

1. Label each of the following statements as true or false.

a)  $10 > 3$  and 10 is a rational number.

g)  $8 \leq 10$  and  $8 \geq 8$ .

b)  $3 \geq 3$  or 7 is an even number.

h) Every real number is an integer and 0 is a rational number.

c)  $5 > 5$  or  $5 < 5$

d) Every square is a rectangle.

i) 7 is a divisor of 21 and 21 is a multiple of 3.

e) Every rectangle is a square.

j) If  $x \in \mathbb{R}$ , then  $x \in \mathbb{N}$  or  $x \in \mathbb{Q}$ .

f) 1 is a divisor of 20.

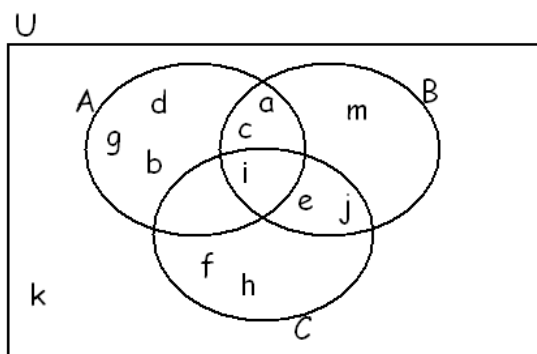
2. Let  $A = \{2, 3, 5, 6, 8, 9, 10\}$  and  $B = \{1, 3, 4, 8, 10\}$ . Label the following statements as true or false.

a)  $2 \in A$     b)  $2 \in B$     c)  $3 \in A \cap B$     d)  $9 \in A \cup B$

3. Let  $A = \{2, 3, 5, 6, 8, 9, 10\}$  and  $B = \{1, 3, 4, 8, 10\}$ .

a) Find  $A \cap B$ .    b) Find  $A \cup B$ .

4. Consider the picture given. Find each of the following.



a)  $A \cap B$

b)  $B \cup C$

c)  $(A \cup B) \cap C$

5. Suppose that  $P$ ,  $S$ , and  $T$  are sets such that  $P = \{1, 2, 3, 4, 5\}$ ,  $S = \{2, 4, 6, 8, 10\}$ , and  $T = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ . Find each of the following sets.

a)  $P \cap S$

c)  $\{x : x \in T \text{ and } x > 3\}$

e)  $\{x : x \in T \text{ and } (x \geq 7 \text{ and } x \leq 2)\}$

b)  $P \cup S$

d)  $\{x : x \in T \text{ and } (x \geq 7 \text{ or } x \leq 2)\}$

6. Let  $R$  be the set of all rectangles and  $S$  the set of all squares. Label each of the following as true or false.

a)  $R \subseteq S$

c)  $R \cup S = R$

e)  $R \cap S = R$

b)  $S \subseteq R$

d)  $R \cup S = S$

f)  $R \cap S = S$

g) Describe  $x$  if we know that  $x \in R$  and  $x \notin S$ .

7. Let  $A$  be the set of females in our class today, and  $B$  be the set of students in our class today who have a calculator with them.

a) Describe the set  $A \cap B$ .    b) Describe the set  $A \cup B$ .

8. Let  $A = \{1, 2, 3, 4, 5\}$ ,  $B = \{2, 4, 6, 8, 10\}$ , and  $C = \{2, 3, 5, 7\}$ . Find each of the following.

a)  $A \cap B$     b)  $A \cap C$     c)  $(A \cup C) \cap B$     d)  $(A \cap C) \cup B$ .

9. Label each of the following as true or false.

a)  $3 \leq 3$     b)  $7 < -6$     c)  $\mathbb{Z} \subseteq \mathbb{N}$     d)  $0 \in \mathbb{N}$     e)  $\mathbb{N} \cup \mathbb{Z} = \mathbb{Z}$

f) for all sets  $A$  and  $B$ ,  $A \cap B = B \cap A$ .

10. \* A set is infinite if it has infinitely many elements. Find three infinite sets  $A$ ,  $B$ , and  $C$  so that the intersection of any two of the three sets is infinite, (i.e.  $A \cap B$  is infinite,  $A \cap C$  is infinite, and  $B \cap C$  is infinite), and the intersection of all three sets is the empty set (i.e.  $A \cap B \cap C = \emptyset$ ).

### Answers

1. a) true    b) true    c) false    d) true    e) false    f) true    g) true    h) false    i) true    j) false

2. a) true    b) false    c) true    d) true

3. a)  $A \cap B = \{3, 8, 10\}$     b)  $A \cup B = \{1, 2, 3, 4, 5, 6, 8, 9, 10\}$

4. a)  $\{a, c, i\}$     b)  $\{a, c, e, f, h, i, j, m\}$     c)  $\{e, i, j\}$

5. a)  $\{2, 4\}$     b)  $\{1, 2, 3, 4, 5, 6, 8, 10\}$     c)  $\{4, 5, 6, 8, 10\}$     d)  $\{1, 2, 7, 8, 9, 10\}$     e)  $\emptyset$

6. a) false    b) true    c) true    d) false    e) false    f) true

g) a rectangle that is NOT a square, i.e. a rectangle that has two sides with different lengths.

7. a) The set of female students who have calculators on them.

b) The set of females, or students with calculators

8. a)  $\{2, 4\}$     b)  $\{2, 3, 5\}$     c)  $\{2, 4\}$     d)  $(A \cap C) \cup B = \{2, 3, 4, 5, 6, 8, 10\}$

9. a) true    b) false    c) false    d) false    e) true    f) true