# Homework Assignment 3

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# 1   Section-2.1 Sets

## 1.1   Problem 1

List the members of these sets.

- a) $[x|x$ is a real number such that $x^2 = 1]$

- b) $[x|x$ is a positive integer less than 12]

- c) $[x|x$ is the square of an integer and $x < 100]$

- d) $[x|x$ is an integer such that $x^2 = 2]$

## 1.2   Problem 1 Solution

The Member Sets are as follows:

- a) $x = [-1, 1]$

- b) $x = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11]$

- c) $x = [0, 1, 4, 9, 16, 25, 36, 49, 64, 81]$

- d) no solution

## 1.3   Problem 2

Use set builder notation to give a description of each of these sets.

- a) [0, 3, 6, 9, 12]

- b) [3,2,1, 0, 1, 2, 3]

- c) [m, n, o, p]

## 1.4   Problem 2 Solution

Set Builder Notation solutions are as follows:

- a)

- b)

- c)

## 1.5   Problem 5

Determine whether each of these pairs of sets are equal.

- a) [1, 3, 3, 3, 5, 5, 5, 5, 5] and [5, 3, 1]

- b) [[1]] and [1, [1]]

- c) [∅] and ∅

## 1.6   Problem 5 Solution

- a) [1, 3, 3, 3, 5, 5, 5, 5, 5] and [5, 3, 1] are equal.

- b) [[1]] and [1, [1]] are not equal.

- c) $[\emptyset]$ and $\emptyset$ are not equal.

## 1.7 Problem 6

Suppose that A = [2, 4, 6], B = [2, 6], C = [4, 6], and D = [4, 6, 8]. Determine which of these sets are subsets of which other of these sets.

## 1.8 Problem 6 Solution

B = [2, 6] is a subset of A = [2, 4, 6]

C = [4, 6] is a subset of A = [2, 4, 6], and, D = [4, 6, 8]

## 1.9 Problem 7

For each of the following sets, determine whether 2 is an element of that set.

- a) $[x \in R | x$ is an integer greater than 1]
- b) $[x \in R | x$ is the square of an integer]
- c) [2,[2]]
- d) [[2],[[2]]]
- e) [[2],[2,[2]]]
- f ) [[[2]]]

## 1.10 Problem 7 Solution

- a) 1 < 2, therefore 2 is an element of the set.
- b) The square root of 2 is not an integer, therefore 2 is not an element of the set.
- c) 2 is an element of the set.
- d) 2 is not an element of the set.
- e) 2 is not an element of the set.
- f ) 2 is not an element of the set.

## 1.11    Problem 11

Determine whether each of these statements is true or false.

- a) $x \in [x]$

- b) $[x] \subset [x]$

- c) $[x] \in [x]$

- d) $[x] \in [[x]]$

- e) $\emptyset \subset [x]$

- f ) $\emptyset \in [x]$

## 1.12    Problem 11 Solution

- a) $x \in [x]$ is true, $x$ is an element within the set.

- b) $[x] \subset [x]$ is true, every set is a subset within itself.

- c) $[x] \in [x]$ is false, a set can not belong to itself.

- d) $[x] \in [[x]]$ is true, as the set exists within the set.

- e) $\emptyset \subset [x]$ is true, every set posseses within it an empty set.

- f ) $\emptyset \in [x]$ is false, an empty set can not be considered an element of a set.

## 1.13    Problem 12

Use a Venn Diagram to illustrate the subset of odd integers in the set of all positive integers not exceeding 10.
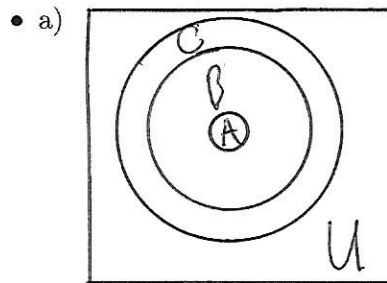
## 1.14    Problem 12 Solution

- a)
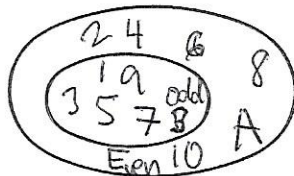
## 1.15  Problem 14

Use a Venn diagram to illustrate the relationship $A \subset B$ and $B \subset C$.

## 1.16  Problem 14 Solution

- a)



## 1.17  Problem 18

Find two sets A and B such that $A \in B$ and $A \subset B$.

## 1.18  Problem 18 Solution

$A = \emptyset$

If $B = [\emptyset, [\emptyset]]$, then $A \in B$ and $A \subset B$

## 1.19  Problem 20

What is the cardinality of each of these sets?

- a) $\emptyset$

- b) $[\emptyset]$

- c) $[\emptyset, [\emptyset]]$

- d) $[\emptyset, [\emptyset], [\emptyset, [\emptyset]]]$

## 1.20  Problem 20 Solution

- a) The cardinality of $\emptyset$ is $|\emptyset| = 0$

- b) The cardinality of $[\emptyset]$ is $|[\emptyset]| = 1$

- c) The cardinality of $[\emptyset, [\emptyset]]$ is $|[\emptyset, [\emptyset]]| = 2$

- d) The cardinality of $[\emptyset, [\emptyset], [\emptyset, [\emptyset]]]$ is $|[\emptyset, [\emptyset], [\emptyset, [\emptyset]]]| = 3$

## 1.21 Problem 21

Find the power set of each of these sets, where $a$ and $b$ are distinct elements.

- a) $[a]$

- b) $[a, b]$

- c) $[\emptyset, [\emptyset]]$

## 1.22 Problem 21 Solution

- a) The Power Set of $[a]$ is $[\emptyset, [a]]$

- b) The Power Set of $[a, b]$ is $[\emptyset, [a], [b], [a, b]]$

- c) The Power Set of $[\emptyset, [\emptyset]]$ is $[\emptyset, [\emptyset], [[\emptyset]], [\emptyset, [\emptyset]]]$

## 1.23 Problem 27

Let A $= [a, b, c, d]$ and B $= [y, z]$; Find:

- a) A x B

- b) B x A

## 1.24 Problem 27 Solution

- a) A x B $= [(a, y), (b, y), (c, y), (d, y), (a, z), (b, z), (c, z), (d, z)]$

- b) B x A $= [(y, a), (y, b), (y, c), (y, d), (z, a), (z, b), (z, c), (z, d)]$