

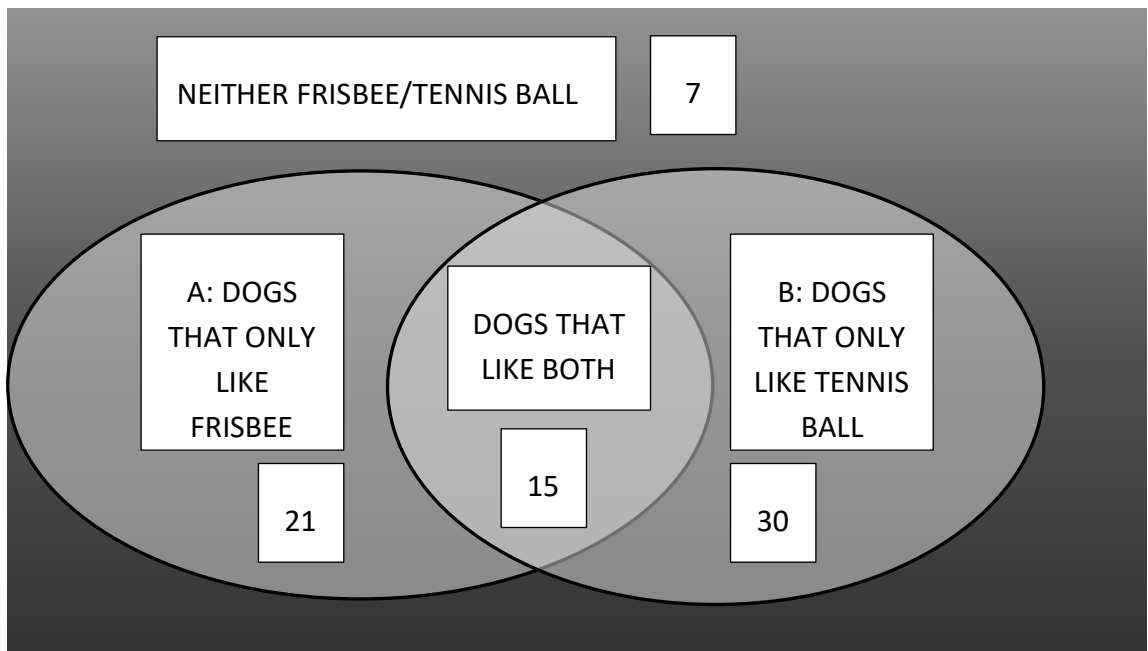
**1. ANSWER:**

- a)  $R = \{\text{Red, Orange, Yellow, Green, Blue, Indigo, Violet}\}$
- b)  $E = \{\text{Orange, Blue}\}$
- c)  $E' = \{\text{Red, Yellow, Green, Indigo, Violet}\}$

2.

**a) ANSWER: 73**

To solve, you could draw a Venn Diagram **OR** use set theory notation.



Add up the numbers in the rectangle representing the universal set:

$$21 + 15 + 30 + 7 = 73$$

We could also write set theory notation.



From the table we are told:

$$|A \cap B| = 15 \quad (15 \text{ dogs like both frisbees and tennis balls})$$

$$|A - B| = 21 \quad (21 \text{ dogs only like frisbees})$$

$$|B - A| = 30 \quad (30 \text{ dogs only like tennis balls})$$

$$|(A \cup B)'| = 7 \quad (7 \text{ dogs don't like frisbees or tennis balls})$$

$$|U| = |A \cap B| + |A - B| + |B - A| + |(A \cup B)'|$$

$$|U| = 15 + 21 + 30 + 7 = 73$$

**b) ANSWER: 36**

From your Venn diagram, 21 dogs like only frisbees and 15 dogs like both frisbees and tennis balls.  $21 + 15 = 36$ .

Or written with set theory notation:  $|A| = |A - B| + |A \cap B| = 21 + 15 = 36$

**c) ANSWER: 66**

= Dogs that only like frisbee + dogs that only like tennis balls + dogs that like frisbees and tennis balls

