

We survey 100 people and split them up as being or *not* being in sets A, B, and C.  
 What more can we learn?

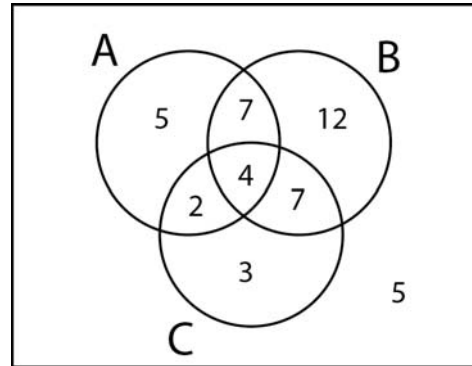
We have talked before of how we can think of the regions in a Venn diagram as distinct areas, labeling each region with the number of elements in that region.

For instance, we have seen this Venn before. Let's put some meaning to it. Let's say that we asked 45 people questions about the music they like.

Let A be the set of people who like country music.

Let B be the set of people who like rock music.

Let C be the set of people who like classical music.



The numbers in each region are the numbers of people in that region. For instance, there are 5 people who like country but neither rock nor classical. Can you mark this region?

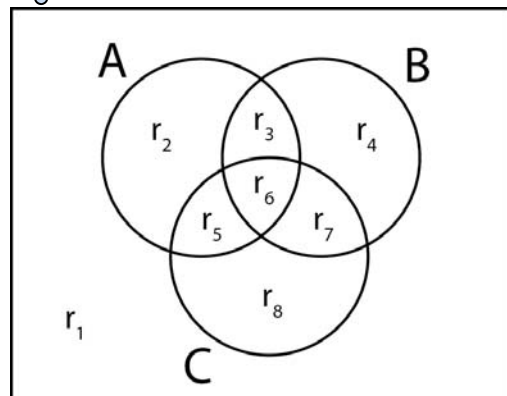
expl 1: For this generic Venn diagram, use set notation to name the regions indicated. There may be more than one answer.

Generic Venn diagrams will have regions labeled as  $r_1, r_2, r_3$ , etc.

a.)  $r_6$

b.)  $r_6$  and  $r_5$  together

c.)  $r_8$



expl 2: For the Venn in the previous example, express the set  $C - B$  as the *union* of two sets.

Recall, region  $r_8$  could be thought of as  $C \cap A' \cap B'$ .

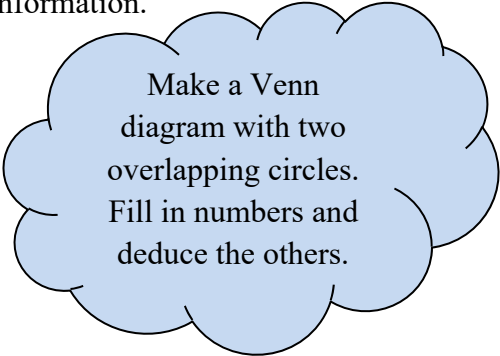
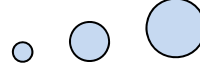
**Survey Problems:**

These problems arise from survey data. Perhaps we asked lots of people questions or delved into existing records. What more can we glean from the information we gather? Here is an example that splits our survey data into two sets.

expl 3: An investigation of auto accidents revealed the following information.

- 18 accidents involved alcohol and excessive speed
- 26 accidents involved alcohol
- 12 accidents involved excessive speed but *not* alcohol
- 21 accidents involved *neither* alcohol *nor* excessive speed

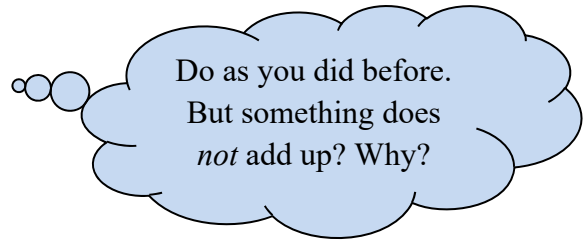
How many accidents were investigated?



Occasionally, we will see problems like this where the pieces just do *not* fit together. These will be called **contradictions** due to **inconsistent data**.

expl 4: Suppose that an Internet blog states the following information concerning which music streaming service its members use.

- 316 use iHeart radio
- 478 use Spotify
- 104 use both iHeart and Spotify
- 567 use only one of the services

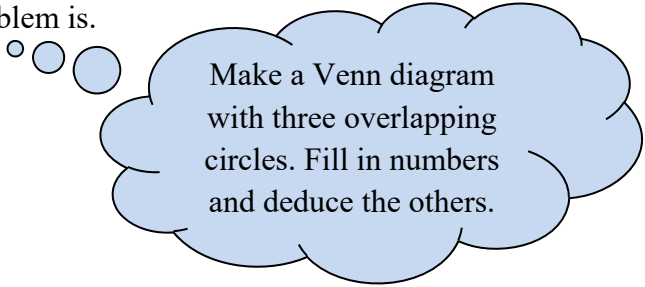


Find the inconsistency in the data.

expl 5: From the information below, find the number of elements in the sets A, B, and C. If the data is inconsistent, say so and state where the problem is.

