In addition to tree diagrams, another useful tool we can use for helping us work with probabilities is Venn diagrams. We can use Venn diagrams to graphically signify the relationships between sets. In mathematics, we can call any collection of "objects" (a set of numbers, a set of pairs, or in probability, we can think of a set of outcomes or events) a Set, and we can use curly brackets {} to list the items in the set. So the set of odd outcomes when we roll one die is {1,3,5} and the set of numbers greater than 2 is the set {3,4,5,6}. We can use Venn diagrams to represent the overlap between these sets. So for example
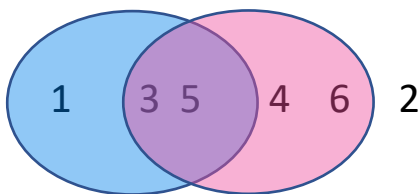
Shows the set of odd numbers in Blue, the set of numbers greater than 2 in red, and of course, what's left over sits outside this space. The intersection of these two sets is the set of numbers that are odd AND greater than 2. So we write

A AND B = {3, 5}

We can also combine these sets to give the set of all of the numbers on the die that are odd OR greater than 2, which will give {1,3,4,5,6}.

The probability of A given B, can be determined by restricting our attention to the set B, so in this case the set of outcomes that are odd, GIVEN that they are greater than 2 is the set {3,5} as a fraction of all B.

If two sets have no overlap, they are said to be disjoint or mutually exclusive, which is usually represented as separate circles.

On the other hand, we can also have sets that are subsets. For example, suppose from the outcomes of a die we have the sets A: multiples of 3; and B: numbers greater than 2. In this case, the Venn diagram looks like this, and we say that A is a subset of B.

Now if we consider conditional probabilities in this case, we have the probability of A given B, so this is our probability of {3,6} as a fraction of the probability of {3,4,5,6}. However if we have the probability of B given A, well, if A occurs, then since it's part of B, then B is a certainty, or we can think of it as the probably of {3,6} as a fraction of {3,6} which will give us 1.