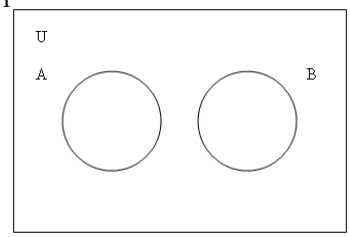
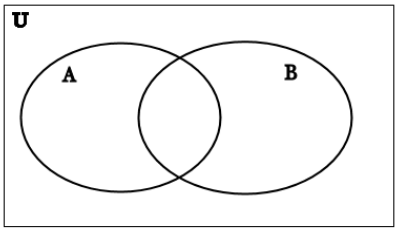
Worksheet 4: Sets

Activity 2

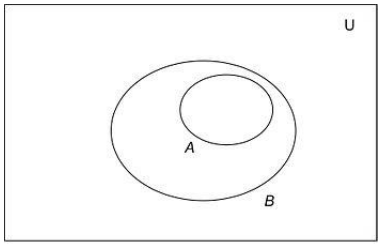
For each of the following Venn diagrams define sets A and B such that the image would be an accurate representation.



A={1,3,5,7,9}, B={2,4,6,8,10}



A={1,2,3}, B={3,4,5}



A⊂B

A={1,2,3}, B={1,2,3,4,5}

Activity 3

For the following sets:

- G = { 8, 12, 15 }
- H = { {8, 12, 15} , {14, 12} , {13, 10} }
- I = { 1, 2, 3, {3}, {4, 5}, {6, 7}, {8} , ∅ }

Answer the following questions

- What is the cardinality of G? 3
- What is the cardinality of H? 3
- What is the cardinality of I? 8

True or false?

- 8 ∈ G T
- 8 ∈ H F
- 8 ∈ I F
- {8} ∈ G F
- {8} ∈ H F
- {8} ∈ I T
- {8} ⊆ G T
- {8} ⊆ H F
- {8} ⊆ I F

If A={{3}} 3∈A? F {3} ∈A? T

∅ ∈ G ? F ∅ ⊆ G ? T ∅ ⊂ G ? T

∅ ∈ I ? T ∅ ⊆ ∅ ? T ∅ ⊂ ∅ ? F

Activity 4. Suppose that you can get a cheese pizza plain, or with any combination of the following toppings. How many different pizzas could you order? List them all (use letters A, B, C, and D to list toppings).

{**A**nchovies, **B**lack olives, **C**anadian bacon, **D**elicious pepperoni }

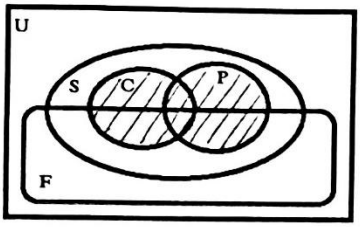
A combination of toppings correspond to a subset of the set {A,B,C,D}. A 4 element set has 16 subsets. They are the following: ∅, {A}, {B}, {C}, {D}, {A,B}, {A,C}, {A,D}, {B,C}, {B,D}, {C,D}, {A,B,C}, {A,B,D}, {A,C,D}, {B,C,D}, {A,B,C,D}.

Activity 5. Consider the following sets:

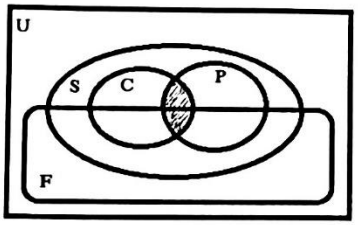
U = set of all students at NMSU	P = set of all physics majors
S = set of all students with majors in SOC	F = set of all women students at NMSU
C = set of all computer science major	

For each of the following groups of people, shade in the corresponding Venn diagram to correctly indicate where that set of people is located.

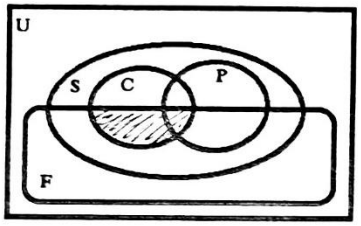
1. The set of people majoring in either computer science or physics.



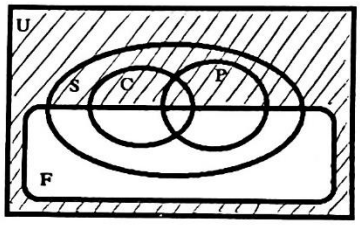
2. The set of people majoring in both computer science and physics.