$$= |A - B| + |B - A| + |A \cap B|$$

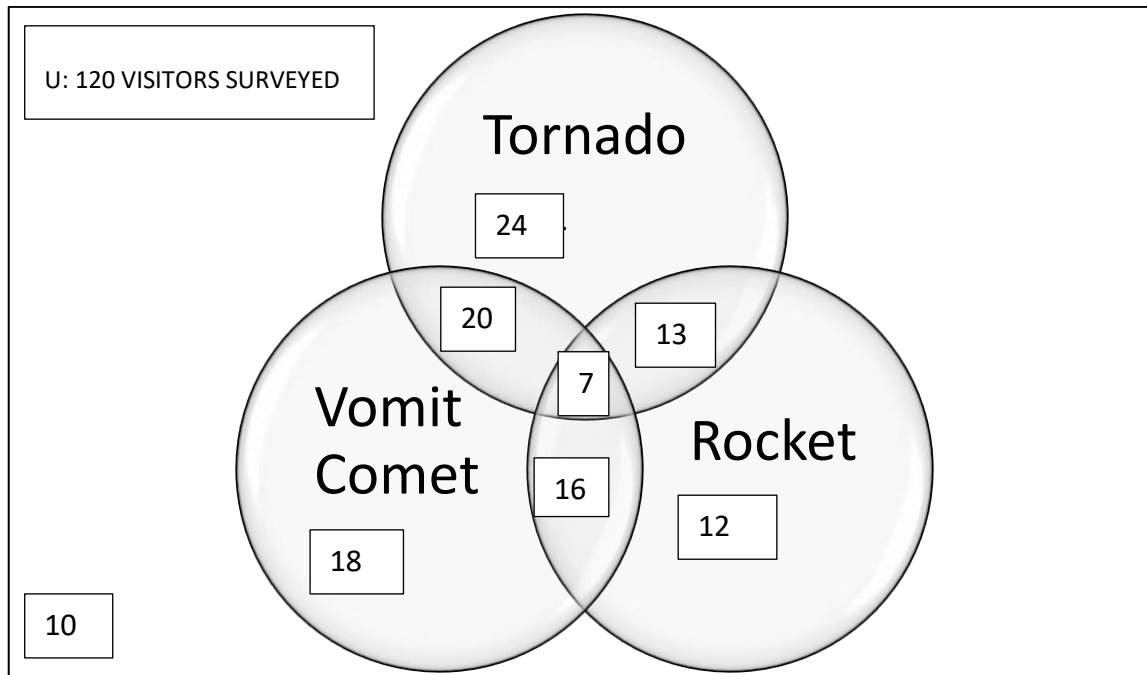
$$= 21 + 30 + 15 = 66$$

**d) ANSWER: 28**

From the Venn diagram:  $|B'| = 7 + 21 = 28$



3. a) See Venn diagram.



b) **ANSWER:**  $12 + 16 + 7 + 13 = 48$

c) **ANSWER:**  $13 + 7 = 20$

d) **ANSWER:** 13

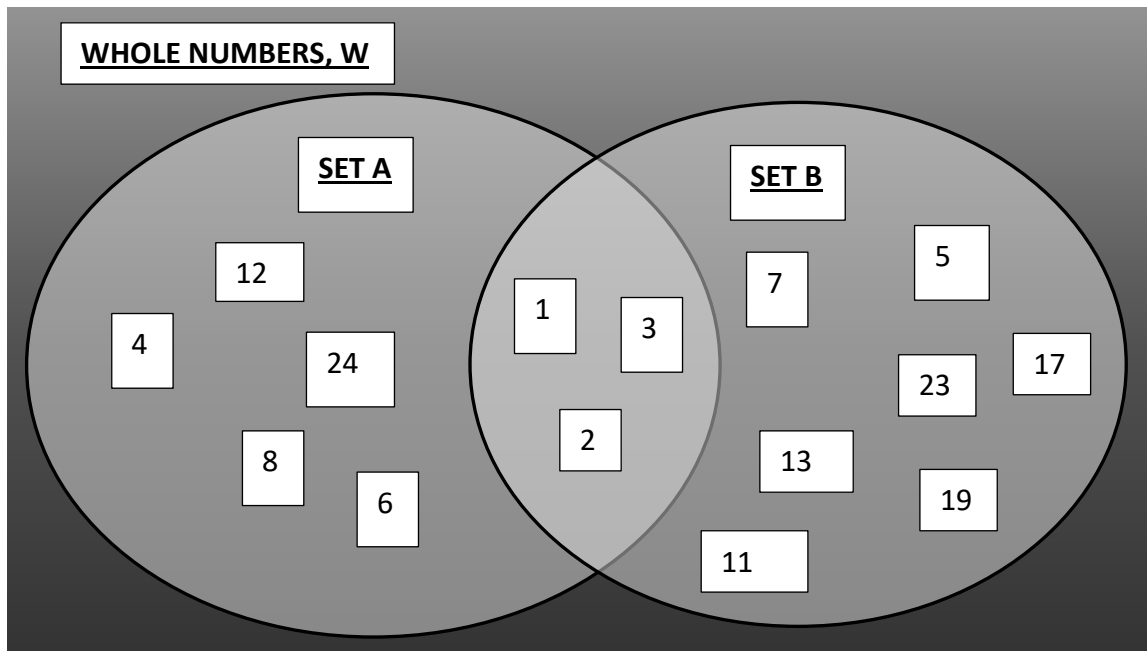


4. **SOLUTION:** Start by writing out the sets.

