

# Rationality, Choice and Common Knowledge

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# Recap: What is Game Theory?

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- Analysis of strategic interactions in which the outcome for each agent depends on not only her action but also the choices made by others.
- Or, Study of rational behavior in interactive or interdependent situations
- Strategic interaction: Each individual's action affects the outcome and all interacting individuals are aware of it.
- Assumptions:
  - Rationality
  - Common Knowledge

# Rationality

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**Rationality:** The theory of rational choice is that a decision-maker chooses the best action according to her **preferences**, among all the actions available to her. [Osborne]

- Rationality = Consistency in decision making.
- Rationality is not about what the decision maker likes or dislikes.

## Preferences

Liking=Preference defined on a set of alternative

- Notion of "at least as good as"
- Requirement that a relation is preference relation that it is complete and transitive.
- Preference combined with constraint/s leads to a choice.

# Completeness and Transitivity

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Preferences are **complete** if the consumer can rank any two baskets of goods

A strictly preferred to B

B strictly preferred to A

indifferent between A and B

Preferences are transitive if a consumer who prefers basket A to basket B, and basket B to basket C also prefers basket A to basket C

With these two properties ranking of all elements of a finite set is possible.

# Common Knowledge

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Let us consider following situation:

Ram and Shyam plan to meet at India Gate

Ram came to know that India Gate is closed today for some security reason.

So, he sends a sms to Shyam saying let us meet at rajeev Chowk Metro Gate No. 1 at 7 pm.

Shyam receives the sms and confirms that he would come there at 7 pm.

Shyam reaches to the gate no. 1 at 7 pm but does find Ram there. Shyam may think that Ram didn't receive his message.

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# Common Knowledge: The Assumptions

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Some piece of information  $X$

- Knowledge: I know  $X$
- Mutual knowledge: Each of us knows  $X$
- Common Knowledge: Each of us knows that each of us knows  $X$ , ...

The rules of the game are common knowledge (players, strategies, payoffs, timing, information) are common knowledge