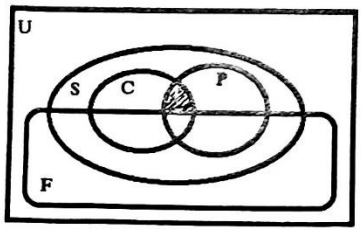
3. The set of computer science majors who are women.



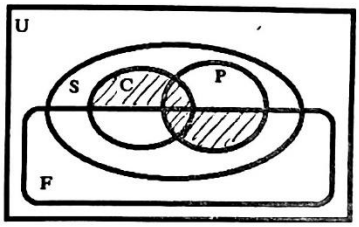
4. The set of people who do not have a major in SOC.



5. The set of male students who are majoring in both computer science and physics.



6. The set of female physics students and male computer science students.



Activity 6. Complete the following sentences without using the symbols ∩, ∪, and -.

1. $x \notin (A \cap B)$ if, and only if, $x \notin A$ or $x \notin B$.
2. $x \notin (A \cup B)$ if, and only if, $x \notin A$ and $x \notin B$.
3. $x \notin (A - B)$ if, and only if, $x \notin A$ or $x \in B$.

Activity 7. Consider the following sets:

U = set of all students at NMSU	P = set of all physics majors
S = set of all students with majors in SOC	F = set of all female students at NMSU
C = set of all computer science major	

Write an expression using these sets and the set operations to express the following:

1. The set of people majoring in either computer science or physics. $C \cup P$
2. The set of people majoring in both computer science and physics. $C \cap P$
3. The set of computer science majors who are women. $C \cap F$
4. The set of people who do not have a major in SOC. $\overline{S}$
5. The set of male students who are majoring in both computer science and physics. $\overline{F} \cap C \cap P$
6. The set of female physics students and male computer science students. $(F \cap P) \cup (\overline{F} \cap C)$

Activity 8. Let $A = \{w, x, y, z\}$ and $B = \{a, b\}$. Use the set-roster notation to write each of the following sets, and indicate the number of elements that are in each set:

a. $A \times B = \{ (w, a), (w, b), (x, a), (x, b), (y, a), (y, b), (z, a), (z, b) \}$ *The set has 8 elements*

b. $B \times A = \{ (a, w), (a, x), (a, y), (a, z), (b, w), (b, x), (b, y), (b, z) \}$ *The set has 8 elements*

c. $A \times A = \{ (w, w), (w, x), (w, y), (w, z), (x, w), (x, x), (x, y), (x, z), (y, w), (y, x), (y, y), (y, z), (z, w), (z, x), (z, y), (z, z) \}$
The set has 16 elements.

Activity 9.

1. Is {{a, d, e}, {b, c}, {d, f }} a partition of {a, b, c, d, e, f }? No. d appears twice.
2. Is {{w, x, v}, {u, y, q}, {p, z}} a partition of {p, q, u, v, w, x, y, z}? Yes.
3. Is {{5, 4}, {7, 2}, {1, 3, 4}, {6, 8}} a partition of {1, 2, 3, 4, 5, 6, 7, 8}? No. 4 appears twice.
4. Is {{3, 7, 8}, {2, 9}, {1, 4, 5}} a partition of {1, 2, 3, 4, 5, 6, 7, 8, 9}? No. Missing 6.

Activity 10. Assume

- A = { letters in the word ELEPHANT }
- B = { letters in the word SYNCHOPHANT }
- C = {letters in the word FANTASTIC}
- D = {letters in the word STUDENT}

If the universe U is the set of 26 capital letters find the following:

1. $A \cup B$ = { E,L,P,H,A,N,T,S,Y,C,O} = { E,L,E,P,H,A,N,T, S,Y,N,C,H,O,P,H,A,N,T}
2. $A \cap B$ = {P,H,A,N,T}
3. $A \cap C$ = {A,N,T}
4. $(A \cap C) \cup (B \cap D)$ = {A,N,T}∪{S,T,N}={A,N,T,S}
5. $A \cap (C \cap D)$ = {N,T}
6. $A - B$ = { E,L}
7. Symmetric difference $C \oplus D$ = (C - D) ∪ (D - C) = {F,A,I,C} ∪{U,D,E}={F,A,I,C,U,D,E}
8. Complement $\overline{B}$ = U – B = {B,D,E,F,G,I,J,K,L,M,Q,R,U,V,W,X,Z}