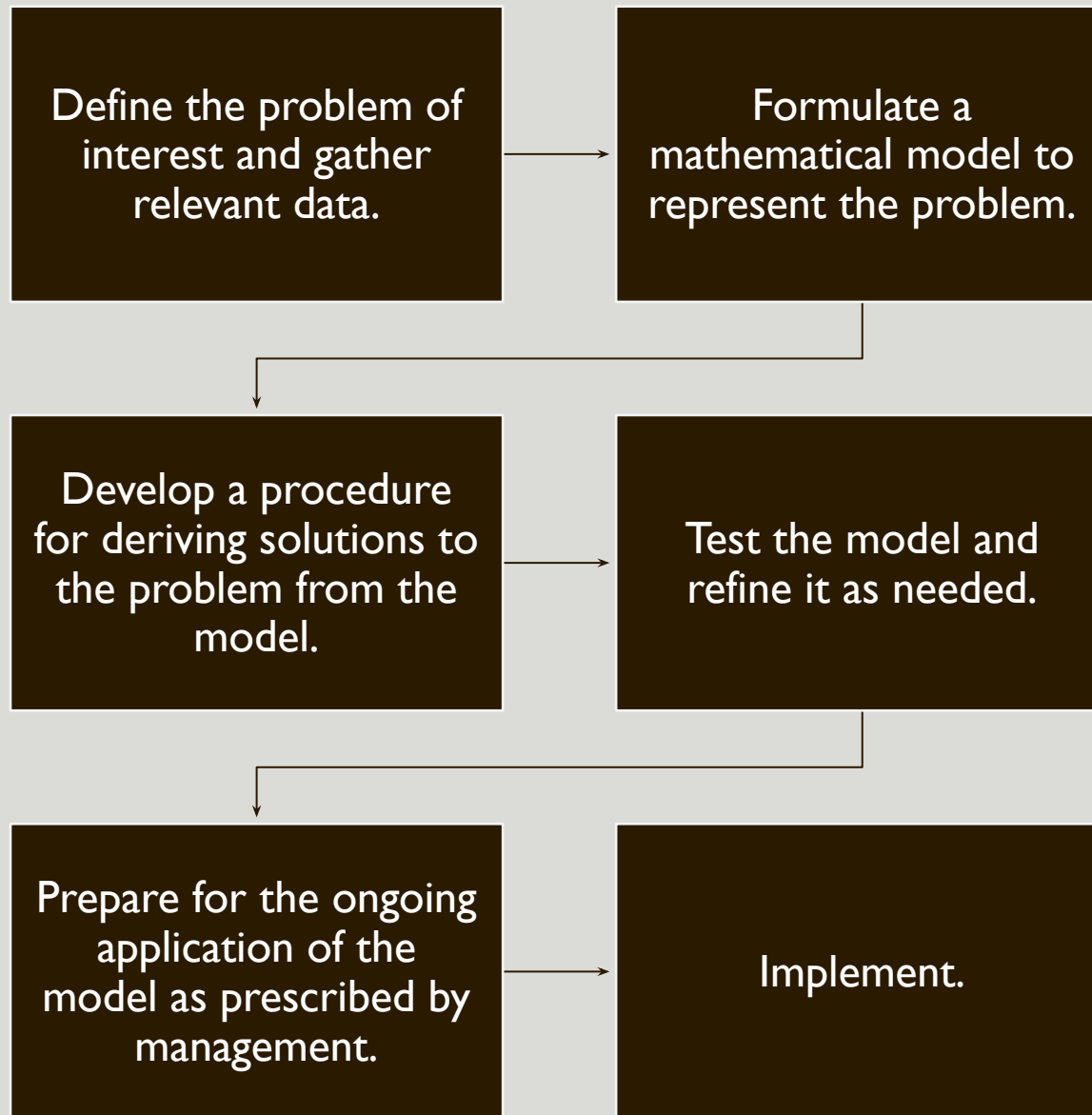


# INTRO TO OPERATIONS RESEARCH

- Operations Research (OR) concerns how to conduct and coordinate the operations (i.e., the activities) within an organization using an approach that resembles the way research is conducted in established scientific fields. The goal is almost without exception to find an “optimal” solution from among many workable possibilities.
- OR has been applied extensively in such diverse areas as agriculture, manufacturing, transportation, construction, telecommunications, financial planning, health care, the military, and public services.
- “Management science” sometimes is used as a synonym for operations research.

# RELATIONSHIP TO BUSINESS ANALYTICS

- In the last 15 years, “Business Analytics” has emerged as a closely related field.
- Business Analytics—the science of transforming data into information to help make better decisions.
  - Descriptive Analytics - locate the relevant data and identify the interesting patterns in order to better describe and understand what is going on now, applying data mining techniques
  - Predictive Analytics - using the data to predict what will happen in the future, applying statistical techniques
  - Prescriptive Analytics - using the data to prescribe what should be done in the future
- OR overlaps significantly with the last bullet, as most of the techniques used for prescriptive analytics are those relevant to OR.



## **RELATIONSHIP TO MATHEMATICAL MODELING**

# OUR COURSE – MATH BEHIND COMMON PARADIGMS

- Chapters 1-2: Overview of OR
- Chapters 3-7: Linear programming, Simplex Method, Duality, Sensitivity
- Chapters 9, 10: Selected sections on Transportation and Network Models
- Other Chapter(s) TBD

This section includes both MAT 4340 and MAT 5340. Information in ASULearn that is for students seeking graduate credit will be highlighted each week.

# OUR GOAL FOR WEEK 1: CHAPTERS 1 AND 2 AND A HINT OF CHAPTER 3

- Reading:
  - Chapter 1: Introduction and overview of OR
  - Chapter 2: The modeling process
  - Articles on General Motors and the San Francisco PD
  - Chapter 3, Section 1: A Simple Linear Programming Problem and its Graphical Solution

# LINEAR PROGRAMMING – SIMPLE EXAMPLE – RESOURCE ALLOCATION

*A doll factory wants to plan how many Barbie and Ken dolls to manufacture in a week to maximize company profit. A Barbie doll earns \$6.00 in profit and is made of 12 ounces of plastic for her body and 5 ounces of nylon for her hair. A Ken doll earns \$6.50 and is made of 14 ounces of plastic. Each doll goes in a box made of 4 ounces of cardboard. The company can only get one weekly shipment of raw materials, including 100,000 ounces of plastic, 30,000 ounces of nylon and 35,000 ounces of cardboard.*

# DISSECTION OF THE PROBLEM

- *Profit – make as large as possible: A Barbie earns \$6.00 and a Ken earns \$6.50*
- *Plastic – limited to 100000 ounces: 12 ounces for each Barbie 14 ounces for each Ken*
- *Nylon – limited to 30,000 ounces: 5 ounces for each Barbie and none for Ken*
- *Cardboard – limited to 35,000 ounces: 4 ounces for each doll*