

1. Consider the following sets.

$$U = \{\text{all professors}\}$$

$$A = \{\text{female professors}\}$$

$$B = \{\text{professors under 40 years of age}\}$$

$A \cap B$ is the set

- 1) {male professors under 40 years of age}
 - 2) {male professors who are 40 or older}
 - 3) {professors who are male or under 40}
 - 4) {female professors under 40 years of age}
 - 5) none of the above (6)
2. Suppose that $A = \{1, 3, 5, 7, 9\}$, $B = \{1, 3, 7\}$, and $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$. List the elements of the following set: $A \cap A$. (6)

3. If S and T are sets such that $n(S \cap T) = 13$, $n(S) = 7$, $n(S \cup T) = 3$, find $n(T)$. (6)

4. In which Venn diagram does the shaded portion represent $(A \cap B)^c$?

a)

b)

c)

d)

5) none of the above (6)

5. Consider the Venn diagram below.

$$n(A \cap B \cap C) = ?$$

- a) 2
- b) 5
- c) 8
- d) 21
- e) none of the above

(6)

6. One hundred male college students were surveyed. Twenty of the students were members of a fraternity, 5 were honors students, 77 were neither members of a fraternity nor honors students, and 18 were members of a fraternity but not honors students.

(1) Draw a Venn diagram displaying the given data and the number of elements in each basic region. **(3)**

(2) How many honors students do not belong to a fraternity? **(3)**

(3) How many fraternity members are honors students? **(2)**

7. Area codes in the U.S. are three-digit numbers where the first digit is not a 0 or a 1, and the middle digit is either 0 or 1. How many area codes are possible? (Some of these are not used.) **(6)**

8. An exam consists of 4 multiple choice questions; each question has 4 choices. Assuming all questions are answered, in how many ways can the test be completed? **(6)**

9. How many different selections of 3 newspapers can be made from a set of 10 newspapers? **(6)**

10. How many different signals may be formed from 5 different colored flags if a signal consists of 3 different colored flags arranged in a particular order? **(6)**

11. How many poker hands consist of 4 clubs and a card of a different suit?

- a) $39C(13, 4)$
- b) $39C(52, 4)$
- c) $48C(13, 4)$
- d) $48C(52, 4)$
- e) none of the above

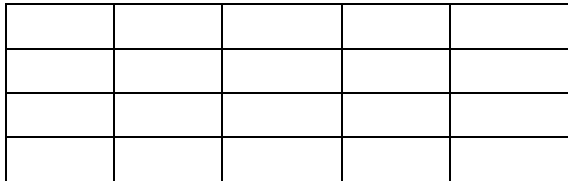
(7)

12. There are 25 quarts of milk on a supermarket shelf, 4 of which are spoiled. A customer buys 3 quarts of milk.

(a) How many samples are possible? (4)

(b) How many samples contain exactly two quarts of spoiled milk? (4)

13. In the street map shown below, how many routes are there from A to B (with no backtracking)? (7)



14. Determine the first three terms in the binomial expansion of $(x + y)^{12}$ (3, 3, 3)

15. A population of crabs which eats algae lives in a bay. In the bay there are five kinds of algae. A biologist wants to find out which of the types of algae are eaten by the crabs. If the biologist examines the stomach contents of the crabs, how many possibilities are there for the kinds of algae she will find? (7)