

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

# Relational Mapping Properties (Archery)



Albert R. Meyer

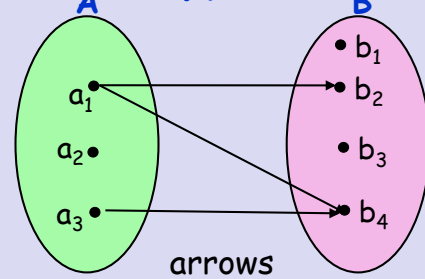
February 22, 2012

lec 3W.1

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

## Binary relation $R$ from $A$ to $B$

domain  $A$   $R$  codomain  $B$



Albert R. Meyer

February 22, 2012

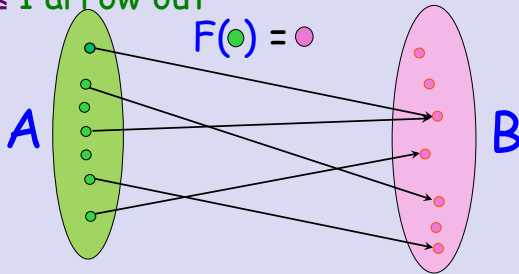
lec 3W.2

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

## function archery

$\leq 1$  arrow out

$$F(\bullet) = \bullet$$



Albert R. Meyer

February 22, 2012

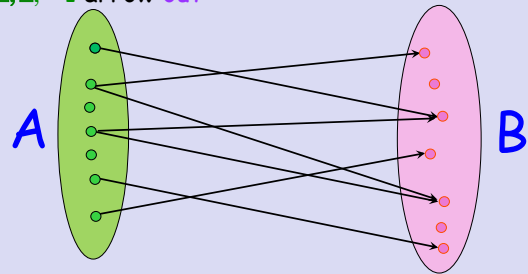
lec 3W.3

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

## archery on relations

$\leq, \geq, = 1$  arrow out

$\leq, \geq, = 1$  arrow in



Albert R. Meyer

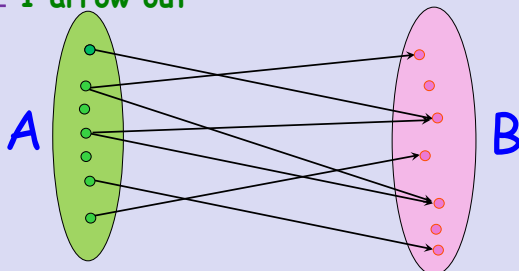
February 22, 2012

lec 3W.4

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

## total relation archery

$\geq 1$  arrow out



Albert R. Meyer

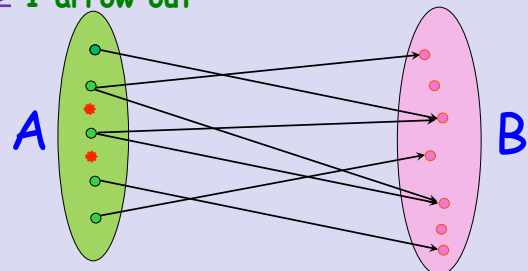
February 22, 2012

lec 3W.5

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

## total relation archery

$\geq 1$  arrow out



Albert R. Meyer

February 22, 2012

lec 3W.6

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

### total relation archery

$\geq 1$  arrow out

Albert R. Meyer      February 22, 2012      lec 3W.7

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

### total relation

R is total iff

$$A = R^{-1}(B)$$

Albert R. Meyer      February 22, 2012      lec 3W.8

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

### total & function archery

exactly 1 arrow out

$F(\bullet) = \bullet$

Albert R. Meyer      February 22, 2012      lec 3W.9

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

$$g: \mathbb{R} \times \mathbb{R} \rightarrow \mathbb{R}$$

$$g(x, y) ::= \frac{1}{x - y}$$

domain(g) = all pairs of reals  
 codomain(g) = all reals

But g is **not total**:  
 $g(r, r)$  not defined

Albert R. Meyer      February 22, 2012      lec 3W.10

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

$$g_0: D \rightarrow \mathbb{R}$$

$$g_0(x, y) ::= \frac{1}{x - y}$$

where  $D ::= \mathbb{R}^2 - \{(x, y) \mid x = y\}$

$g_0, g$  have the  
 same graph, different domains

$g_0$  is **total**

Albert R. Meyer      February 22, 2012      lec 3W.11

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

### surjection archery

$\geq 1$  arrow in

Albert R. Meyer      February 22, 2012      lec 3W.12

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

## surjection archery

$\geq 1$  arrow in

Albert R. Meyer      February 22, 2012      lec 3W.13

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

## surjection archery

$\geq 1$  arrow in

Albert R. Meyer      February 22, 2012      lec 3W.14

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

## surjection

R is a surjection iff

$$R(A) = B$$

Albert R. Meyer      February 22, 2012      lec 3W.15

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

## injection archery

$\leq 1$  arrow in

Albert R. Meyer      February 22, 2012      lec 3W.16

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

## injection archery

$\leq 1$  arrow in

Albert R. Meyer      February 22, 2012      lec 3W.17

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

## injection archery

$\leq 1$  arrow in

Albert R. Meyer      February 22, 2012      lec 3W.18

