Ex1: Use the Venn diagram to determine which of the following is correct:
   a) \( A' \cap B = (A \cap B)' \)  
   b) \( (A \cap B') \subseteq A' \)  
   c) \( (A \cap B) \cup (A \cap B') = U \)  
   d) \( (B \cap A') \subseteq A' \)  
   (Answer: a. not correct  
   b. not correct  
   c. correct  
   d. correct)

Ex2: Let \( U \) be a universal set with disjoint subsets \( A \) and \( B \); \( n(U) = 30 \), \( n(A) =14 \), and \( n(B) = 6 \). Find \( n(A' \cap B) \).

Ex3: Let \( U \) be a universal set with disjoint subsets \( A \) and \( B \); \( n(U) = 80 \), \( n(A) =20 \), and \( n(B) = 30 \). Find \( n(A' \cup B) \).

Ex4: A set \( X \) is partitioned into subsets \( X_1, X_2, \) and \( X_3 \). The number of element in \( X_1 \) is twice the number in \( X_2 \), and the number in \( X_3 \) is five times the number in \( X_2 \). If \( n(X) = 40 \), find \( n(X_1), n(X_2) \) and \( n(X_3) \).

Ex5: A set \( X \) is partitioned into subsets \( X_1, X_2, \) and \( X_3 \). The number of element in \( X_2 \) is twice the number in \( X_1 \), and the number in \( X_3 \) is three times the number in \( X_2 \). If \( n(X) = 45 \), find \( n(X_1) \).

Ex6: On a certain model of a new car, there are 6 optional equipment’s (radio, power steering, A/C,...) How many different choices of optional equipment are there for this model?

Ex7: At a pizza store, customers can order a pizza in 4 different sizes, 3 different thickness and 7 different topping. How many different kind of pizza can be made if:
   a) there is no restriction on number of toppings
   b) there must be at least one topping

Ex8: In a survey of 100 people, 38 were college males, 36 were college female, 18 were college male smokers, 11 were female college smokers and 8 were neither college students nor smokers. Find the total number of smokers.

Ex9: Let \( A \) and \( B \) be subsets of a universal set \( U \) with \( n(A) =10 \), \( n(B) = 15 \), \( n(A')=12 \), and \( n(A \cap B)=8 \). Find \( n(A' \cup B') \).

Ex10: Let \( A \) and \( B \) be subsets of a universal set \( U \) with \( n(A) =10 \), \( n(B) = 15 \), \( n(A')=12 \), and \( n(A' \cap B')=5 \). Find \( n(A \cap B) \).

Answers #2-10 (not in order): (47) , (10, 5 , 25) , ( a. 4.3.2^7 ; b. 4.3.(2^7-1)) , (15 ) , (8) ; (6) , (30) , ( 2^6) ; (5)

Ex11: An automobile tested by a national highway traffic safety commission was found to have 20 production defects. Of these, 11 were classified as major defects and 8 were design defects; 4 were neither major nor design defects. How many of the design defects were major?

Ex12: In a large class of 250 students, 100 are taking accounting, 150 are taking economics, and 200 are taking English composition.
   Of those students that are taking economics, 25 are not taking either accounting or English, 75 are taking both accounting and English, and 25 are taking English but not accounting.
   a) How many students are taking accounting and economics but not English?
   b) How many are taking accounting but neither English nor economic?

Ex13: Let \( A, B, \) and \( C \) be subsets of a universal set \( U \). Suppose \( n(U)=80 \), \( n(A)=15 \), \( n(A \cap B)=2 \), \( n(C)=30 \), \( n(A' \cup B') =35 \), and \( n(A \cup B) \cap C = \emptyset \). Find \( n(A' \cap B) \).
**Ex14:** A market analyst is analyzing the result of market survey on a new product for pain reliever. Each individual surveyed was asked to respond (positively, neutral, or negatively) to the effectiveness of the drug, the side effects (if any), and its cost.

There are 150 completed the surveys. Of those surveyed, 60 responded positively to effectiveness, 50 responded positively to side effects, and 40 to cost. Also, 20 responded positively to both effectiveness and side effect, 15 to side effect and cost, 10 to cost and effectiveness, and 37 to none of the items. Find the number that responded positively to all three.

**Ex15:** Eighty-two individuals have complained about the 1988 Jolt mobile. The information is summarized below:

- 25 complained about steering
- 22 complained about visibility
- 7 complained about steering and visibility

Also, 23 complained about comfort, 11 complained about steering and comfort, 5 complained about all three.

a) How many complained about comfort and visibility but not about steering?

b) How many complained about exactly one of the three items?

**Ex16:** A survey of 100 college students gave the following data:

- 8 owned truck
- 48 owned a bicycle
- 20 owned neither a car nor a truck nor a bicycle

How many students who owned a bicycle and either a car or a truck?

**Ex17:** A survey of 200 college students gave the following data:

- 39 own an imported car
- 98 own a bicycle
- 250 own neither a car nor a bicycle

a) If no students owns two cars, how many own both car and a bicycle?

b) If you also know that 21 owners of imported cars do not own bicycles, how many owners of domestic cars do own bicycles?

**Ex18:** The political Science department in a certain university is studying the relationships between membership in the two major parties (Democrat & Republican) and affiliation with the two largest religious groups (Catholic and Protestant). The following information were obtained from 1000 adults:

- 450 are Democrat, 150 of these are Catholic and 100 of them are neither Catholic nor Protestant.
- 350 are Republican, 250 of these are not Protestant.
- 250 are Catholics, including 40 who are not Republican nor Democrat
- 110 are neither Democrat nor Republican and neither Catholic nor Protestant.

Draw the Venn diagram then find the number of people that are:

a) Protestant.  b) Republican and Protestant  c) Republican but neither Catholic nor Protestant.

(Hint: it is not possible for to be both Democrat and Republican or to be both Catholics and Protestant).

**Ex19:** A survey of people attending a conference found the following:

- 140 are Democrats
- 170 are Smokers
- 100 of Republican not Smokers
- 80 of Single Republican are not Smokers

Find how many :

a) are Republican.  b) are Married and Smokers  c) Attended the conference.

**Ex20:** A corporation employs 95 people in the areas of sales, research, and administration. 10 people can function in any of the three areas, 30 can function in sales and administration, 20 can function in sales and research, and 15 can function in administration and research. There are twice as many people in sales as in research, and the same number in sales and in administration. How many can function in sales only, administration only, research only?

Answers #11-20 (not in order): (a 350 ; b. 100 ; c. 190) , (a.38 ; b. 20) , (8) , (20, 25, 5) , (14) ; (a.3 ; b.33) ; ( a.25 ; b. 0) , (3) , (30) , (a. 220 ; b. 80 ; c. 360)