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Answers Key:

5 Marks

1. f (x) = 2x - 3
   (i) $\frac{f(0)+f(1)}{2} = \frac{[2(0)-3]+[2(1)-3]}{2}$
   $= \frac{0-3+2-3}{2} = \frac{2-6}{2}$
   $= \frac{-4}{2} = -2$
   (ii) Given f (x) = 0
   2x- 3 = 0
   2x = 3
   x = 3/2
   (iii) Given f (x) = 1
   2x - 3 = x
   2x -.x = 3
   x = 3
   (iv) Given f(x) = f(1 - x)
   2x - 3 = 2(1 - x)-3
   2x-3 = 2 - 2x - 3
   2x + 2x = 2 - 3 + 3
   4x = 2
   x = 2/4.= 1/2
2. A = {1, 2, 3, 4} ; B = {2, 5, 8,11,14}; f(x) = 3x - 1
   f(1) = 3(1) –1 = 3 – 1 = 2; f(2) = 3(2) –1 = 6 –1 = 5
   f(3) = 3(3) –1 = 9 –1 = 8; f(4) = 4(3) –1 = 12 –1 = 11
   (i) Arrow diagram
   Let us represent the function f :A ⟶ B by an arrow diagram

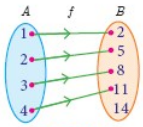


Fig. 1.19

   (ii) Table form
   The given function f can be represented in a tabular form as given below

x	1	2	3	4
f(x)	2	5	8	11

   (iii) Set of ordered pairs
   The function f can be represented as a set of ordered pairs as
   f = {(1,2),(2,5),(3,8),(4,11)}
   (iv) Graphical form
   In the adjacent xy -plane the points
   (1,2), (2,5), (3,8), (4,11) are plotted (Fig.1.20).

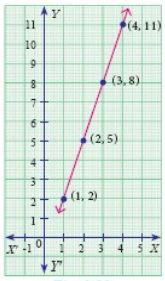


Fig. 1.20

3. A = {1, 2),B = {1, 2, 3, 4}, C = {5, 6},D = {5, 6, 7, 8}
   A x C = {1, 2} x {5, 6}
   $A \times C = \{(1,5),(1,6),(2,5),(2,6)\}$
   B x D = { 1, 2, 3, 4} x { 5, 6, 7, 8}
   $B \times D = \{(1,5),(1,6),(1,7),(1,8)(2,5),(2,6),(2,7),(2,8)(3,5),(3,6),(3,7),(3,8)(4,5),(4,6),(4,7),(4,8)\}$
   (A x C) is a subset of (B x D)
4. $A - B = \{1,2;4\} - \{2,4,5\} = \{1\}$
   $B - C = \{2,4,5\} - \{2,5\} = \{4\}$
   $\therefore\ (A - B) \times (B - C) = \{1\} \times \{4\} = \{(1,4)\}$

2 Marks

5. 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)}
6. The function f : N ⟶ N is defined by f(x) = 3x + 2
   (i) If x = 1, f(1) = 3(1) + 2 = 5
   If x = 2, f(2) = 3(2) + 2 = 8
   If x = 3, f(3) = 3(3) + 2 = 11
   The images of 1, 2, 3 are 5, 8, 11 respectively.
   (ii) If x is the pre-image of 29, then f(x) = 29, Hence 3x + 2 = 29
   3x = 27 ⇒ x = 9
   Similarly, if x is the pre-image of 53, then f(x) = 53. Hence 3x + 2 = 53
   3x = 51 ⇒ x = 17
   Thus the pre-images of 29 and 53 are 9 and 17 respectively.
   (iii) Since different elements of N have different images in the co-domain, the function f is a one-one function.
   The co-domain of f is N.
   But the range of f = {5, 8, 11, 14, 17,....} is a proper subset of N.
   Therefore f is not an onto function. That is, f is an into function.
   Thus f is a one-one and into function.
7. Since A x A has 9 elements,
   A would have 3 elements
   A x A contains (- 1, 0) and (0, 1)
   -1, 0 ∈ A
   Similarly (0, 1) is in A x A
   So, 0,1 ∈ A
   From (1) and (2). = -1, 0, 1 ∈ A
   A = {-1, 0 , 1}
   A x A = {-1, 0, 1} x {1, 0, -1}
   = {(-1, 1), (-1, 0), (-1, -1), (0, -1),(0,0), (0, 1), (1, -1), (1, 0),(1, 1)}
   The remaining elements of A x A are
   {(- 1, - 1), (- 1, 1), (0, - 1), (0, 0), (1, - 1), (1,0),(1, 1)}
8. h (x) is defined for all real values of 'x'.
   i.e., x ϵ R
9. $f(-3) = 3(-3) - 2 = -11$ as $-3 < 0$
   $f(0) = 1$ as $x = 0$
   $f(5) = 4(5) + 1 = 20 + 1 = 21$ as $x > 0$

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QUESTION BANK 365

Fill in the blanks

10. (☒) One element

Multiple Choice Question

11. (c) 3
12. (a) (A x C) ⊂ (B x D)
13. (c) {4,9,25,49,121}
14. (d) (3,-2)
15. (a) (8,6)
16. (c) One-to-one function
17. (a) 7
18. (d) quadratic
19. (b) $\{(x, y) : y = |x|, x, y \in R\}$