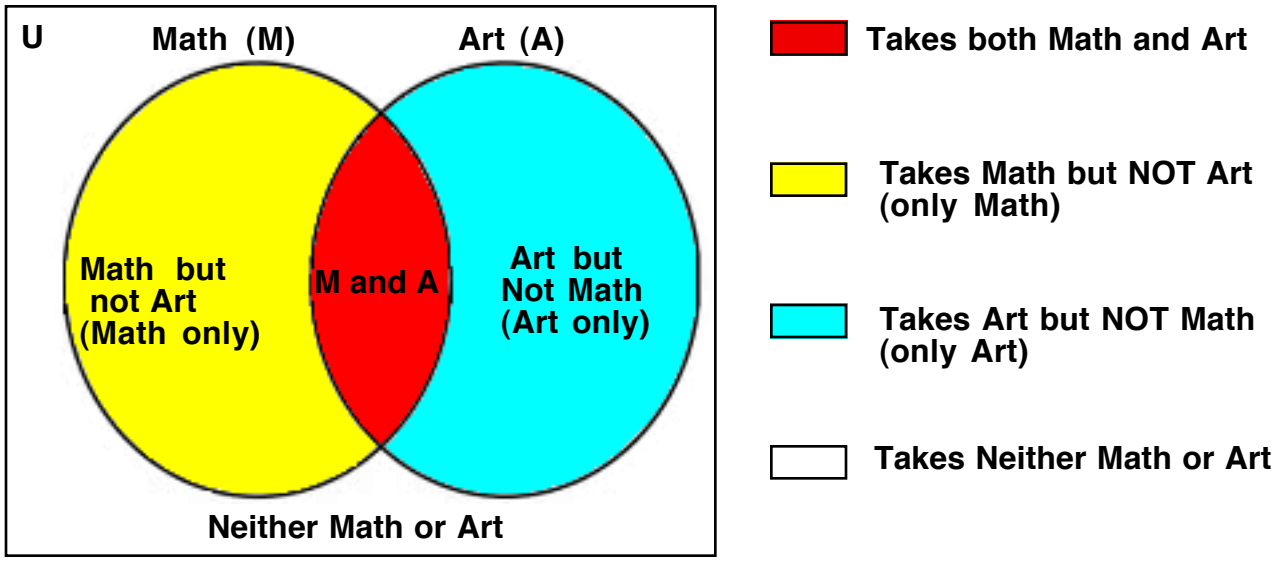
Section 4– 4: **Venn Diagrams**

A two circle Venn Diagram consists of two overlapping circles inside a larger rectangular area. The rectangle and two overlapping circles divide the region into 4 distinct areas. If the attribute for each circle is given then the unique attributes for the 4 distinct areas are known.

2 Circle Venn Diagrams

A college offers both Math and Art classes. There are only 4 different enrollment outcomes for these subjects. Students at the college may enroll in Math but not Art, Art but not Math, both Math and Art or not take any Math or Art classes.



The **circle on the left** represents **all the students that take Math.** It has **two regions**. Some Math students take **only Math** and **NOT** Art and some math students take **both Math and Art** . The two regions are disjoint. The total number of students in the and regions represent all the students that take Math.

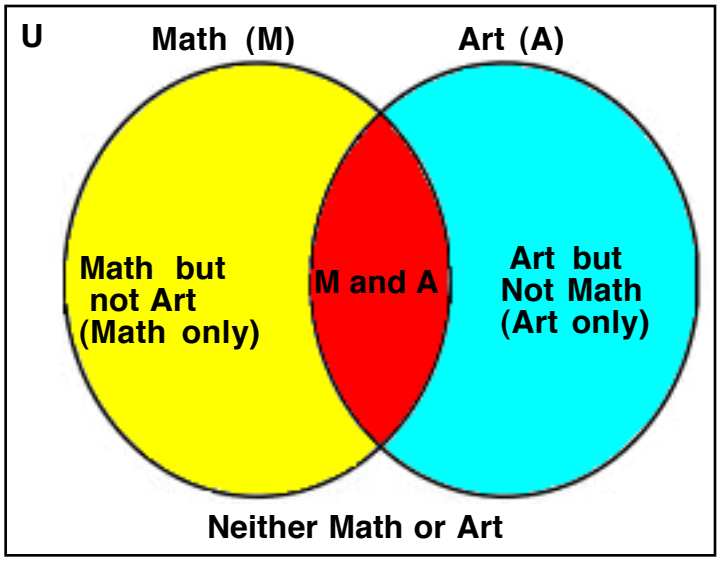
The **circle on the right** represents all the students that take Art. It has two regions. Some Art students take **only Art** and **NOT** Math and some Art students take **both Art and Math** .

