Definitions and Short Answers. Complete the given statement or answer each question to the best of your ability.

1. State in your own words, what it means for a set to be well-defined.

2. Use set builder notation to describe the set A={a, e, i, o, u}.

True or False. If the statement is false, give a counterexample. If it is true, give an example to illustrate the statement.

3. A $\subset$ A, for all sets A.

4. If a set is not finite, it is infinite.

5. If $n(A) = n(B)$, then $A = B$.

Use one of the following symbols, $\in$, $\notin$, $\subset$, $\subseteq$, to make each of the following statements true.

6. 3 ____ {1, 2, 3}

7. {2, 1, 4} ____ {1, 2, 4}

8. 4 ____ {1, 2, 3}

Use Venn diagrams to shade the following.

9. $A' \cup B'$

10. $(A - B) \cup (B - A)$

Use the given information to answer each of the following questions.

Let U = All College freshmen
A = Education majors
B = Females
C = Biology majors

11. Describe the set $A \cap B$.

12. Describe the set $C \cap \overline{B}$.

Answer each of the following to the best of your ability.

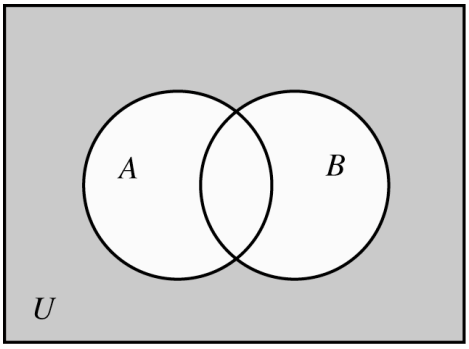
13. Provide a formula to show that the set **N** = {1, 2, 3, 4, …} is equivalent to **O** = {1, 3, 5, 7, …}.

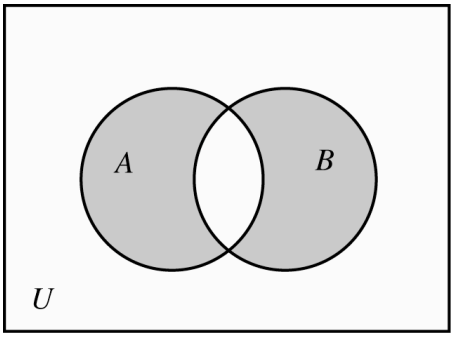
14. Find the cardinal number of the set **B** if **B** = $\{x | x$ is a factor of 1$\}$

15. A survey of 240 families showed that 91 had a dog; 70 had a cat; 31 had a dog and a cat; 91 had neither a cat nor a dog nor a parakeet; 7 had a cat, a dog, and a parakeet. How many had a parakeet only?

16. List all proper subsets of **D** = {a, b, c}.

Answer Key
Testname: CHAPTER TWO – EXAM A

1. Answers will vary, but should include the idea that any element in the universal set is either in the given set or not.
2. $A = \{x \mid x \text{ is a vowel in the English alphabet}\}$
3. False. A is not a proper subset of itself.
4. True, by definition of an infinite set.
5. False. The two sets are equivalent, but not equal.
6. $\in$
7. $\subseteq$
8. $\notin$
9. 

10. 

11. All female education majors.
12. All male biology majors.
13. Let $n \in N$ correspond to $o \in O$ using the formula $o = 2n - 1$.
14. $n(B) = 1$
15. 19
16. $\varnothing$, {a}, {b}, {c}, {a,b}, {a,c}, {b,c}

Definitions and Short Answers. Complete the given statement or answer each question to the best of your ability.

1. Define the set difference, A-B.

2. Describe the difference between two equal sets and two equivalent sets.

3. The set ***A*** is a proper subset of the set ***B*** if and only if…

True or False. If the statement is false, give a counterexample. If it is true, give an example to illustrate the statement.

4. If $n(A) < n(B)$, then $A \subset B$.

5. All infinite sets are countable.

6. If $A \subseteq B$ and $B \subseteq A$, then $A = B$.

Find the cardinal number of the following set.

7. $\{\varnothing\}$

Provide a one-to-one correspondence from *A* to *B*.

8. $A = \{1, 2, 3\}$ and $B = \{a, b, c\}$

9. $N = \{1, 2, 3, 4, \ldots\}$ and $T = \{10, 20, 30, 40, \ldots\}$

Use Venn diagrams to determine if the following statements are true or false.

10. $\overline{(A \cup B)} = \overline{A} \cap \overline{B}$

Find $n(A)$

11. $A = \{\{\}, \{a, b\}, \{c, d, e\}\}$

How many one-to-one correspondences exist between the two sets *A* and *B*.

12. $A = \{1, 2, 3, 4\}$ and $B = \{a, b, c, d\}$

Determine the following sets.

Let U = all natural numbers less than 10.
Let A = all even numbers.
Let B = all factors of six.

