Set Intersection

The intersection of two sets is a new set formed by finding common elements in the membership of the original two sets. Thus, if we have A={3,4,7,9} and B={1,3,5,7,9) we can form the intersection of the two sets, written as A∩B as the set {3,7,9}. As an equation we would say as A∩B={3,7,9}.

Let us continue by looking at another set, D={5,7}. Then D∩A={7} and D∩B={5,7}. You might note that in this last example the answer is the same as D. That is D∩B=D. This is true because D⊆B.

Consider E={2,4,5,6,8,9}. Then, E∩B={5,9}. And, we might note that B∩E={5,9}. The fact that B∩E=E∩B is not unique to the sets B and E. By the very definition of the intersection of two sets, the order in which we give the sets makes no difference in the result. Taking the intersection of two sets produces a new set. In that sense, intersection is an “operator”. When the order of the things the operator is working on makes no difference, as in B∩E=E∩B, we say that the operation is commutative. Intersection is a commutative operator.

Adding a fifth set to our list, F={1,4,7,11} we might find F∩B∩A as an expression. We need to decide how to do this and there are two choices: we could do F∩B first and take that answer intersect A, which we would write as (F∩B)∩A, or we could take F intersect the result of B∩A, which we would write as F∩(B∩A). Again, from the definition of the intersection, we will get the same answer either way. This, again, is not unique to our sets F, B, and A. This will be true for any sets P, Q, and R. It is always the case that P∩R∩Q=(P∩R) ∩Q=P∩ (R∩Q). An operator that has this property is called associative. Intersection is an associative operator.

Consider yet another set, G={4,6,8}. Now we can examine G∩B. This turns out to be the empty set. We could write G∩B=⌀. This is true because G and B are disjoint.