

Relations and Functions — Assignment 1

Class 12 Maths · Topic-wise question bank covering every concept of the chapter · Narayan Gurukul Academy

Instructions: (1) Attempt all questions. This worksheet walks through every concept of the chapter, topic by topic.
 (2) The interactive MCQ version of these questions (with instant answer reveal) is available on the notes page.
 (3) Universal values: $g = 10 \text{ m/s}^2$ unless stated. Give answers with correct SI units.

Types of Relations

MCQ Questions (choose the correct option)

- A relation R on a set A is reflexive if
 - $(a, a) \in R$ for all $a \in A$
 - $(a, b) \in R \implies (b, a) \in R$
 - $(a, b), (b, c) \in R \implies (a, c) \in R$
 - $R = A \times A$
- A relation R is symmetric if
 - $(a, b) \in R \implies (b, a) \in R$
 - $(a, a) \in R$
 - $(a, b), (b, c) \in R \implies (a, c) \in R$
 - $R = A \times A$
- A relation R is transitive if
 - $(a, b), (b, c) \in R \implies (a, c) \in R$
 - $(a, b) \in R \implies (b, a) \in R$
 - $(a, a) \in R$
 - R is empty
- A relation that is reflexive, symmetric and transitive is called
 - an equivalence relation
 - a function
 - a partial order
 - an empty relation

1 Mark Questions

- Define a reflexive relation.
- Define a symmetric relation.
- What is an equivalence relation?

2 Mark Questions

- Show that the relation $R = \{(1, 1), (2, 2), (1, 2), (2, 1)\}$ on $A = \{1, 2\}$ is an equivalence relation.
- Check whether the relation 'is less than' on the set of integers is reflexive, symmetric or transitive.

3 Mark Questions

- Show that the relation R on the set of integers defined by $R = \{(a, b) : a - b \text{ is divisible by } 5\}$ is an equivalence relation.
- Prove that the relation 'is parallel to' on the set of lines in a plane is an equivalence relation.

Types of Functions

MCQ Questions (choose the correct option)

1. A function $f : A \rightarrow B$ is one-one (injective) if
 - (A) distinct elements of A have distinct images
 - (B) every element of B has a pre-image
 - (C) f is constant
 - (D) $A = B$
2. A function $f : A \rightarrow B$ is onto (surjective) if
 - (A) every element of B is the image of some element of A
 - (B) distinct inputs give distinct outputs
 - (C) f is constant
 - (D) the range is a proper subset of B
3. A function that is both one-one and onto is called
 - (A) bijective
 - (B) injective only
 - (C) surjective only
 - (D) constant
4. The function $f : \mathbb{R} \rightarrow \mathbb{R}$, $f(x) = x^2$, is
 - (A) neither one-one nor onto
 - (B) one-one and onto
 - (C) one-one only
 - (D) onto only

1 Mark Questions

1. Define a one-one function.
2. Define an onto function.
3. What is a bijective function?

2 Mark Questions

1. Check whether $f : \mathbb{R} \rightarrow \mathbb{R}$, $f(x) = 2x$ is one-one and onto.
2. Check whether $f : \mathbb{R} \rightarrow \mathbb{R}$, $f(x) = |x|$ is one-one.

3 Mark Questions

1. Show that $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = 3x + 2$ is bijective.
2. Show that $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x^2$ is neither one-one nor onto.

Composition and Invertible Functions

MCQ Questions (choose the correct option)

1. The composition $(f \circ g)(x)$ means
 - (A) $f(g(x))$
 - (B) $g(f(x))$
 - (C) $f(x) \circ g(x)$
 - (D) $f(x) + g(x)$
2. A function f is invertible if it is

- (A) bijective
 - (B) injective only
 - (C) surjective only
 - (D) constant
3. If f is invertible, then f^{-1} satisfies
- (A) $f^{-1}(f(x)) = x$
 - (B) $f^{-1}(f(x)) = 0$
 - (C) $f^{-1}(f(x)) = f(x)$
 - (D) $f^{-1} = f$
4. For $f(x) = 2x + 3$, the inverse $f^{-1}(x)$ is
- (A) $(x - 3)/2$
 - (B) $2x - 3$
 - (C) $(x + 3)/2$
 - (D) $x/2 + 3$

1 Mark Questions

1. Define the composition $f \circ g$.
2. When is a function invertible?
3. Find f^{-1} if $f(x) = 2x + 3$.

2 Mark Questions

1. If $f(x) = x + 2$ and $g(x) = 3x$, find $(f \circ g)(x)$.
2. Find the inverse of $f(x) = (x - 1)/2$.

3 Mark Questions

1. If $f(x) = 2x + 1$ and $g(x) = x^2$, find $(g \circ f)(x)$ and $(f \circ g)(x)$.
2. Find the inverse of $f(x) = (3x + 2)/(x - 1)$, $x \neq 1$.

Binary Operations

MCQ Questions (choose the correct option)

1. A binary operation $*$ on a set A is commutative if
 - (A) $a * b = b * a$
 - (B) $a * (b * c) = (a * b) * c$
 - (C) $a * e = a$
 - (D) $a * a = a$
2. A binary operation $*$ is associative if
 - (A) $a * (b * c) = (a * b) * c$
 - (B) $a * b = b * a$
 - (C) $a * e = a$
 - (D) $a * a = a$
3. An element e is the identity for $*$ if
 - (A) $a * e = e * a = a$
 - (B) $a * e = e$
 - (C) $a * a = e$

(D) $a * b = b * a$

4. On the set of integers, addition is

(A) commutative and associative

(B) only commutative

(C) only associative

(D) neither

1 Mark Questions

1. Define a commutative binary operation.
2. Define an associative binary operation.
3. What is an identity element for a binary operation?

2 Mark Questions

1. Check whether the operation $a * b = a + b - 2$ on integers is commutative.
2. Find the identity element for the operation $a * b = a + b - 2$ on integers.

3 Mark Questions

1. Show that the operation $a * b = a + b - ab$ on the set of rationals is commutative and associative.
2. On the set of positive rationals, define $a * b = ab/2$. Find the identity element and check associativity.