Both circles contain the region because it represents students that take Art and also take Math

The **white area inside the Rectangle but outside the overlapping circles** represents the students at the school that **DO NOT** take Math or Art. These are very unfortunate students

Example 1

52 students at FLC were asked about their enrollment in Math and Art classes. 3 students said that they take Math and Art. 15 students said that they take Math. 30 said that they take Art. How many students are in each of the four regions of the Venn Diagram?



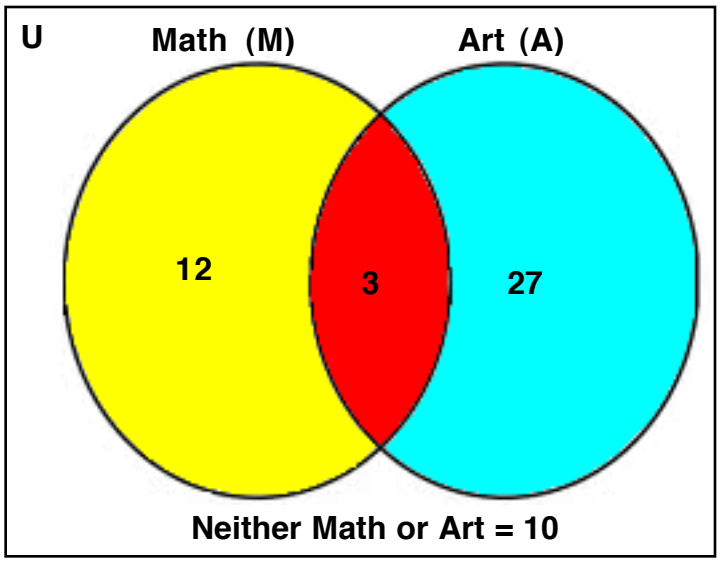
3 take Math and Art. ▭ = 3.

15 take Math. ▭ + ▭ = 15 so ▭ + 3 = 15 ▭ = 12

30 take Art. ▭ + ▭ = 30 so 3 + ▭ = 30 ▭ = 27

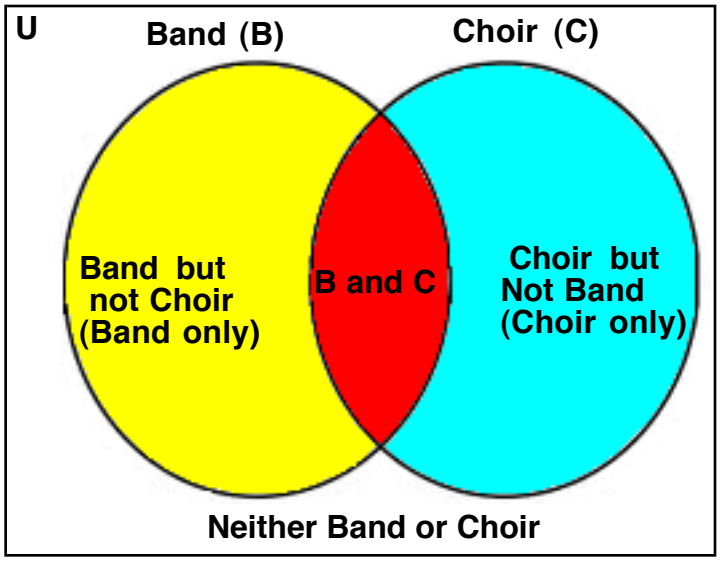
All 4 colored areas total 52.

