Discrete Math

Lab 3

1) 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*}

(a) $\{x \in \mathbb{N} | x \text{ is a multiple of } 3 \text{ and } x \leq 12\}$

(b) $\{x \in \mathbb{Z} | -3 \leq x \leq 3\}$

(c) $\{x | x \text{ is a letter in the alphabet from } m \text{ to } p\}$

2) Which of the intervals **(0, 1)**, **(0, 1]**, **[0, 1)**, **[0, 1]** contain a) 0? b) 1?

a) [0, 1), [0, 1]
b) (0, 1], [0, 1]

- Closed interval $[a, b]$ __ "**Contain**"
- Open interval (a, b) __ "**Not contain**"

3) Determine whether each of these pairs of sets are equal.

a) ***{1, 3, 3, 3, 5, 5, 5, 5, 5}, {5, 3, 1}***

"The sets are equal."

b) ***{{1}}, {1, {1}}***

"The sets are not equal. Because the first set is a subset of the second set."

c) ∅, {∅}

"The sets are not equal. Because the first set is an element of the second set."

4) What is the cardinality of each of these sets?

a) $\{a\}$ "1"

b) $\{\{a\}\}$ "1"

c) $\{a, \{a\}\}$ "2"

d) $\{a, \{a\}, \{a, \{a\}\}\}$ "3"

5) What is the cardinality of each of these sets?

a) $\emptyset$

b) $\{\emptyset\}$

c) $\{\emptyset, \{\emptyset\}\}$

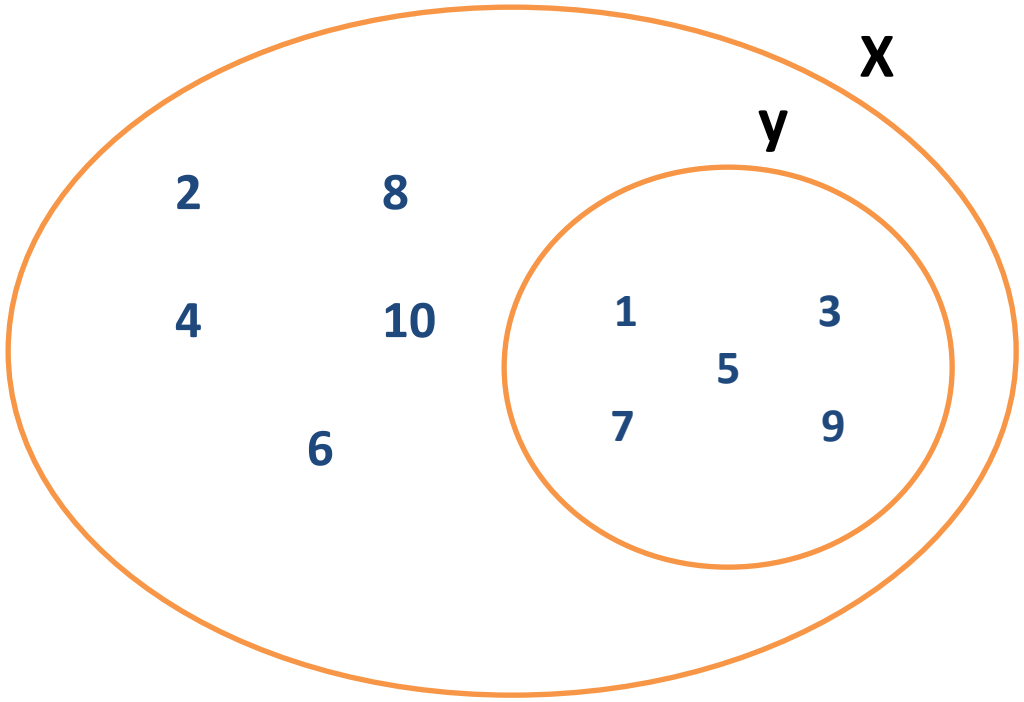
d) $\{\emptyset, \{\emptyset\}, \{\emptyset, \{\emptyset\}\}\}$

a) 0, **b)** 1, **c)** 2, **d)** 3.

