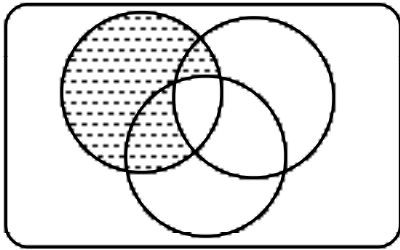


1. Suppose  $A \leftrightarrow B = A$ . Then always
  - a.  $A = B$
  - b. B is a subset of A
  - c.  $A = \emptyset$
  - d.  $A \approx B = A$
  - e. A is a subset of B
  
2. Let  $U = \{\text{natural numbers between 1 and 20 inclusive}\}$ ,  $A = \{\text{even numbers in } U\}$ ,  $B = \{\text{numbers divisible by 4 in } U\}$ . Then  $A \leftrightarrow B' =$ 
  - a. U
  - b.  $\{4, 8, 12, 16, 20\}$
  - c.  $\{\text{odd numbers in } U\}$
  - d.  $\{2, 6, 10, 14, 18\}$
  - e.  $\emptyset$
  
3.  $n(S \approx T) = 12$ ,  $n(S \leftrightarrow T) = 2$ ,  $n(T) = 3$ . What is  $n(S \leftrightarrow T')$ ?
  - a. 1
  - b. 9
  - c. 7
  - d. 5
  - e. 11



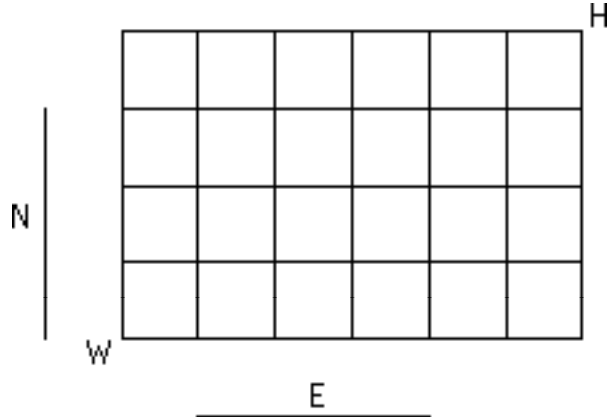
- a.  $A \leftrightarrow (B \leftrightarrow C)'$
  - b.  $A \approx (B \leftrightarrow C)$
  - c.  $A \leftrightarrow B \leftrightarrow C$
  - d.  $A \leftrightarrow B'$
  - e.  $A \leftrightarrow B' \leftrightarrow C'$
- 
5. A class has 100 students. There are 65 males, 49 seniors and 75 people supporting the war. 25 male seniors support the war, 50 males support the war, 37 seniors support the war and there are 30 male seniors. How many female non-seniors do not support the war?
    - a. 7
    - b. 3
    - c. 1
    - d. 10
    - e. 25
  
  6. A man has 6 different pairs of shoes. In how many ways can he choose a left shoe and right shoe which do not match?
    - a. 30
    - b. 36
    - c. 6
    - d. 15
    - e. 20
  
  7. How many 3 letter words can be formed from the word "interesting" if there are to be no repeated letters?
    - a.  $7^3$
    - b. 210
    - c.  $11 \cdot 10 \cdot 9$
    - d.  $11^3$
    - e. 20
  
  8. How many different poker hands consist entirely of hearts?

a.  $P(13, 5)$    b.  $C(52, 13)$    c.  $C(52, 5)$    d.  $C(13, 5)$    e.  $13^5$

9. A committee of 2 men and 3 women is selected from 5 men and 6 women. How many committees are possible? a.  $C(6, 2) \cdot C(5, 3)$    b.  $P(5, 2) \cdot P(6, 3)$    c.  $C(11, 5)$    d.  $P(11, 5)$    e.  $C(5, 2) \cdot C(6, 3)$

10. A girl has 10 books and 15 magazines. In the coming week she plans to read one book and one magazine every day (with no repetitions). In how many different ways can she plan her reading schedule? a.  $P(25, 14)$  b.  $C(10, 7) \cdot C(15, 7)$  c.  $P(10, 7) \cdot P(15, 7)$  d.  $C(25, 14)$  e.  $P(25, 7)$
11. An exam consists of 5 "true-false" questions. How many ways are there of getting more correct answers than incorrect answers? a. 10 b. 16 c.  $2^5$  d.  $P(5, 3)$  e. 6
12. How many poker hands are there which consist of one ace, 2 cards from another denomination and 2 cards from a third denomination?  
a.  $C(52, 5)$  b.  $4 \cdot 12 \cdot C(4, 2) \cdot 11 \cdot C(4, 2)$  c.  $4 \cdot C(12, 2) \cdot C(4, 2) \cdot C(4, 2)$  d.  $4 \cdot C(4, 2) \cdot C(4, 2)$  e.  $13 \cdot 12$
13. A sandwich shop offers a choice of 6 kinds of bread, 9 kinds of meat, and 7 kinds of garnishes. Each sandwich can have only one kind of bread and one kind of meat but any selection of garnishes. How many different sandwiches can be made?  
a.  $\binom{6}{1} + \binom{9}{1} + \binom{7}{1}$  b.  $6 + 9 + 2^7$  c.  $6 \cdot 9 \binom{7}{2}$  d.  $6 \cdot 9 \cdot 49$  e.  $6 \cdot 9 \cdot 2^7$
14. What is the coefficient of  $x^4 y^2$  in the expansion of  $(x + 2y)^6$ ? a. 24 b. 60 c. 15 d. 12 e. 10
15. Which of the following is false?  
a.  $P(n, r) = P(n, n-r)$  b.  $\binom{n}{0} = 1$  c.  $C(n, r) = \frac{P(n, r)}{r!}$  d.  $C(n, r) = C(n, n-r)$  e.  $\binom{n}{n} = 1$
16. There are 3 boys and 3 girls at a party. How many different pairings of the 6 into 3 (heterosexual) couples can be formed?  
a. 36 b. 9 c. 6 d. 15 e. 20
17. A rock band has 8 members, 3 of whom are the stars. A photographer taking publicity pictures wants the band to pose in two rows with the stars sitting in the first row and the other members in the band standing behind them. In how many ways can the band member arrange themselves for this picture?  
a.  $2^8$  b.  $\binom{8}{3} \binom{8}{5}$  c.  $\binom{8}{3} 5!$  d.  $3! 5!$  e.  $2^3 \binom{8}{5}$

18. The following is a part of a street map of a certain city



A woman visiting the city of business stays in a Hotel at H and works at a business at W. How many different routes can she choose in walking to work? Assume she only walks south or west.

- a.  $P(6, 4)$       b.  $2^4 \binom{10}{6}$       c.  $\binom{10}{4}$       d. 24      e.  $4! 6!$

19. An urn contains 14 balls: 8 are red, 4 are white, and 2 are blue. A sample of 5 balls is to be selected. How many samples contain more blue balls than red?

- a.  $\binom{14}{5}$       b. 384      c. 14      d. 54      e. 12

20. Ten horses are entered in a race in which the first three finishers win different amounts of prize money. Three of the horses belong to Col. Early. In how many ways can the first, second, and third place finishers be determined so that none of them are Col. Early's horses?

- a.  $P(7,3)$       b.  $P(10,3)$       c.  $\binom{7}{3}$       d.  $\binom{10}{3} - \binom{7}{3}$       e.  $\frac{1}{7!} P(10,3)$