The consumption set is denoted by X. If x, $y \in X$, then x and y are potential consumption bundles. $x = (x_1, x_2, ..., x_n)$ where n is the number of goods and x_k is the quantity of good k in the consumer's consumption bundle. For consumer i, consumption set is denoted by X_i and a consumption bundle $x_i = (x_{i1}, x_{12}, ..., x_{in})$

1 Consumption Preference

- A preference relation $\succeq$ is an ordering over the elements of X. $x \succeq y$ means " x is atleast as good as y or x is weakly preferred over y".
- **Strict preference($\succ$)**: $x \succ y$ means $x \succeq y$ ("x is atleast as good as y") and $y \not\succeq x$("y is not atleast as good as x) i.e. "x is better than y"
- **Indifference** ($\sim$) :x $\sim y$ mean x and $y \succeq x$ i.e "x is just as good as y"
- A preference relation $\succeq$ represents "preferences" of each individual.

2 Axioms of Rational Choice

- **Completeness**: If x and y are any two consumption possibilities, the consumer can always specify exactly one of the following possibilities.

$$x \succ y, y \succ x, x \sim y.$$

  Any alternative can be compared

- **Transitivity**: $x \succeq y$ and $y \succeq z \implies x \succeq z$
  Choices must be internally consistent
- **Continuity**: If a consumer reports that $x \succ y$, then she must also report that $x' \succ y$ for any y "close to" x.

3 Utility

- A utility function $u : X \mapsto \mathbb{R}$ represents $\succeq$ if and only if for all $x, y \in X$

$$x \succeq y u(x) \geq u(y).$$

- The function is unique only up to an order-preserving transformation.
- Any preference relation that can be represented by a continuous function is rational.