13. $A \cap B$

14. $\overline{A} \cup B$

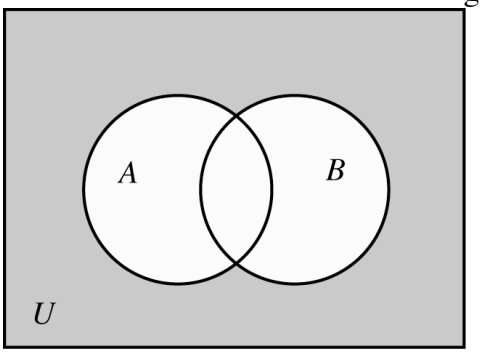
Determine the number of subsets of A if,

15. $n(A) = 5$

16. $A = \varnothing$

Answer Key
Testname: CHAPTER TWO – EXAM B

1. All the elements in A, but not in B.
2. Two sets are equal if they contain the same elements. Two sets are equivalent if there is a one-to-one correspondence between the two sets.
3. Set ***A*** is a proper subset of the set *B* if and only if ***A*** is a subset of ***B*** and there is an element in ***B*** that is not in ***A.***
4. False. Answers will vary, but an example is ***A*** = {1} and ***B*** = {2, 3}. ***n(A)*** = 1, and ***n(B)*** = 2.
5. False. Answers will vary, but an example is the set of Real numbers.
6. True. Answers will vary.
7. 1
8. Answers will vary; here is an example. $1 \to a,\ 2 \to b,\ 3 \to c$.
9. Let $n \in N,\ t \in T,\ n \to 10n = t$.
10. The statement is true. The shaded figure is given:



11. 3
12. $4 \times 3 \times 2 \times 1 = 24$.
13. {2, 6}
14. {1, 2, 3, 5, 6, 7, 9}
15. $2^5 = 32$
16. 1

Definitions and Short Answers. Complete the given statement or answer each question to the best of your ability.

1. Define $A \cap B$.

2. State DeMorgan's laws for set theory.

True or False. If the statement is false, give a counterexample. If it is true, give an example to illustrate the statement.

3. If $A \subseteq B$, then $n(A) \leq n(B)$.

4. $A \cap B \subseteq A$ for all sets A and B.

5. If $A \cap B = \varnothing$, then $n(A \cup B) = n(A) + n(B)$.

6. All sets are proper subsets of the Universal set.

7. If $A \subset B$, then $A - B = A$.

List the elements in the following set.

8. $A = \{x | x \text{ is a natural number } < 10\}$.

Answer each of the following questions.

9. Suppose $A \subset B$ and $n(B) = 10$. What are possible values for $n(A)$?

10. Suppose $A \cap B \neq \varnothing$ and $n(A) = 10$, $n(B) = 10$. What are possible values for $n(A \cup B)$?

Use the following definitions to answer the following questions.

$N = \{x | x \text{ is a natural number}\}$

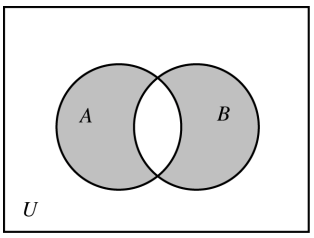
$I = \{x | x \text{ is an integer}\}$

$R = \{x | x \text{ is a real number}\}$

11. Is I a proper subset of N, W, and R? Why or why not?

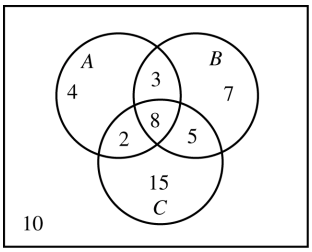
12. What is the set $I - N$?

Use the diagram below to answer the following question.



13. Describe the shaded region in your own words and using set notation.

Use the Venn diagram below to answer the following questions.



14. Find $n(C - A)$.

15. Find $n\left(A \cap \left(\overline{B \cup C}\right)\right)$.

Shade two Venn diagrams to determine if the following statements are true.

16. $A - B = A \cap \overline{B}$.

Answer Key
Testname: CHAPTER TWO – EXAM C

1. A intersect B is the set of all elements that are in A **and** in B.
2. $\overline{(A \cup B)} = \overline{A} \cap \overline{B}$ and $\overline{(A \cap B)} = \overline{A} \cup \overline{B}$
3. True. Answers will vary.
4. True. Answers will vary.
5. True. Answers will vary.
6. False. The Universal set is a subset of itself and not a proper subset.
7. True. Answers will vary.
8. $A = \{1,\ 2,\ 3,\ 4,\ 5,\ 6,\ 7,\ 8,\ 9\}$
9. $0 \le n(A) \le 9$. Or, the number of elements in *A* can be any whole number between zero and 9.
10. The only possible value is 10.
11. *I* is not a proper subset of *N* or *W*, but is a proper subset of *R*.
12. $I - N = \{0,\ -1,\ -2,\ -3,\ \ldots\}$.
13. $(A - B) \cup (B - A)$
14. 20
15. 4
16. This is true.