▭ + ▭ + ▭ + ▭ = 52 12 + 3 + 27 + ▭ = 52 ▭ = 10



Example 2

60 students were asked about their enrollment in the Band and Choir program at their school. 23 students said that they take only Band. 30 said that they take Band. 13 students said that they take only Choir. How many students are in each of the four regions of the Venn Diagram?



23 take only band. ▭ = 23.

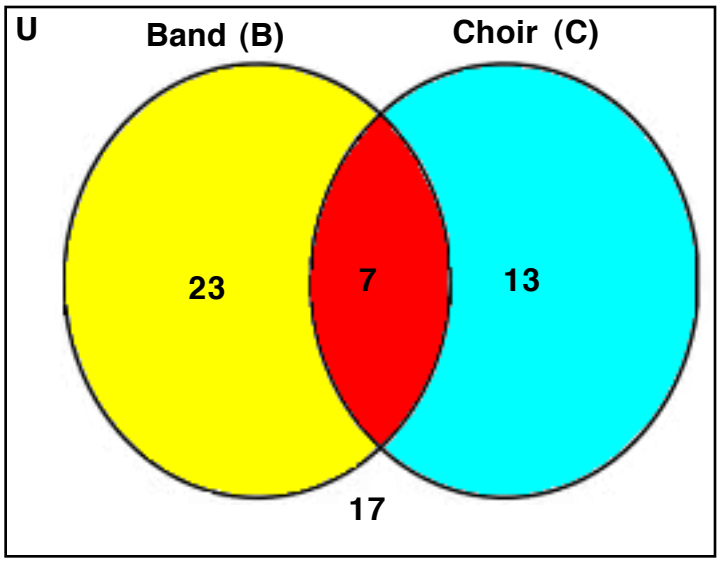
30 take Band. ▭ + ▭ = 30 so 23 + ▭ =30 ▭ = 7

13 take only Choir. ▭ = 13.

There are a total of 60 students

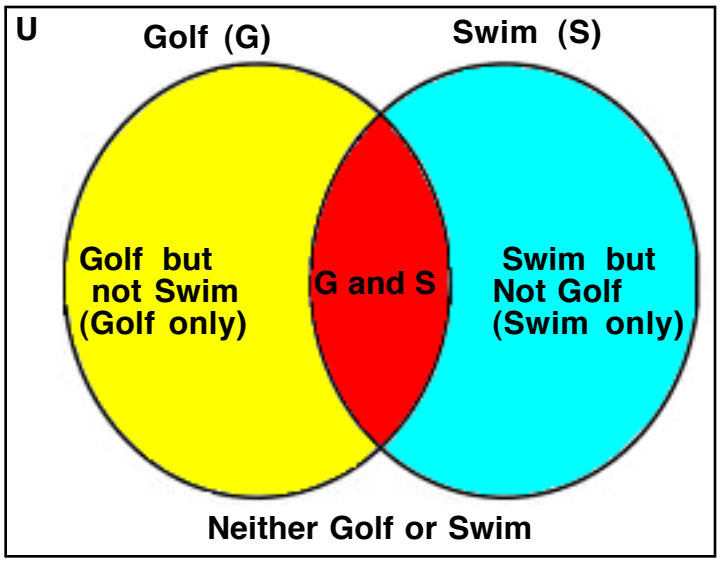
▭ + ▭ + ▭ + ▭ = 60

23 + 7 + 13 + ▭ = 60 ▭ =17



Example 3

50 people at the Senior Center were asked if they Golf or Swim. 4 of them said that they Golf and Swim. 25 said that they Golf. 14 said that they did not Golf or Swim. How many seniors are in each of the four regions of the Venn Diagram?



