جامـــــعة المـــــستـقبـل
AL MUSTAQBAL UNIVERSITY

كلية العلـــوم
قـســـــــم علوم الذكاء الاصطناعي

المحاضرة الثامنة

المادة : Discrete Structures
المرحلة : الاولى/ الكورس الثاني
اسم الاستاذ: م.د. رياض حامد سلمان

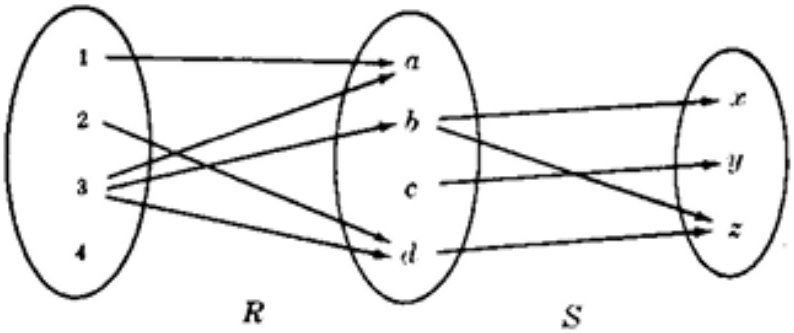
Composition of relations:

When a relation is formed over stages such that let R be one relation defined from set X to Y, and S be another relation defined from set Y to Z,
then a relation W denoted by R ° S is a composite relation, i.e
$W = R \circ S = \{(x,z) : \exists\, x \in X$ for which $(x,y) \in R$ and $(y,z) \in S\}$
Composite relation W can also represented by a diagram.

Example :
let $A = \{1,2,3,4\}$
$B = \{a, b, c, d\}$
$C = \{x, y, z\}$
And
$R = \{(1,a),(2,d),(3,a),(3,d),(3,b)\}$
$S = \{(b,x),(b,z),(c,y),(d,z)\}$
Find $R \circ S$?

Solution :

1) The first way by arrow form



There is an arrow (path) from 2 to d which is followed by an arrow from d to z

$2Rd$ and $dSz \Rightarrow 2(R \circ S)\, z$
And $3(R \circ S)x$ and $3(R \circ S)z$

So **$R \circ S = \{(3,x),(3,z),(2,z)\}$**

Home work:

Consider the following relations on the set $A = \{1, 2, 3\}$:

$R = \{(1, 1), (1, 2), (1, 3), (3, 3)\}$,
$S = \{(1, 1)(1, 2), (2, 1)(2, 2), (3, 3)\}$,
$T = \{(1, 1), (1, 2), (2, 2), (2, 3)\}$
$\varnothing$ = empty relation
$A \times A$ = universal relation

- Determine whether or not each of the above relations on A is:
  (1) reflexive;
  (2) symmetric;
  (3) transitive;
  (4) antisymmetric.
  (5) Irreflexive
  (6) compatibility
  7) Partial ordered relation