

Islington College**Module: MA4001NI: Logic and Problem Solving**

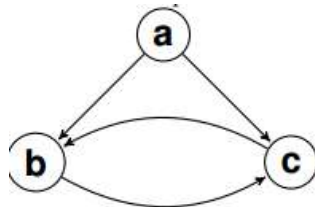
- 1) Let a set be $A = \{x : x \in \mathbb{Z}^+, x \leq 3\}$ and R_1 be the relation given
 - (a) Present the relation R_1 in arrow diagram.
 - (b) Draw a directed graph (di-graph) representation of R_1 .
 - (c) Determine whether the relation R_1 on set A are equivalence relation or not.

- 2) Let a set be $A = \{x : x \in \mathbb{Z}^+, x \leq 3\}$ and R_2 be the relation given as:
 $R_2 = \{(1,2), (2,1), (3,2), (2,3)\}$;
 - (a) Draw a matrix representation of R_2 .
 - (b) Present the relation R_2 in arrow diagram.
 - (c) Draw a di-graph representation of R_2 .
 - (d) Determine whether the relation R_2 on set A are equivalence relation or not.

- 3) Represent each of the given relations below on set $\{1, 2, 3\}$ by matrix and the directed graphs (Di-graphs).
 - (a) $R_1 = \{(1, 2), (2, 1), (2, 2), (3, 3)\}$
 - (b) $R_2 = \{(1, 1), (1, 2), (1, 3), (2, 2), (2, 3), (3, 3)\}$
 - (c) $R_3 = \{(1, 1), (1, 2), (1, 3), (2, 1), (2, 3), (3, 1), (3, 2), (3, 3)\}$

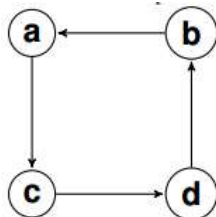
- 4) List the ordered pairs in the relations represented by the directed graph.

(a)



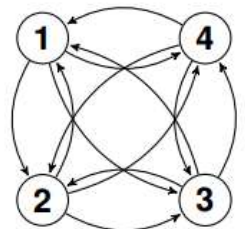
Also, determine whether the relation is reflexive, irreflexive, symmetric, antisymmetric, and transitive.

(b)



Also, determine whether the relation is reflexive, irreflexive, symmetric, antisymmetric, and transitive.

(c)



Also, determine whether the relation is reflexive, irreflexive, symmetric, antisymmetric, and transitive.

- 5) For $f(x) = 2x - 2$ and $g(x) = -x^2 + 1$, find the composite function defined by $(f \circ g)(x)$ and $(g \circ f)(x)$.
- 6) Find the inverse of each functions.
 - (a) $f(x) = \frac{1}{x} - 2$
 - (b) $g(x) = \sqrt[3]{x} - 3$
 - (c) $h(x) = \frac{7x+18}{2}$
- 7) Given that $f(x) = x^2 + 7$ and $g(x) = x - 3$, Find $f \circ g(x)$ and $g \circ f(x)$.
- 8) If $f(x) = 5x$, $g(x) = \frac{2x}{3-4x}$, find the values of $g \circ f^{-1}(x)$ and $(g \circ f)^{-1}(x)$.
- 9) Arrangements containing 6 different letters from the word **AMPLITUDE** are to be made.
 - a) Find the number of 6-letter arrangements if there are no restrictions,
 - b) The number of 6-letter arrangements which start with the letter P and end with the letter U.
10. An ordinary fair die is rolled at random. Find the probability of getting.
 - a) a '3'.
 - b) not a '3'
 - c) greater than 4 or less than 2.
 - d) 1 or 3 or 6
 - e) not a prime number
 - f) Number less than 1.
11. Three unbiased coins are tossed simultaneously. List the sample space and find the probability getting,
 - a) exactly all tails.
 - b) at least one tail,
 - c) one tail,

- d) at most one tail,
- e) at most two tails,
- f) exactly one tail or two tails.