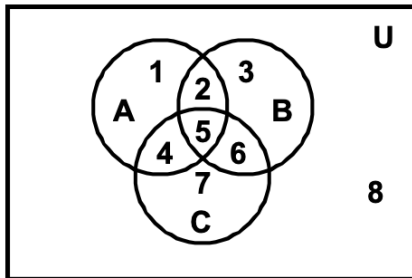


Venn Diagram Sections



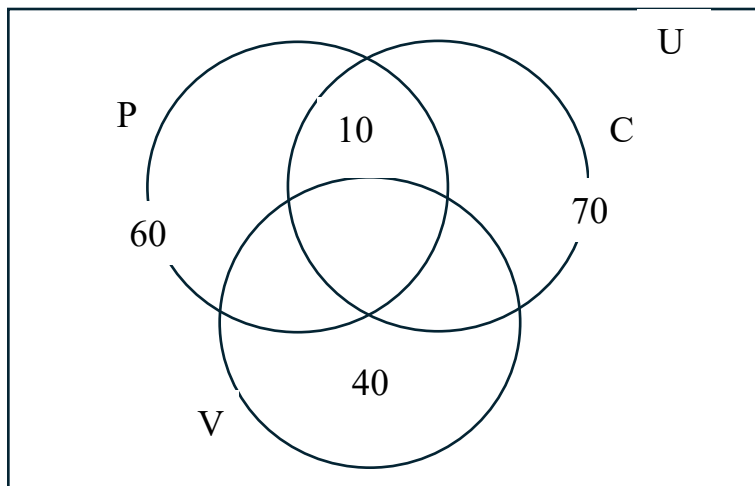
Region 5 is in all three circles. So any elements in region 5 would belong to all three sets. In other words; $A \cap B \cap C$.

What about Region 2? Those are the elements in A and B, but not C. How might you describe Region 6? Those are elements in B and C, but not in A. Try Region 4. The elements in A and C, but not B.

This is fun, let's look at some more regions. Region 1 describes the elements in A only. What about region 3? Those elements are only in B. Region 7 then would be the elements in C only. Region 8 would describe elements that are not members of any of the sets, but belong to the universal set.

Strategy- 1. Determine the number of sets, place that number of circles in the Universal set and label. 2. Place the total number in the Universal set. 3. Determine if you know any intersections and place those numbers in that intersection. 4. Other numbers should go on the line(s) of the circle(s) until you can determine by adding or subtracting where those numbers should go.

A restaurant offers three types of pizza: pepperoni, cheese, and vegetarian. If 60 customers order pepperoni, 70 customers order cheese, and 40 customers order vegetarian only, and 10 customers order both pepperoni and cheese, how many customers order only one type of pizza?



A survey was conducted among 200 people to determine their preferred type of vacation: beach, city, or mountains. Of the respondents, 100 preferred beach vacations, 80 preferred city vacations, and 60 preferred mountain vacations. If 30 people preferred both beach and city vacations, how many people preferred only mountain vacations?

A music streaming service offers three types of music: classical, pop, and rock. Of the 500 subscribers, 250 listen to classical music, 300 listen to pop music, and 200 listen to rock music. If 50 subscribers listen to both classical and pop music, and 10 like all three, how many subscribers listen to only rock music?

A school offers three extracurricular activities: debate club, drama club, and robotics club. Of the 150 students in the school, 50 students are in the debate club, 60 students are in the drama club, and 40 students are in the robotics club. If 20 students are in both debate and drama clubs, how many students are in exactly one club?