4 said they Golf and Swim. ▭ = 4

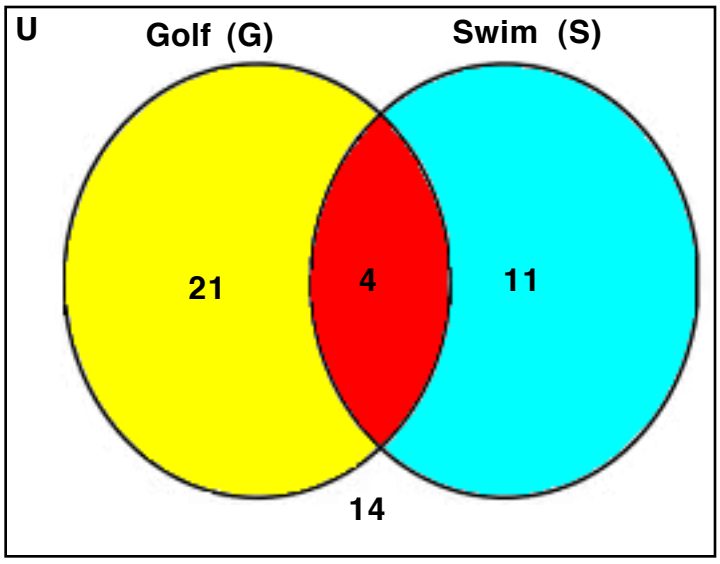
25 said they Golf. ▭ + ▭ = 25 so ▭ + 4 = 25 ▭ = 21

14 said they did not Golf or Swim. ▭ = 14

There are a total of 50 students

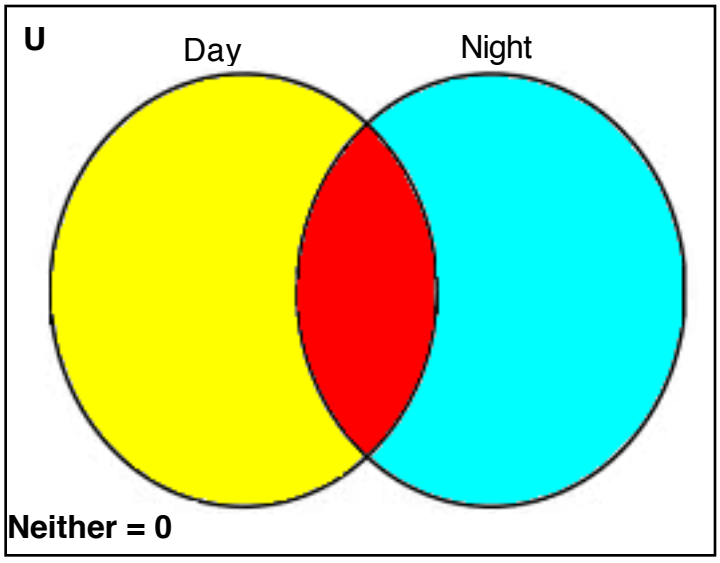
▭ + ▭ + ▭ + ▭ = 50

21 + 4 + ▭ + 14 = 50 ▭ =11



Example 4 Finding the number in the overlapping area.

A group of 65 students were asked if they took day or night classes. All 65 took said that they took at least one class. 45 said they took Day classes. 25 said that they took night classes. How many students are in each of the four regions of the Venn Diagram?



All 65 said they took at least one class so neither = 0

There are **65 students** who take day or night or both. ▭ + ▭ + ▭ = 65

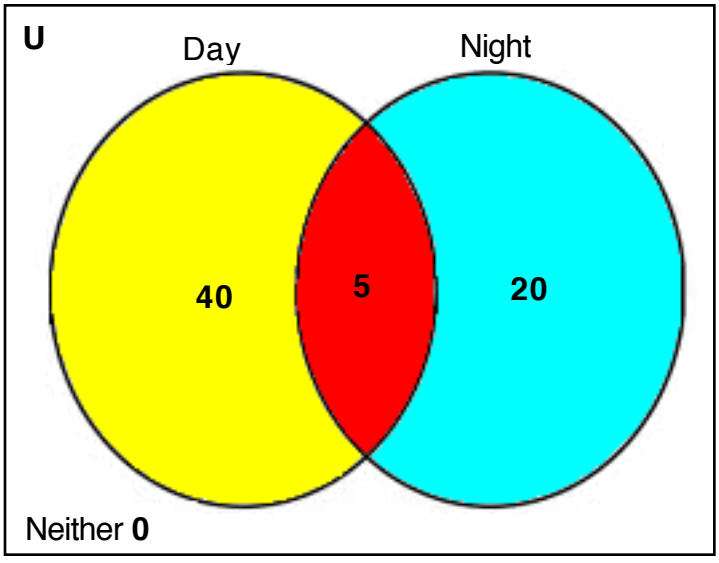
45 students say they take day classes ▭ + ▭ = 45