$$A = \{1, 2, 3, 4, 6, 8, 12, 24\}$$

$$B = \{1, 2, 3, 5, 7, 11, 13, 17, 19, 23\}$$

In a Venn diagram this would look like:



- a)  $A \cap B = \{1, 2, 3\}$   
 b)  $A \cup B = \{1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 17, 19, 23\}$   
 c)  $B - A = \{5, 7, 11, 13, 17, 19, 23\}$

5. **SOLUTION:** People who live in Germany cannot also live in North America – since Germany is in Europe. **Answer: B**



**6. ANSWER: TRUE**

**SOLUTION:** Set A is made up of elements, x, such that x is any even natural number.

$$B \cup C = \{2, 4, 6, 8, 20, 40, 60, 80\}$$

All the elements of the set  $B \cup C$  are even, natural numbers.

Therefore all elements of  $B \cup C$  are also elements of set A, so  $B \cup C$  is a subset of A.

**7. ANSWER: 16**

**SOLUTION:** Use the Inclusion-Exclusion Principle. Write out the formula and fill in the information we are given. Then solve for what is missing.

$$|F \cup B \cup M| = |F| + |B| + |M| - |F \cap B| - |F \cap M| - |B \cap M| + |F \cap B \cap M|$$

$$50 = 29 + 17 + 35 - 5 - 14 - |B \cap M| + 4$$

$$50 = 66 - |B \cap M|$$

$$|B \cap M| = 16$$

**16 cats have only a bird and mouse toy.**

**8. ANSWER:  $U = \{0 \leq x \leq 15, x \in W\}$** 

9. ANSWER:  $B = \{2, 4, 9, 7, 8, 13, 15\}$

SOLUTION: Inclusion-Exclusion Principle applies to the elements in each set.

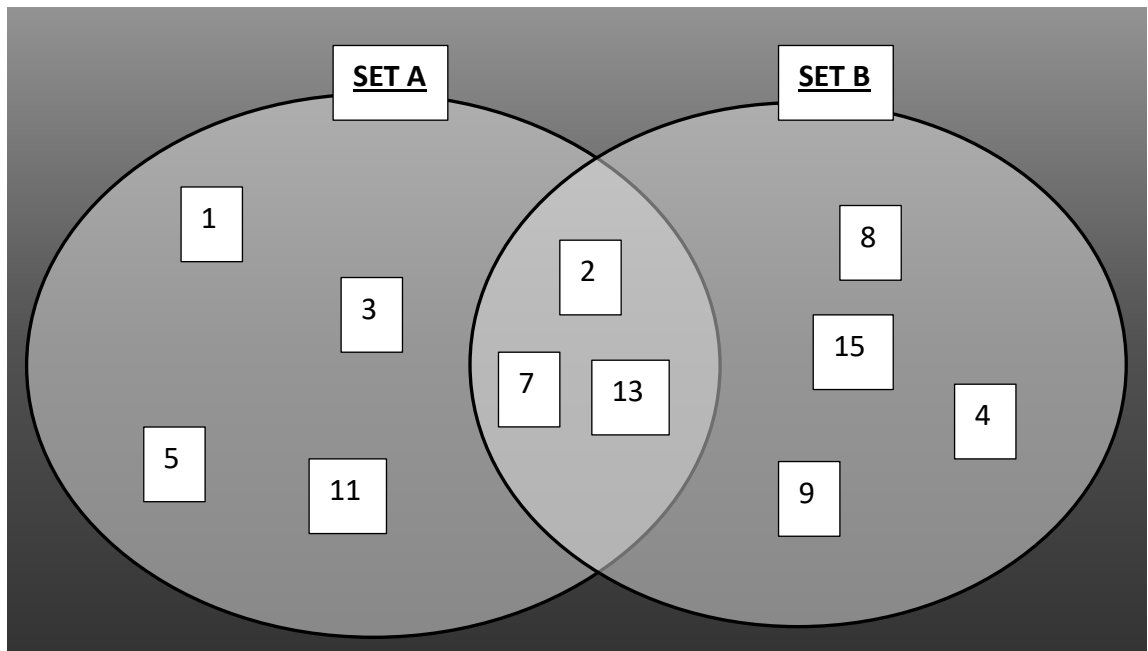
$$A \cup B = A + B - A \cap B$$

Rearrange to solve for set B.

$$B = A \cup B - A + A \cap B$$

$$B = \{1, 2, 3, 4, 5, 7, 8, 9, 11, 13, 15\} - \{1, 2, 3, 5, 7, 11, 13\} + \{2, 7, 13\}$$

$$B = \{2, 4, 7, 8, 9, 13, 15\}$$



10. ANSWER:  $P' = \{x \mid x \geq 55\}$

