* **Cartesian product:**
* A Cartesian product is a set of all ordered 2-tuples where each “part” is from a given set Denoted by A x B, and uses parenthesis (not curly brackets).
* For example, 2-D Cartesian coordinates are the set of all ordered pairs **Z** x **Z** Recall **Z** is the set of all integers.
* This is all the possible coordinates in 2-D space, Example: Given **A = {a, b}** and **B = {0, 1}**, what is their Cartiesian product? **C = A x B = { (a,0), (a,1), (b,0), (b,1) }.**
* Note that Cartesian products have only 2 parts in these examples (later examples have more parts)
* Formal definition of a Cartesian product: **A x B = { (*a*, *b*) | *a* ∈ A and *b* ∈ B }.**
* All the possible grades in this class will be a Cartesian product of the set S of all the students in this class and the set G of all possible grades. Let S = { Alice, Bob, Chris } and G = { A, B, C }, D = {(Alice, A), (Alice, B), (Alice, C), (Bob, A), (Bob, B), (Bob, C), (Chris, A), (Chris, B), (Chris, C) }
* There can be Cartesian products on more than two sets.
* A 3-D coordinate is an element from the Cartesian product of **Z** x **Z** x **Z**
* For sets ***A***, ***B***, their ***Cartesian product******A* x *B* :≡ {(*a*, *b*) | *a*∈*A* ∧ *b*∈*B*}**.
* ***E.g.* {a, b } x {1,2} = {(a,1), (a,2), (b,1), (b,2)}**
* Note that for finite ***A***, ***B***, **|*A*** x ***B*| = |*A*||*B*|.**
* Note that the Cartesian product is ***not*** commutative: **∀ *AB*: *A* x *B* = *B* x *A*.**
* Extends to ***A*1x*A*2x … x*An*...**