ProofSpace Comprehension Quiz

Relations

Equivalence Relations

1 Which of the following relations on $A = \{1, 2, 3\}$ is transitive?

(a) $R = \{(1, 1), (2, 2), (3, 2), (2, 3)\}$

(b) $R = \{(1, 1), (2, 2), (3, 2), (3, 1)\}$

(c) $R = \{(1, 1), (1, 2), (1, 3), (3, 2), (2, 3)\}$

(d) None of the above options.

2 Which of the following relations on $A = \{1, 2, 3\}$ is reflexive?

(a) $R = \{(1, 1), (2, 2), (3, 2), (2, 3)\}$

(b) $R = \{(1, 1), (2, 2), (3, 2), (3, 1)\}$

(c) $R = \{(1, 1), (1, 2), (1, 3), (3, 2), (2, 3)\}$

(d) None of the above options.

3 Which of the following relations on $A = \{1, 2, 3\}$ is symmetric?

(a) $R = \{(1, 1), (2, 2), (3, 2), (2, 3)\}$

(b) $R = \{(1, 1), (2, 2), (3, 2), (3, 1)\}$

(c) $R = \{(1, 1), (1, 2), (1, 3), (3, 2), (2, 3)\}$

(d) None of the above options.

4 Which of the following relations on $A = \{1, 2, 3\}$ is an equivalence relation?

(a) $R = \{(1, 1), (2, 2), (3, 2), (2, 3)\}$

(b) $R = \{(1, 1), (2, 2), (3, 2), (3, 1)\}$

(c) $R = \{(1, 1), (1, 2), (1, 3), (3, 2), (2, 3)\}$

(d) None of the above options.

5   Consider the relation on $\mathbb{Z}$ given by:

> $(x, y) \in R$ if and only if there exists $z \in \mathbb{N}$ such that $x = y + z$.

For the questions below, provide a brief justification (you needn't provide a formal proof).

a) Is $(1, -5)$ in R? Why or why not?

b) Is R transitive? Why or why not?

c) Is R symmetric? Why or why not?

d) Is R reflexive? Why or why not?