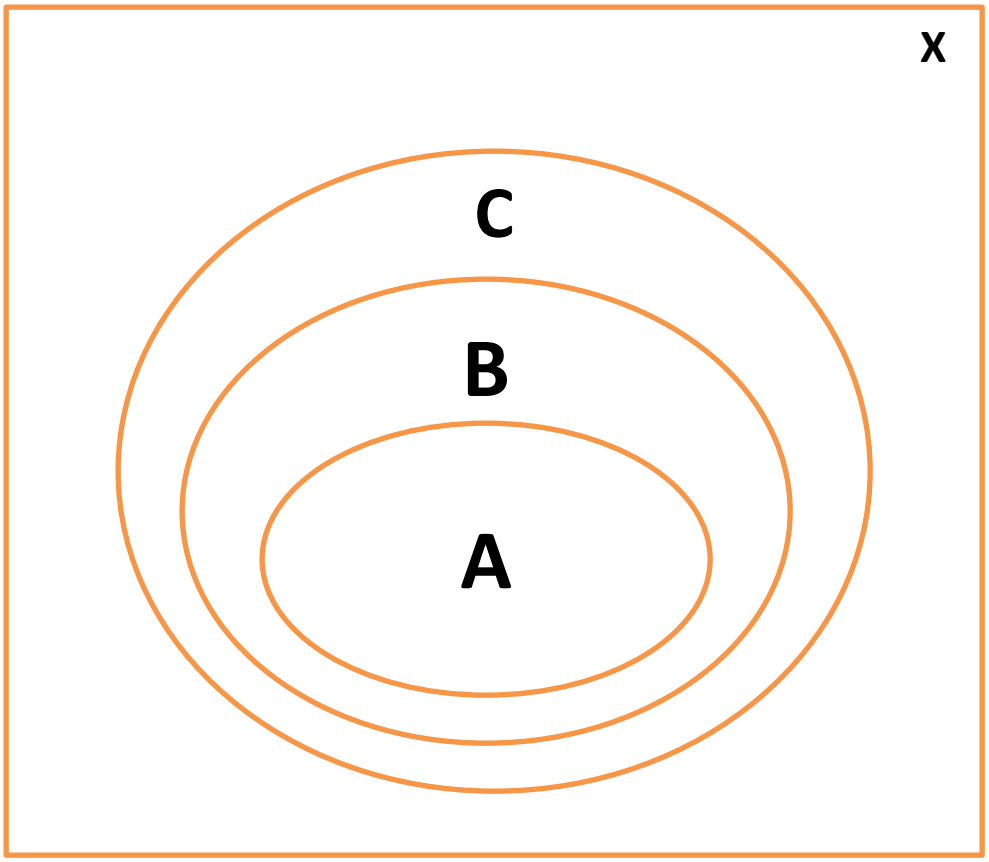
6) Suppose that A = {2, 4, 6}, B = {2, 6}, C = {4, 6}, and D = {4, 6, 8}. Determine which of these sets are subsets of which other of these sets.

$$A \subseteq A, B \subseteq A, B \subseteq B, C \subseteq A, C \subseteq C, C \subseteq D, D \subseteq D.$$

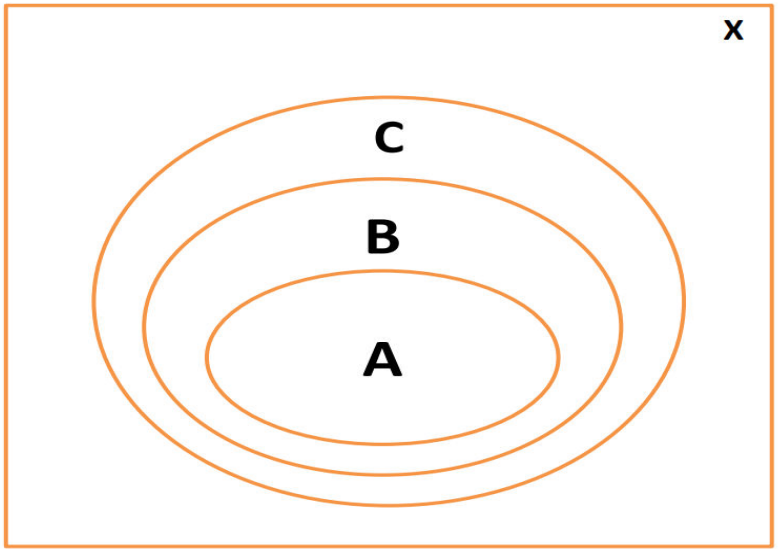
7) Use a **Venn diagram** to illustrate the subset of odd integers in the set of all positive integers not exceeding 10.



8) Use a **Venn diagram** to illustrate the relationship $A \subseteq B$ and $B \subseteq C$.



9) Suppose that A, B, and C are sets such that $A \subseteq B$ and $B \subseteq C$. Show that $A \subseteq C$ using **Venn diagram** .



Assignment

10) Let $A = \{a, b, c, d\}$ and $B = \{y, z\}$. Find

a) $A \times B$

"{(a,y),(a,z),(b,y),(b,z),(c,y),(c,z),(d,y),(d,z)}"

a) $B \times A$

"{(y,a),(y,b),(y,c),(y,d),(z,a),(z,b),(z,c),(z,d)} "

11) Let A = {a, b, c}, B = {x, y}, and C = {0, 1}. Find

a) A x B x C

b) C x B x A

c) C x A x B

d) B x B x B

(a) $A \times B \times C = \{(a,x,0),(a,x,1),(a,y,0),(a,y,1),(b,x,0),(b,x,1),$
$(b,y,0),(b,y,1),(c,x,0),(c,x,1),(c,y,0),(c,y,1)\}$
(b) $C \times B \times A = \{(0,x,a),(0,x,b),(0,x,c),(0,y,a),(0,y,b),(0,y,c),$
$(1,x,a),(1,x,b),(1,x,c),(1,y,a),(1,y,b),(1,y,c)\}$
(c) $C \times A \times B = \{(0,a,x),(0,a,y),(0,b,x),(0,b,y),(0,c,x),(0,c,y),$
$(1,a,x),(1,a,y),(1,b,x),(1,b,y),(1,c,x),(1,c,y)\}$
(d) $B \times B \times B = \{(x,x,x),(x,x,y),(x,y,x),(x,y,y),(y,x,x),(y,x,y),(y,y,x),(y,y,y)\}$