

1 Introduction

What exactly is a **venn diagram**? A venn diagram is an illustration that shows the similarities and differences between two or more groups/data sets.

Drawing pictures is really helpful when solving venn diagram problems. A figure with an empty venn diagram is below. Fill it in with venn diagram with "A", "B", and "A and B".

Hint: "A" is one group, "B" is another group, and "A and B" corresponds to the section that both groups share.

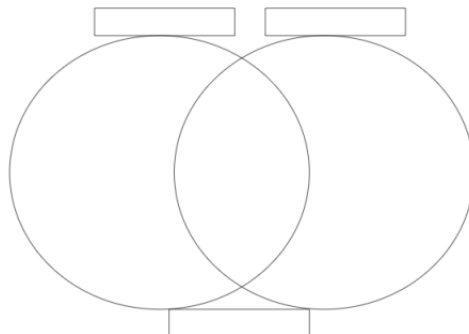


Figure 1: Venn Diagram

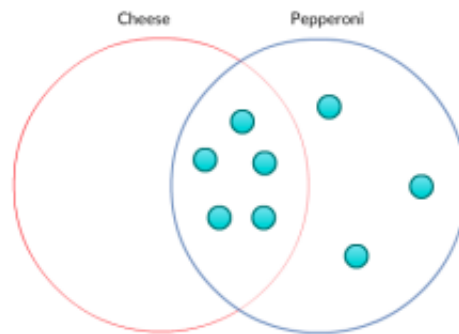
2 Warm-Up

At Mathnerd Elementary School, there are 12 kids in one class. All of the kids are eating at least one slice of pizza. They are offered cheese or pepperoni pizza. 8 of the kids ate pepperoni pizza and 5 of the kids ate both cheese and pepperoni pizza. How many kids ate cheese pizza?

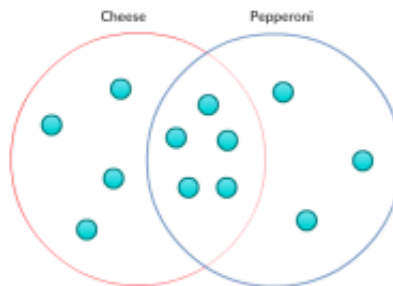


Alright! So let's try using the Venn diagram. We'll place points in the circles to represent the kids - one point per kid. Let's go!

We first place five points in the intersection space inside of both circles, because there are five kids that ate both pizzas. Now, since there are 8 kids eating pepperoni pizza, and 5 points are already inside the intersection, there must be three more points inside the pepperoni circle which aren't in the cheese circle



Since there are 12 kids, there must be 4 left which are inside the cheese circle but not the pepperoni circle. We've placed all of our kids into the diagram. Now we can just read off the answer to our original problems.



There are 9 points inside the cheese circle on the left. So 9 kids ate cheese pizza!

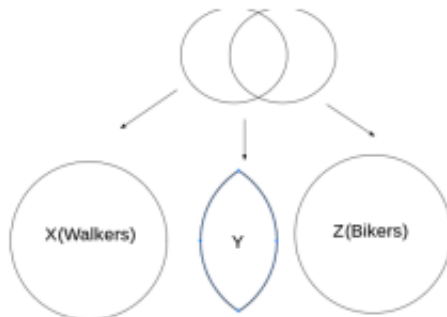
Quick Question: Why did we start on the 5 kids with both pizzas rather than with the "12 total kids" or the "8 people eating pepperoni"?

3 Try it yourself!

1. A school took a survey to see students' preferred transportation methods to and from school. The statistic showed that 22 students walk, 17 bike, and 12 use both. How many students did they survey in total?
2. A student was curious to see what her peers did over winter break. She asked her 30 classmates and found that 19 of them vacationed in Lake Tahoe and 17 went to Disneyland, and 8 lucky kids did both. Add up all the values in your diagram. Is it the same as the total? If not, why did you fall short? In Venn Diagrams, we must look at A, B, and both, but also consider neither A or B. This number is denoted outside of the Venn Diagram and should be accounted for in the total. How many students did only one activity over break? How many did none?
3. In another part of the Pleasanton Zoo, the sea lions can learn up to three tricks: roll over, clap, and dance. Of the sea lions: 50 sea lions can roll over, 50 sea lions can clap, 50 sea lions can dance, 9 sea lions can do all three. 17 sea lions can roll over and clap, 12 sea lions can dance and roll over, 18 sea lions can clap and dance, 9 sea lions can do none. How many sea lions are in the zoo in total? How many sea lions know two or more tricks?

4 Sum It All Up

Now that you are more comfortable with Venn diagrams, take Problem 1 and try to find the total number of students in terms of values x , y , and z . Use the diagram below as a guide.



5 Challenge Problems

- There are 158 seniors at AVHS. 92 are taking Calc BC, 71 are taking Multi, and 40 are taking Problem Solving. The math students include 14 who are taking only both Calc BC and Multi, 18 are taking only Calc BC and Problem Solving, 11 are taking only Multi and Problem Solving. Lastly, there are 8 brave souls taking all three math classes. How many seniors (the non-cool seniors) at AVHS are not taking any math class?
- Suppose that a car manufacturer is trying to predict demand for the next sales cycle, based on the previous year's data. The company database is searched, and it turns out that the luxury sound system was ordered in 2541 models, and the normal sound system was ordered in 7983. The sunroof was ordered in 3048 models, and of those, 2115 ordered the luxury sound system also. Find out how many orders there were for all possible combinations of luxury/normal stereo and with/without sunroof.
- You are playing a carnival game where there are red, blue, and purple (both red and blue) bottles, and you have to guess the number of purple bottles. You see 18 bottles in front of you, but they are faced down so you can't see the colors. The carnival worker tells you that 11 have a blue bottom and 13 of them are red, and 3 are clear. Try to win the game using a Venn diagram.
- There's a candy store that sells chocolate bars and lollipops. A customer can only buy one per candy. On one lovely afternoon, there were 66 chocolate bars and 59 lollipops sold. 19 customers bought both a chocolate bar and a lollipop. How many customers came in that afternoon?
- Sets A and B , shown in the Venn diagram, have the same number of elements. Their union has 2007 elements and their intersection has 1001 elements. Find the number of elements in A .