If ▭ + ▭ + ▭ = 65 and ▭ + ▭ = 45 then ▭ = 20

25 say they take night classes. ▭ + ▭ = 25

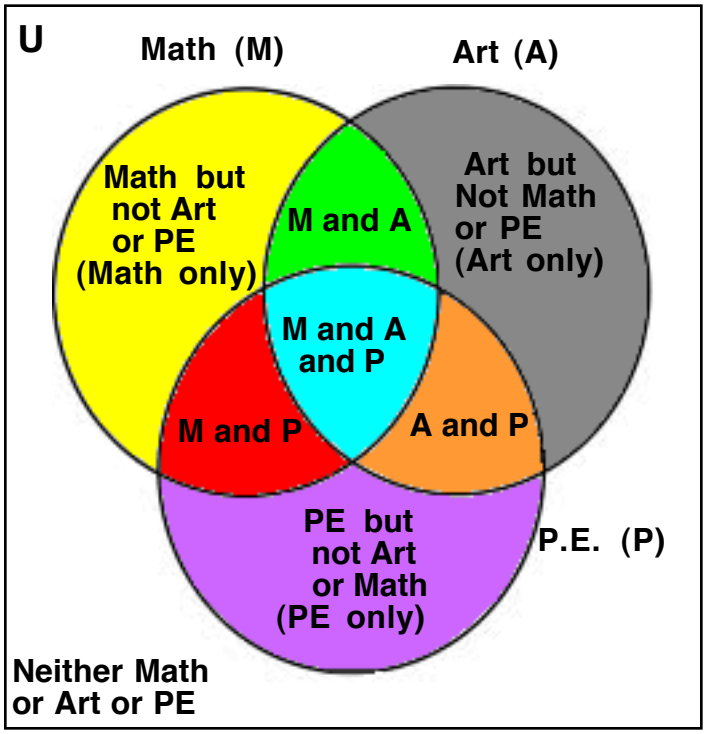
If ▭ + ▭ = 25 and ▭ = 20 then ▭ = 5

45 say they take day classes. ▭ + ▭ = 45 and ▭ = 5 then ▭ = 40



3 Circle Venn Diagrams

A college offers Math and Art and PE classes. There are 8 different enrollment outcomes for these 3 subjects.



- **Takes only Math NOT Art or PE**
- **Takes only ART NOT Math or PE**
- **Takes only PE NOT Math or ART**
- **Takes both Math and Art and PE**
- **Takes Math and PE but NOT ART**
- **Takes Math and ART but NOT PE**
- **Takes Art and PE but NOT Math**
- **Takes Neither Math or Art or PE**

The **circle on the left** represents **all the students that take Math.** It has **4 regions**. **The math students in** ▭ take **only Math** and **NOT** Art or PE. The **math students in** ▭ take **both Math and ART but not PE**. **The math students in** ▭ take **both Math** and **PE but not ART. The students in** ▭ **take Math and Art and PE.** The 4 regions are disjoint. The total number of students in the ▭ and ▭ and ▭ and ▭ regions represent **the total of all the students that take Math**.

