





- **MULTIOBJECTIVE PROGRAMMING**

- Conflicting between Objectives (Goals) => Trade-off among objectives
- Non-dominance, Non-inferiority, “Efficiency,” or “Pareto Optimality”
- Terminology
  - ⇒ Decision Space vs. Objective Space
  - ⇒ Tradeoff 抵換 vs. Pay-off 償付
  - ⇒ Noninferior Solution or “Best-Compromise Solution” 非劣解
- Categories of MOP Solution Methods
  - ⇒ Information Flow: Bottom-Up or Top-Down
  - ⇒ Techniques that Incorporate Preferences
- Generating Techniques: Evaluating Alternatives, Decision Support
  - ⇒ Weighting method, Constraint method
  - ⇒ Multiobjective simplex method, and others
- Number of Decision Makers

<p>Maximize <math>\mathbf{Z}(x_1, x_2) = [Z_1(x_1, x_2), Z_2(x_1, x_2)]</math></p> <p>where</p> $Z_1(x_1, x_2) = 5x_1 - 2x_2$ $Z_2(x_1, x_2) = -x_1 + 4x_2$ <p>s.t. <math>-x_1 + x_2 \leq 3, \quad x_1 + x_2 \leq 8</math></p> $x_1 \leq 6, \quad x_2 \leq 4$
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- **THE ANALYTIC HIERARCHY PROCESS (AHP)**

- Top Objective, Criteria, Sub-criteria, Sub...-criteria, Alternatives
- Complete Hierarchy and Partial Hierarchy
- Mathematical Fundamentals: Properties a Positive Reciprocal Matrix
- Priority (Weighting) Vectors and Eigenvector
- Inconsistency Index and Eigenvalues
  - ⇒ The Maximum Eigenvalue and Random Index
  - ⇒ Consistency Index or Consistency Ratio
- Variations of AHP: Fuzzy AHP and Grey AHP (Preference Programming)
- Analytical Network Process
  - ⇒ A network is comprised of the clusters, elements and links. The ANP is a descriptive theory that combines these measures to match what people actually do or guides them to do better than they were previously using only qualitative thinking and hunches, and not limited to the top-down thinking of the hierarchic models. A simple network can be extended to complex multi-level models of networks of benefits, opportunities, costs and risks.
- Super Decision: Software for AHP and ANP
  - ⇒ Rather than prescribing a "correct" decision, these methods help the decision makers to find a solution that best suits their goal and their understanding of the problem. It provides a comprehensive and rational framework for structuring a decision problem, for representing and quantifying its elements, for relating those elements to overall goals, and for evaluating alternative solutions.