Venn Diagram Problems

- 1a. A survey of 70 high school students revealed that 35 like folk music, 15 like classical music, and 5 like both. How many of the students surveyed do not like either folk or classical music?
- 2a. Out of 35 students in a finite math class, 22 are male, 19 are business majors, 27 are freshmen, 14 are male business students, 17 are male freshmen, 15 are freshmen business majors, and 11 are male freshmen business majors. How many upper class women non-business majors are in the class? How many women business majors are in the class?
- 3a. A survey of 100 college faculty who exercise regularly found that 45 jog, 30 swim, 20 cycle, 6 jog and swim. 1 jogs and cycles, 5 swim and cycle, and 1 does all three. How many of the faculty members do not do any of these three activities? How many just jog?
- 4a. After a genetics experiment, the number of pea plants having certain characteristics were tallied, with the results as follows.
- | | |
|----|------------------------------------|
| 22 | were tall |
| 25 | produce green peas |
| 39 | produce smooth peas |
| 9 | are tall and produce green peas |
| 17 | are tall and produce smooth peas. |
| 20 | produce green peas and smooth peas |
| 6 | have all three characteristics |
| 4 | have none of the characteristics. |
- (a) Find the total number of plants counted.
- (b) How many plants are tall, but produce peas which are neither smooth nor green?
- (c) How many plants are not tall, but produce peas which are smooth and green?
- 5a. A survey of 80 business executives found the following recommendations on college majors for business students.
- | | |
|----|--|
| 36 | recommended liberal arts courses |
| 32 | recommended business courses. |
| 32 | recommended technical courses. |
| 16 | recommended technical and business courses. |
| 16 | recommended business and liberal arts courses. |
| 14 | recommended liberal arts and technical courses |
| 6 | recommended all three. |
- (a) How many executives recommend liberal arts, but neither of the other two?
- (b) How many recommend none of these three types of courses?

6a. The musical tastes of a number of college students were surveyed, and it was found that:

- 22 like Johnny Cash
- 25 like Elvis Presley
- 39 like The Carpenters
- 9 like Johnny Cash and Elvis Presley
- 17 like Johnny Cash and The Carpenters
- 20 like Elvis Presley and The Carpenters
- 6 like all three
- 4 like none of these performers

- (a) How many students were surveyed?
- (b) How many like exactly two of these three performers?
- (c) How many like Johnny Cash only?
- (d) How many do not like Johnny Cash?

7a. The following data shows the preferences of 110 people at a wine-tasting party.

- 99 like Spanada
- 96 like Ripple
- 99 like Boone's Fair Apple Wine
- 95 like Spanada and Ripple
- 94 like Ripple and Boone's
- 96 like Spanada and Boone's
- 93 like all three.

How many of the people:

- (a) like none of the three beverages?
- (b) like Spanada, but not Ripple?
- (c) do not like Boone's Farm Apple Wine?
- (d) like only Ripple?
- (e) like exactly two wines?

8a. Routine physical examinations of 500 pre-school children revealed that 40 had dental problems, 45 had vision problems, 55 had hearing problems, 15 had dental and vision problems, 15 had dental and hearing problems, 20 had vision and hearing problems, and 10 had dental, vision, and hearing problems. How many of the children had none of the three kinds of problems?

- 9a. Human blood can contain either no antigens, the A antigen, the B antigen, or both the A and B antigens. A third antigen, called the Rh antigen, is significant in human reproduction, and again may or may not be present in an individual. Blood is called type A-positive if the subject has the A and Rh, but not the B antigen. Subjects having only the A and B antigens are said to have type AB-negative blood. Subjects having only the Rh antigen have type O-positive blood, etc. In a certain hospital the following data on patients were recorded:

25	patients had the A antigen,
17	had the A and B antigens,
27	had the B antigen,
22	had the B and Rh antigens,
30	had the Rh antigen,
12	had none of the antigens,
16	had the A and Rh antigens,
15	had all three antigens.