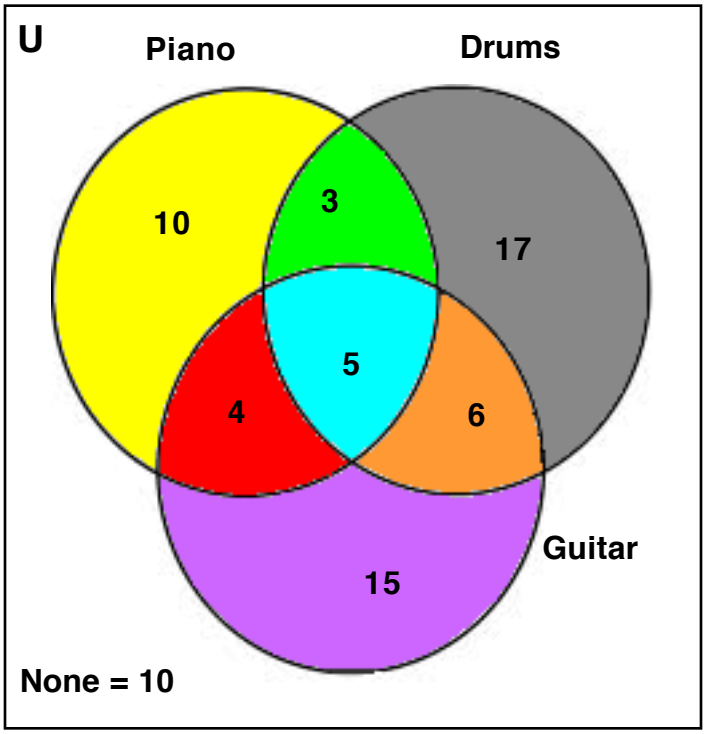
The **circle on the right** represents all the students that take **Art**. It also has 4 regions with similar conditions as the circle for Math. The total number of students in the ▭ and ▭ and ▭ and ▭ regions represent **the total of all the students that take Art**.

The **circle on the bottom** represents all the students that take **PE**. It also has 4 regions with similar conditions as the circle for Math. The total number of students in the ▭ and ▭ and ▭ and ▭ regions represent **the total of all the students that take PE**. ▭

The **white area inside the Rectangle but outside the overlapping circles** represents the students at the school that **DO NOT** take any Math,PE or Art classes.

Example 1

70 people were asked what instruments they played. 22 said they play the piano. 31 said they play the drums. 30 said they play the guitar. 8 said they play the piano and the drums. 9 said they play the piano and the guitar. 11 said they play the drums and the guitar. 5 people said that could play all three instruments.



5 play all three instruments. = 5

11 people play drums and guitars. 5 + = 11 so = 6

8 people play piano and the drums 5 + = 8 so = 3

9 said they played the piano and the guitar. 5 + = 9 so = 4.

31 said they played the drums so + 3 + 5 + 6 = 31 so = 17
17 play only drums and no other instrument.

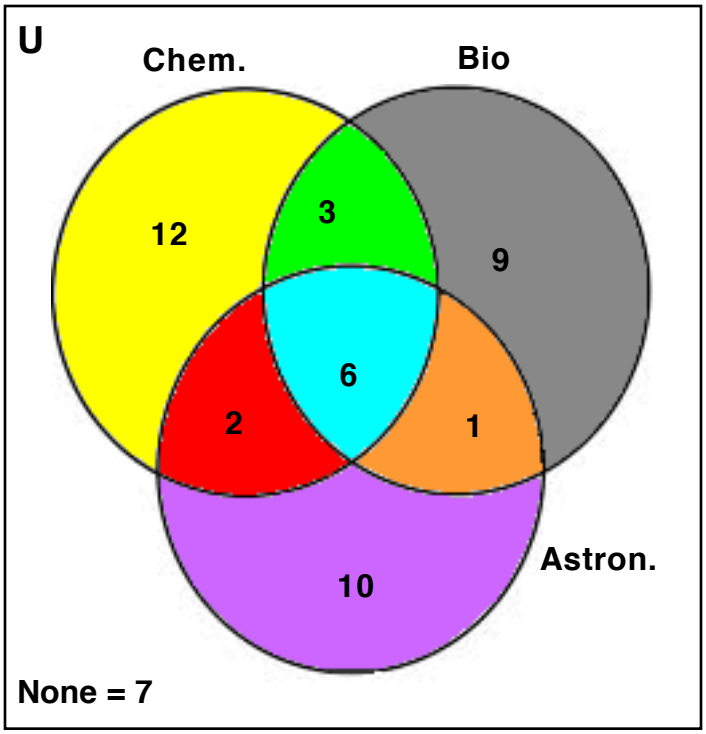
22 said they played the piano so + 3 +5 + 4 = 22 = 10
10 play only the piano and no other instrument.

