Relations and Functions: Chapter Introduction

Roll numbers and birthdays are both functions, but only roll numbers are one-one. The chapter classifies relations and functions and shows which functions can be reversed.

Name: Date: Score: ____ / 21

A. Fill in the blanks

1. A function gives every input exactly ____ output.

2. A function in which different inputs always give different outputs is called ____.

3. A function in which every element of the co-domain is an image is called ____.

4. A function that is both one-one and onto is called ____.

5. A relation that is reflexive, symmetric and transitive is an ____ relation.

B. True or False

6. Student → birthday is a function. True / False

7. Student → birthday is one-one. True / False

8. Every function has an inverse. True / False

9. "Is in the same class as" is an equivalence relation. True / False

C. Assertion and reason

10. Assertion (A): f(x) = x² on ℝ has no inverse.
Reason (R): f is not one-one on ℝ.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

11. Assertion (A): Roll-number assignment for 40 students using 1-40 is invertible.
Reason (R): It is one-one and onto.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

D. Choose the correct option

12. Which is not a function from students to numbers?

(a) student → roll number
(b) student → age
(c) student → phone numbers of all friends
(d) student → height in cm

Answer: _____

13. f: $\mathbb{R} \to \mathbb{R}$, $f(x) = x^2$ is:

(a) one-one
(b) onto
(c) many-one
(d) bijective

Answer: _____

14. f: $\mathbb{R} \to \mathbb{R}$, $f(x) = 2x + 3$ is:

(a) many-one
(b) bijective
(c) not onto
(d) not a function

Answer: _____

15. The relation "is the father of" on people is:

(a) reflexive
(b) symmetric
(c) transitive
(d) none of these

Answer: _____

E. Numerical problems

16. Find the inverse of $f(x) = 2x + 3$ on $\mathbb{R}$.

17. $A = \{1, 2, 3\}$. Is $R = \{(1,1), (2,2), (3,3), (1,2), (2,1)\}$ an equivalence relation?

18. Check whether f: $\mathbb{N} \to \mathbb{N}$, $f(n) = 2n$ is onto.

F. Short answer questions

19. Distinguish a relation from a function with an example.

20. Why is student → birthday a function but not one-one?

G. Match the columns

21. Match each item in Column A with the correct item in Column B.

Column A	Column B	Your answer
1. One-one	(a) One-one and onto	1 → ____
2. Onto	(b) Every element of B is used	2 → ____
3. Bijective	(c) Different inputs, different outputs	3 → ____
4. Equivalence	(d) Reflexive, symmetric, transitive	4 → ____

Detailed solutions

1. one

2. one-one

3. onto

4. bijective

5. equivalence

6. True. Each student has exactly one birthday.

7. False. Two students can share a birthday, so it is many-one.

8. False. Only bijective functions are invertible.

9. True. It is reflexive, symmetric and transitive.

10. (a) A function needs to be bijective to be invertible.

11. (a) A bijection has an inverse.

12. (c) student → phone numbers of all friends. One student can have many friends' numbers.

13. (c) many-one. $f(2) = f(-2) = 4$.

14. (b) bijective. Distinct x give distinct values and every real number is reached.

15. (d) none of these. No one is their own father; it is not symmetric or transitive.

16. Put $y = 2x + 3$; $x = (y - 3) / 2$. **Answer: $f^{-1}(y) = (y - 3) / 2$**

17. Reflexive: (1,1), (2,2), (3,3) $\in$ R ✓; Symmetric: (1,2) and (2,1) $\in$ R ✓; Transitive: (1,2),(2,1) give (1,1) $\in$ R; (2,1),(1,2) give (2,2) $\in$ R ✓. **Answer: Yes, it is an equivalence relation**

18. Images are 2, 4, 6, …; 1 is not an image. **Answer: Not onto (but one-one)**

19. A relation is any set of pairs linking A to B; a function is a relation in which every element of A has exactly one image. Student → friends is a relation, student → roll number is a function.

20. Each student has exactly one birthday (function), but two different students can have the same birthday, so different inputs can share an output (many-one).

21. 1 → (c), 2 → (b), 3 → (a), 4 → (d). Each type matches its defining property.