Session 06: Digraphs and Relations

6A.1 In-degree and out-degree

6A.2

6A.3

Relations

6B.1 Equivalence RElations (6.2.2)

6B.2

6B.3 Relations and Cartesian Products (6.3)

Reflexive :

Symmetric :

Transitive :

Anti-symmetric :

Equivalence Relation :

Partial Order :

Order :

Directed Graphs

A directed graph or digraph is a graph, or set of nodes connected by edges, where the edges have a direction associated with them. In formal terms a digraph is a pair $G = (V, A)$(sometimes $G = (V, E)$) of a set V, whose elements are called vertices or nodes, and a set A of ordered pairs of vertices, called arcs, directed edges, or arrows (and sometimes simply 'edges' with the corresponding set named E instead of A).

Recurrence Relation

In mathematics, a recurrence relation is an equation that recursively defines a sequence, once one or more initial terms are given: each further term of the sequence is defined as a function of the preceding terms. The term difference equation sometimes (and for the purposes of this article) refers to a specific type of recurrence relation. However, "difference equation" is frequently used to refer to any recurrence relation.

2008 Zone B question 7

Given the set $S = \{g, e, r, b, i, l\}$.

- Describe how each subset of S can be represented by using a 6 digit binary string
- Write down the string corresponding to the subset $\{g, r, l\}$ and the subset corresponding to the string 010101.
- What is the total number of subsets of S?

- A relation R from a set A to a set B is a subset of the **cartesian product** A x B.
- Thus R is a set of **ordered pairs** where the first element comes from A and the second element comes from B i.e. (a, b)
- If $(a, b) \in R$ we say that a is related to b and write aRb.
- If $(a, b) \notin R$, we say that a is not related to b and write aRb. CHECK
- If R is a relation from a set A to itself then we say that "R is a relation on A".
- Let $A = \{2, 3, 4, 6\}$ and $B = \{4, 6, 9\}$
- Let R be the relation from A to B defined by $\boldsymbol{xRy}$ if x divides y exactly.

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- Let R be the relation from A to B defined by $\boldsymbol{xRy}$ if x divides y exactly.
- Then
$$R = (2, 4), (2, 6), (3, 6), (3, 9), (4, 4), (6, 6)$$