Chapter 1

Generic stuff:

- connections>> isolations. (Compositions: if a connection exists in a subsystem it must also exist in the composition)
- Hasse diagrams: more connected systems are upper in the hierarchy (order)
- Observations may/may-not be structure preserving
- Disjoint union of X and Y is (x,1) (y,2). 1,2 etc are like new tokens which do not see the set rather the element. Therefore if the element is the same it must be associated with the same token
- Relations are a sub-set of the product
- Partitions: union of partitions forms the set again and intersection is null, they represent internal connectivity in the set. We use Tilda (~) to rep a and b belong to the same part.
- Partition from preorder: we saw that partitions == communication, so a sub-cylce in which every element communicates with every other element becomes a partition.
- Discrete preorder: no relation between the individual elements of a set excel that each individual element may be less than or equal to itself
- Upper set: if p is an element of the upper set, so is everything above it
- A monotone map is a map that preserves directionality, if a goes to b and f(a) goes to f(b) then b must be above a in its preorder
- Meet: greatest lower bound, if there are 2 meets they will be isomorphic, at the same level wrt the order
- Join: lowest upper bound
- Generative effects: things that unexpectedly show up when the order of operation changes as observations may-not always be structure preserving

- Observation is the order of first applying the transformation or carrying out the function
- Galios criteria:

Definition 1.95. A *Galois connection* between preorders P and Q is a pair of monotone maps $f: P \to Q$ and $g: Q \to P$ such that

$$f(p) \leq q \quad \text{if and only if} \quad p \leq g(q). \tag{1.96}$$

We say that f is the *left adjoint* and g is the *right adjoint* of the Galois connection.