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

\[ A \subseteq B \] Because every element in A is also in B.

\[ A \subset B \] Because every element in A is also in B and there is a leftover in B.

A \cap A = \emptyset.
There are 3 main ways to represent a set: listing the elements, describing the elements, and set builder notation. One method is used to represent each set below (Problems 1 – 3). Represent each set using the other two methods.

1. $S = \{\text{diamonds, hearts, spades, clubs}\}$
   
   Set Builder notation: $\{x \mid x \in \text{Suits of cards}\}$

2. The set of primary colors

3. $B = \{b \mid b \text{ is a human blood type}\}$
   
   Description: $\{A^+, A^-, B^+, B^-, AB^+, AB^-, O\}$

4. The **Natural Numbers** are the counting numbers, denoted by the symbol $\mathbb{N}$. Write the set of natural numbers as a list.
   
   $\{1, 2, 3, \ldots \}$

5. The **Integers** (denoted by $\mathbb{Z}$) are the positive and negative counting numbers, and zero. Write the set of integers as a list.
   
   $\{\ldots, -3, -2, -1, 0, 1, 2, 3, \ldots \}$

6. Is $\mathbb{N} \subseteq \mathbb{Z}$? Explain. *Yes.*
   
   Because every element in $\mathbb{N}$ is also in $\mathbb{Z}$

7. Is $\mathbb{N} \subseteq \mathbb{Z}$? Explain.
   
   Yes: Because every element in $\mathbb{Z}$ is also in $\mathbb{N}$
   
   and there is a best over in $\mathbb{Z}$

For problems 10 – 24:

Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{2, 4, 6, 8, 10\}$, and $C = \{1, 4, 7, 9\}$.

Determine if the following statements are true or false. *Explain*

10. $A \subseteq U$
    
    **True:** Every element in $A$ is in $U$

11. $U \subseteq U$
    
    **Yes:** Every set is a subset of itself.

12. $B \subseteq A$
    
    **False**

13. $7 \in B$
    
    **False**

14. $2 \in U$
    
    **True**

Find the following:

15. $n(A)$

16. $n(P(A))$

17. $P(C)$

18. $n(B \cap C)$

For each of the following problems: draw a Venn Diagram to represent sets $A$, $B$, $C$, and the universal set, shade the indicated region, and then list the elements in the indicated set.

19. $A \cap B$ 
    
    $\{2, 6, 4\}$

20. $A \cap C^c$
    
    $\{2, 6, 3, 5\}$

21. $(A \cup C) \cap B$
    
    $\{2, 6, 4\}$

22. $(B \cap C) \cup (A \cap B)$
    
    $\{2, 6, 4\}$

23. $B - A$
    
    $\{8, 10\}$

24. $A - B - C$
    
    $\{5, 3\}$
(For 20 – 22) A random survey of courses students on Lamar’s campus are currently taking was conducted and the following data was collected:

100 students are taking Contemporary Math
57 students are taking History
39 students are taking History and Physics
46 students are taking Contemporary Math but not History or physics
28 students are taking Physics but not History
61 students are taking Contemporary Math but not Physics
12 students are taking Contemporary Math, Physics, and History

25. Draw a Venn Diagram to represent the information yielded by the survey
26. How many students are taking Physics but not Contemporary or History? 1
27. If 150 students were surveyed, how many are not taking contemporary, physics, or history? 19.

Use an Euler Diagram to determine whether the following arguments are valid or invalid. Verify your answers with a truth table:

28. All chocolate is crunchy.
   All crunchy food is grown in Australia.
   Therefore, if a food is grown in Australia, it is chocolate.
   Invalid.

29. If you eat mustard, then you will turn yellow.
   If you turn yellow, you’ll smell like a banana.
   Therefore, if you eat mustard, you’ll smell like a banana.
   True Valid.

Use an Euler Diagram to determine whether the following argument is valid or not. Do not verify using a truth table.

30. Some people are cats.
   All cats eat mice.
   All people eat mice.
   Invalid.
Question 10.