {–5, 1, 3, 4} and Y = {a, b, c}, then which of the following relations are functions from X to Y ?

R_2 = {(–5, b), (1, b), (3, a),(4, c)}

Answer : R_2 = {(–5, b), (1, b), (3, a),(4, c)}

Arrow diagram of R_2 is shown in Fig.1.15(b).

R_2 is a function as each element of x has a unique image in Y.

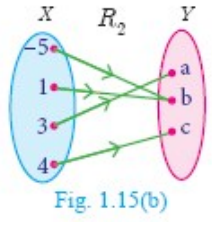


Fig. 1.15(b)

15) Let A = {1, 2, 3, 4} and B = {a, b, c}.

Which of the following are relations from A to B?

(i) { (1, b), (1, c), (3, a), (4, b) }

(ii) { (1, a), (b, 4), (c, 3) }

(iii) { (1, a), (a, 1), (2, b), (b, 2) }

Answer : Let A = {1, 2, 3, 4} and B = {a, b, c} Relations from A to B

(i) { (1, b), (1, c), (3, a), (4, b) }

16) Let A and B be two non-empty finite sets. Then which one among the following two collection is large?

(i) The number of relations between A and B.

(ii) The number of functions between A and B.

Answer : (i) The number of relations between A and B is large.

(ii) Number of relation is always greater than number of functions.

17) Is the relation representing the association between planets and their respective moons a function?

Answer : Yes.

18) Can there be a one to many function?

Answer : There cannot be a one to many function as the elements in Co-domain should have only one preimage in the domain.

19) Is an identity function one-one function?

Answer : Yes. It is one - to - one function

20) If f(x) = 2x - 3 and f(x) = x, then find x

Answer : f(x) = 2x - 3 = x 2x - x = 3 x = 3

21) Let A = {0, 1, 2, 3} and B = {1, 3, 5, 7, 9} be two sets. Let f: A $\rightarrow$B be a function given by f(x) = 2x + 1. Represent this function as a set of ordered pairs.

Answer : A = {1,2,3},B = {1,3,5, 7,9}

f(x) = 2x + 1

f(0)) = 2(0) + 1 = 1

f(1) = 2(1) + 1=3

f(2) = 2(2) + 1 = 5

f(3) = 2(3) + 1 = 7

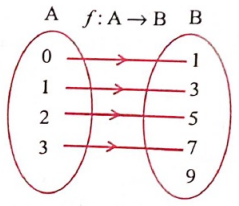
(i) A set of ordered pairs.

f = {(0, 1), (1, 3), (2, 5), (3, 7)}

(ii) A table

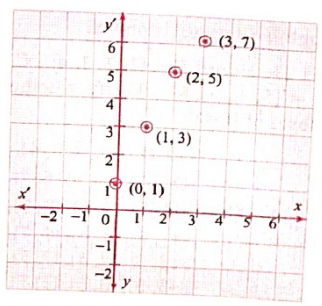
x	0	1	2	3
f(x)	1	3	5	7

(ii) An arrow diagram



(iv) A Graph f = $\{(x, f(x)/x \in A\}$

= {(0, 1), (1, 3), (2, 5), (3, 7)}



22) If G = {7,8} and H = {5,4,2} find, G x H and H x G.

Answer : G x H = {7,8} x {5,4,2}

= {(7,5),(7,4),(7,2), (9,5), (9,4), (8,2)}

H x G = {5,4,2} x {7,8}

= {(5,7), (5, 8), (4,7), (4, 8), (2,7), (2, 8)}

23) If $A = \{-1, 1\}$, find $A \times \mathbf{A} \times \mathbf{A}$

Answer : $A \times A = \{-1, 1\} \times \{-1, 1\}$

$= \{(-1, -1), (-1, 1), (1, -1), (1, 1)\}$

$A \times A \times A = \{(-1, -1), (-1, 1), (1, -1), (1, 1)\} \times \{-1, 1\}$

$= \{(-1, -1, -1), (-1, -1, 1), (-1, 1, -1), (-1, 1, 1), (1, -1, -1), (1, -1, 1), (1, 1, -1), (1, 1, 1)\}$

24) If A - {1,2,3} and B = {a, b, c} then do

i) {(1, a), (2,b), (2, c), (3, c)} and

ii) {(2, b), (3, b)} represent a function A $\rightarrow$ B?

Answer : (i) The two ordered pairs (2, b) and, (2,c) have the same first co-ordinate. Therefore, (1, a), (2, b),(2,c), (3, c) does not represent a function A$\rightarrow$ B.

(ii) Since one element 1 of A is not associated with some element of B. i.e., 1 is not the first co-ordinate of any ordered pair. So {(2, b), (3, b)} does not represent a function from A$\rightarrow$ B.

25) Let A = {1,2,3} and B = {4,5} Let R = {(1,4),(1, 5), (2,4), (3, 5)}. Is 'f' a function from A into B?

Answer : The first elements of two ordered pairs (1,4) and (1, 5) in 'f' are same.

Therefore f = {(1, 4), (1, 5), (2,4),(3, 5)} is not a function from A to B

26) Given $f(x) = x^2 + 6$ and $g(x) = 2x + 1$, find $(g \circ f)(2)$

Answer : $g \circ f = g[f(x)]$

$= g\left[x^2 + 6\right]$

$= 2\left(x^2 + 6\right) + 1$

$= 2x^2 + 12 + 1 = 2x^2 + 13$

Now, $(g \circ f)(2) = 2(2)^2 + 13$

$= 2(4) + 13 = 8 + 13 = 21$

27) A relation R is givenby the set $\{(x, y)/y = x^2 + 3\, x \in \{0, 1, 2, 3, 4, 5\}\}$ Determine the domain and range

Answer : $\{(x, y)/y = x^2 + 3, x \in \{0, 1, 2, 3, 4, 5\}$

For $x = 0$,

$y = 0^2 + 3 = 3$

For $x = 1$,

$y = 1^2 + 3 = 4$

For $x = 2$,

$y = 2^2 + 3 = 7$

For $x = 3$,

$y = 3^2 + 3 = 12$

For $x = 4$,

$y = 4^2 + 3 = 19$

For $x = 5$,

$y = 5^2 + 3 = 28$

Domain = {0, 1,2, 3, 4, 5}

Range = {3, 4,7,12,19,28}

28) Let A = {1,2, 3, ... 100} and R be the relation defined as "is cube of" on A. Find the domain and range of R.

Answer : Let $\mathrm{A} = \{1, 2, 3, \ldots 100\}$

$\mathrm{R} \rightarrow$ is cube of A

$1 \in \mathrm{A}$

$1^3 = 1 \in \mathrm{A})(1, 1)$

$2 \in A$

$2^3 = 8 \in \mathrm{A}(2, 8)$

$3 \in A$

$3^3 = 27 \in \mathrm{A}$

$4 \in A(3, 27)$

$4^3 = 64 \in \mathrm{A}$

$5 \in A(4, 64)$

$5^3 = 125 \in \mathrm{A}$

(Domain = {1, 2,3,4}

Range = {(1, 1), (2, 8), (3,27), (4,64)}

29) If R = {(x, -2), (-5, y)} represents the identity function, find the values of x and y,

Answer : R = {(x, -2.) (-5,y)}R

Given the function R is identity

therefore x = -2

and y = -5

30) Prove that the following functions are One- One or not a One - One. (By Using horizontal test line).

Answer : Yes. It is one - to - one function.