22 said they played the guitar so + 4 +5 + 6 = 30 = 15
15 play only the guitar and no other instrument.

All 8 colored areas total 60 . There were 70 total people so there are 10 people in the white area outside the overlapping circles.

Example 2

50 students were polled about what science courses they liked. 9 liked Chemistry and Biology. 15 liked Chemistry but not Astronomy. 23 liked Chemistry, 19 liked Biology, 10 liked Astronomy but not Chemistry or Biology. **6 liked all three.** 1 liked Biology and Astronomy but not Chemistry.



6 liked all three ▭ = 6

9 liked Chemistry and Biology. 6 ▭ + ▭ = 9 so ▭ = 3

1 liked Biology and Astronomy but not Chemistry. ▭ = 1

19 liked Biology 3 ▭ + 6 ▭ + 1 ▭ + ▭ = 19 so ▭ = 9

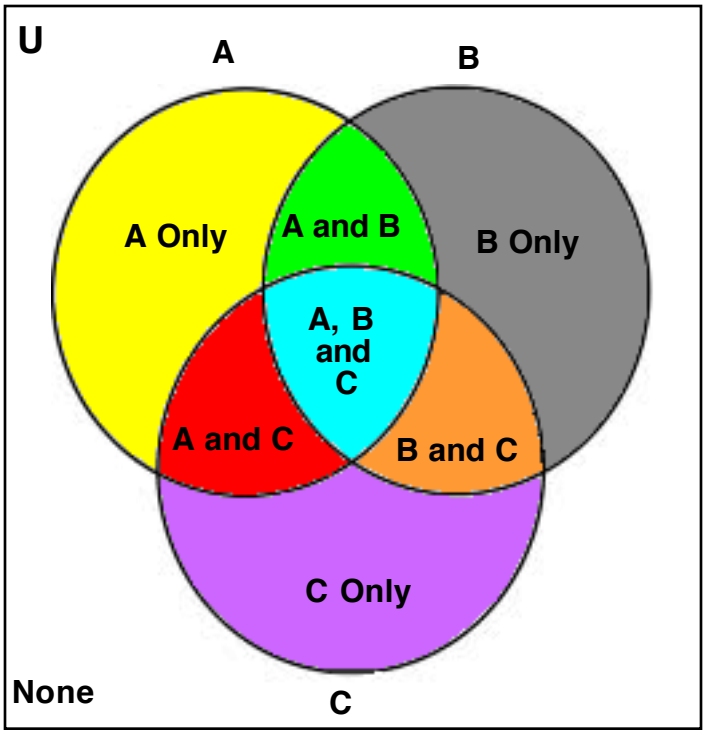
10 liked Astronomy but not Chemistry or Biology. ▭ =10

15 liked Chemistry but not Astronomy. ▭ + 3 ▭ = 15 so ▭ = 12

23 liked Chemistry, 12 ▭ + 3 ▭ + 6 ▭ + ▭ = 23 so ▭ = 2

All 8 colored areas total 43 . There were 50 total people mentioned so there are 7 in the white area ▭ = 9

3 Circle Venn Diagram



3 Circle Venn Diagram in Excel

A only	A only	A and B	B only	**B only**
A only	A only	A and B	B only	B only
A only	A only	A and B	B only	B only
A only	A and C	**A B and C**	**B and C**	B only
A only	A and C	**A B and C**	**B and C**	B only
A only	A and C	**A B and C**	**B and C**	B only
None	**C only**	**C only**	**C only**	
	C only	**C only**	**C only**	
	C only	**C only**	**C only**	
	C only	**C only**	**C only**	