$$A \cap B = \emptyset, \quad n(A \cap C) = 5, \quad n(B \cap C) = 3,$$

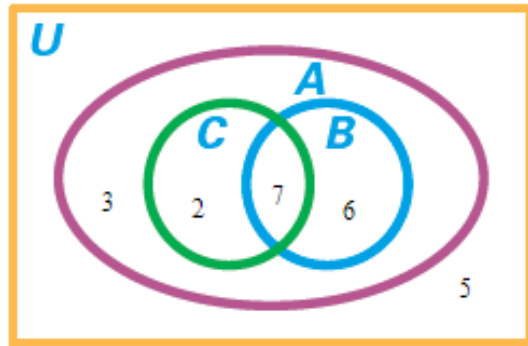
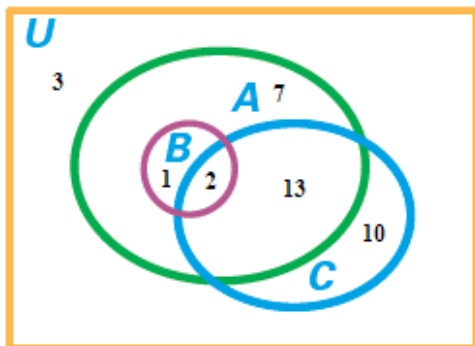
$$n(C - A) = 7, \quad n(A - C) = 2, \quad n(U) = 14$$



The cardinal numbers of these sets are  $n(A) = \underline{\hspace{2cm}}$ ,  $n(B) = \underline{\hspace{2cm}}$ , and  $n(C) = \underline{\hspace{2cm}}$ .

**Irregular Venn Diagrams:**

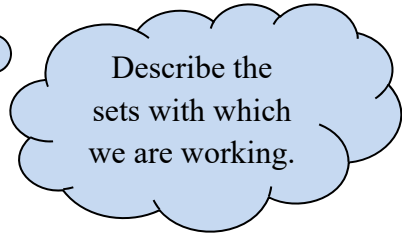
If you are *not* told otherwise, draw your Venn diagrams so that all sets overlap all others. Occasionally, we will see Venns drawn to show off different relationships. Do not let them throw you. Here are two such examples. How are they different?



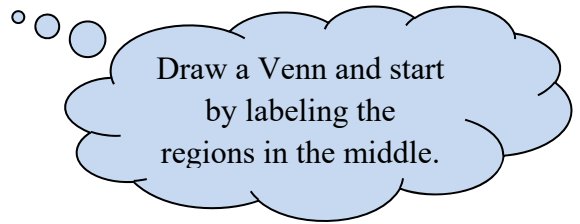
expl 6: Consider the Venn above on the left. Find  $n(C - B)$ . Mark the regions on the Venn.

expl 7: A television network conducted a market survey to determine the evening viewing preferences of people in the 18–25 age bracket. The following information was obtained.

- 3 prefer a reality show early on weekdays
- 14 want to watch TV early on weekdays
- 21 want to see reality shows early
- 8 want reality shows on weekdays
- 31 want to watch TV on weekdays
- 36 want to watch TV early
- 40 want to see reality shows
- 13 prefer late, weekend shows that are *not* reality shows



From this information, determine how many people do *not* want to see reality shows and how many prefer to watch TV on the weekend.

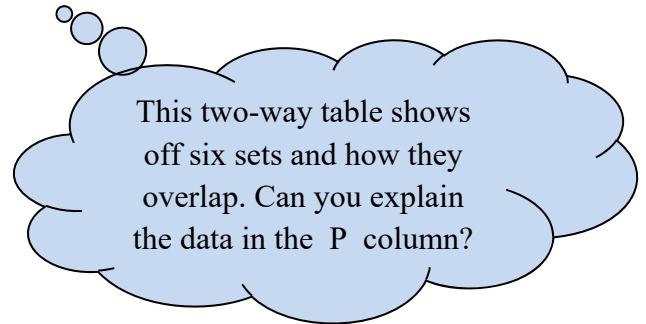


Make sure you answer the questions.

expl 8: A media company that produces Pilates videos surveyed its customers to determine whether they would prefer to purchase the videos by buying an access code to allow them to download from a website, purchase hard copies on a DVD, or access the videos via a podcast. The company has extracted the following table of information from its customer database.

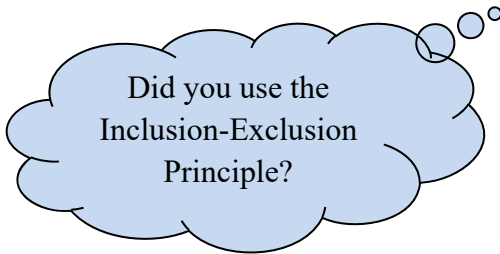
	<b>Access Code (A)</b>	<b>Podcast (P)</b>	<b>DVD (D)</b>	<b>Total</b>
<b>Under 41 (Y)oung</b>	20	15	9	44
<b>41 to 55 (M)iddle-aged</b>	44	34	8	86
<b>Over 55 (S)enior</b>	31	14	5	50
<b>Total</b>	95	63	22	180

- a) Find the number of elements in  $M \cap D$ .  
Describe this group in words.



- b) Find the number of elements in  $A'$ . Describe this group in words.

- c.) Find the number of elements in  $M \cup D$ . Describe this group in words.



- d.) Find the number of elements in  $A - (Y \cup M)$ . Describe this group in words.