- (a) How many patients are represented here?
- (b) How many patients have exactly one antigen?
- (c) How many patients have exactly two antigens?
- 10a. A local merchant uses television, radio, and newspaper advertising. To determine the effectiveness of advertising, he questions 200 customers during a special after-hours sale to see how they knew about the sale. He found that 115 had seen television ads, 75 had heard radio ads, and 125 had read newspaper ads. He also found that 30 received information from television and radio, 70 from television and newspapers, 25 from radio and newspapers, and 10 from all three. If everyone else said they heard it from a friend, how many heard it from a friend?
- 11a. In order to prepare a report on agricultural prospects for his county, the county farm advisor questions 100 farmers about their crop plans for the following year. He finds that 75 intend to plant corn, 55 will plant soybeans, 35 will plant wheat, 35 will plant corn and soybeans, 25 will plant corn and wheat, 15 will plant soybeans and wheat, and 10 will plant all three. How many of the farmers will plant only one crop? How many will plant at least two crops?
- 12a. In a group of 150 primary students, 100 watch "Sesame Street," 55 watch "Electric Company," and 65 watch "Mr. Rogers' Neighborhood." If, in addition, 35 watch "Sesame Street" and "Electric Company," 45 watch "Sesame Street" and "Mr. Rogers," 30 watch "Electric company" and "Mr. Rogers," and 20 watch all three, how many watch none of the three? How many watch only "Sesame Street"?

- 13a. At a pow-wow in Arizona, Native Americans from all over the Southwest came to participate in the ceremonies. A coordinator of the pow-wow took a survey and found that:

15	families brought food, costumes, and crafts:
25	families brought food and crafts:
42	families brought food:
20	families brought costumes and food:
6	families brought costumes and crafts, but not food:
4	families brought crafts, but neither food nor costumes:
10	families brought none of the three items:
18	families brought costumes, but not crafts:

- (a) How many families were surveyed?
- (b) How many families brought costumes?
- (c) How many families brought crafts, but not costumes?
- (d) How many families did not bring crafts?
- (e) How many families brought food or costumes?

- 14a. A survey of people attending a Lunar New Year celebration in Chinatown yielded the following results:

120	were women:
150	spoke Cantonese:
170	lit firecrackers:
108	of the men spoke Cantonese:
100	of the men did not light firecrackers:
18	of the non-Cantonese-speaking women lit firecrackers:
78	non-Cantonese-speaking men did not light firecrackers:
30	of the women who spoke Cantonese lit firecrackers.

- (a) How many attended?
- (b) How many of those who attended did not speak Cantonese?
- (c) How many women did not light firecrackers?
- (d) How many of those who lit firecrackers were Cantonese-speaking men?

15a. A chicken farmer surveyed his flock with the following results. The farmer had:

- 9 fat red roosters:
- 2 fat red hens:
- 37 fat chickens:
- 26 fat roosters
- 7 thin brown hens:
- 18 thin brown roosters:
- 6 thin red roosters:
- 6 thin red hens:

Answer the following questions about the flock. [Hint: You need a Venn Diagram with regions for fat, for male (a rooster is a male, a hen is a female), and for red (assume that brown and red are opposites in the chicken world).] How many chickens were:

- | | |
|-------------------------|------------------------|
| (a) fat? | (b) red? |
| (c) male? | (d) fat, but not male? |
| (e) brown, but not fat? | (f) red and fat? |

16. Country-Western songs seem to emphasize three basic themes: love, prison, and trucks. A survey of the local country-western radio station produced the following data:

- 12 songs were about a truck driver who was in love while in prison:
- 13 were about a prisoner in love:
- 28 were about a person in love:
- 18 were about a truck driver in love.
- 3 were about a truck driver in prison who was not in love:
- 2 were about a prisoner who was not in love and did not drive a truck:
- 8 were about a person who was not in prison, not in love, and did not drive a truck:
- 16 were about truck drivers who were not in prison.

- (a) How many songs were surveyed?

Find the number of songs about:

- | | |
|------------------------------|---------------------------|
| (b) truck drivers: | (c) prisoners: |
| (d) truck drivers in prison: | (e) people not in prison: |
| (f) people not in love: | |

17A. A survey of 80 sophomores at a western college showed that:

36	took English:
32	took history:
32	took political science:
16	took political science and history:
16	took history and English:
14	took political science and English:
6	took all three

How many students:

- (a) took English and neither of the other two?
- (b) took none of the three courses?
- (c) took history, but neither of the other two?
- (d) took political science and history, but not English?
- (e) did not take political science?