

# Practice Problems 2 Solutions

Be sure to provide an answer for each question. You may work with other students as well as use your notes, the book, and the internet. Do make sure you understand how to solve the problems and answer the questions, as similar ones may appear on the exams.

1. Given the following sets, generate the requested Cartesian product.

$$A = \{1,3,5,7\}$$

$$B = \{2,4,6,8\}$$

$$C = \{1,5\}$$

- a.  $A \times B$

$$\{(1,2),(1,4),(1,6),(1,8),(3,2),(3,4),(3,6),(3,8),(5,2),(5,4),(5,6),(5,8), (7,2),(7,4),(7,6),(7,8)\}$$

- b.  $C \times A$

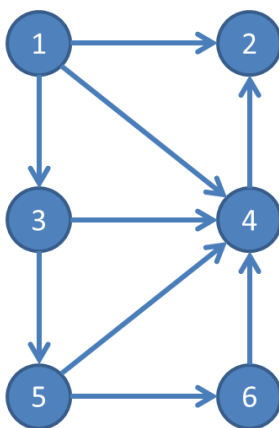
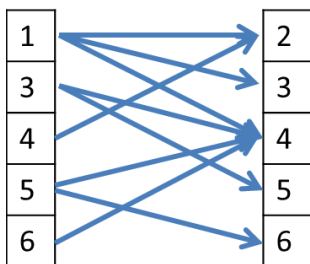
$$\{(1,1),(1,3),(1,5),(1,7),(5,1),(5,3),(5,5),(5,7)\}$$

- c.  $B \times C$

$$\{(2,1),(2,5),(4,1),(4,5),(6,1),(6,5),(8,1),(8,5)\}$$

2. Given the following set, generate a graphical depiction, an arrow diagram, and a matrix representation of the set. Additionally, provide the current domain and codomain.

$$\{(1,2),(1,3),(1,4),(3,4),(3,5),(4,2),(5,4),(5,6),(6,4)\}$$



	2	3	4	5	6
1	X	X	X		
3			X	X	
4	X				
5			X		X
6			X		

**Current Domain:**  $\{1,3,4,5,6\}$

**Current Codomain:**  $\{2,3,4,5,6\}$

3. Given the following relations and their domain and range, first determine whether the relation is a function or not. If it is a function, determine whether it is a partial or total function and then list all properties of functions and all properties of relations that apply to it. If it is not a function, only list all properties of relations that apply to it.

a.  $\{(-2,2),(-1,1),(1,1),(2,2)\}$

Domain:  $\{-2,-1,0,1,2\}$ , Range:  $\{1,2\}$

**Partial function, surjection, anti-symmetric**

b.  $\{(1,2),(2,4),(3,6),(4,8),(5,10),(6,12)\}$

Domain:  $\{1,2,3,4,5,6\}$ , Range:  $\{2,4,6,8,10,12\}$

**Total function, injection, surjection, bijection, anti-reflexive, anti-symmetric**

c.  $\{(1,1),(2,4),(3,9),(4,16)\}$

Domain:  $\mathbb{Z}$ , the set of all integers, Range:  $\mathbb{Z}$ , the set of all integers

**Partial function, anti-symmetric**

d.  $\{(1,2),(1,3),(1,4),(1,5),(2,2),(2,3),(2,4),(2,5),(3,3),(4,3),(4,4),(4,5),(5,5)\}$

Domain:  $\{1,2,3,4,5\}$ , Range:  $\{2,3,4,5\}$

**Transitive, anti-symmetric**

e.  $\{(1,1),(1,2),(1,3),(2,1),(2,2),(3,1),(3,3),(3,4),(4,3),(4,4)\}$

Domain:  $\{1,2,3,4\}$ , Range:  $\{1,2,3,4\}$

**Symmetric, reflexive**

f.  $\{(1,1),(1,2),(2,1),(2,2),(3,3),(3,4),(4,3),(4,4)\}$

Domain:  $\{1,2,3,4\}$ , Range:  $\{1,2,3,4\}$

**Symmetric, reflexive, transitive, equivalence**