Introduction and Overview
STAT 427, SP 2011

Prof. Prem K. Goel
Mon, Wed, Fri 10:30-11:18
SM 1009
Instructor

• Prof. Goel, Prem
• E-mail: goel.1@osu.edu
• Office: CH 204C (Cockins Hall)
• Office Phone: 614-292-8110
• Office Hours: Wed and Fri 11:30 - 12:30
• Course Website: www.stat.osu.edu/~goel/
• Relevant course material will be posted on this website by 8:00PM day before the class
Grader

• Zhiguang Xu
• E-mail: xu.304@osu.edu
• Office: CH 420 (Cockins Hall)
• Office Phone: 614-247-2589
• Office Hours: Tues 4:30-5:30, Wed 12:30-1:30 and Thu 10:30-12:30
  ○ (In Math Stat Learning Center)
Student Information

• Name: Last, First
• Signature
  – For matching with attendance sign-up sheet
• Major
• Math Courses Background
Probability and Statistics

• Why study
  – Statistics
    • Science of Decision Making Under Uncertainty
      ➢ Understanding Variability
      ➢ Explaining Variability
        o E.g., assigning causes to breakdowns (Challenger Shuttle)
    • Almost every discipline depends on quantitative evidence
    • All of us need to understand and analyze this evidence
  – Probability
    • Formal Language for Statistical Reasoning
    • Basic Rules of Probability Calculus
    • How to assign probabilities to various outcomes (collection of outcomes - EVENT) of interest
    • How to interpret the probability of an event
Why Uncertainty

• Variability in Outcomes when an experiment is performed
  – Cell to cell
  – Unit to unit
  – Person to person
  – DNA to DNA
  – Nature
  – Games of Chance
Studies of Uncertainty and Variation: Examples

• Are all third-year engineering students taking the same number of credit hours?
• If you kick a football several times, will the distance the ball traveled be the same?
  – We can’t necessarily predict the exact number of credit hours a specific student is taking or predict the distance the ball will travel for any particular kick.
• However, lots of the time, data will follow a general pattern.
  – From this pattern, we can get an idea of the expected (most likely) number of credit hours a third-year student will take or the distance the football will travel.
Applications of Statistics and Probability

<table>
<thead>
<tr>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gambling – what are the odds?</td>
</tr>
<tr>
<td>Engineering – designing/testing products</td>
</tr>
<tr>
<td>Medicine &amp; Biology – drug development/ genomics,</td>
</tr>
<tr>
<td>Business – advertising/marketing</td>
</tr>
<tr>
<td>Manufacturing – process/quality control</td>
</tr>
<tr>
<td>Insurance – Actuarial estimates</td>
</tr>
<tr>
<td>Economics and Politics – Predicting Unemployment rates/Opinion Polling</td>
</tr>
<tr>
<td>Law – DNA matching</td>
</tr>
</tbody>
</table>
Overview of Probability

- The study of *randomness* and *uncertainty*
- “Chances”, “odds”, “likelihood”, “expected”, “probably”, “on average”, ...
Preview

• Set Algebra:
  • containment, equality, union, intersection, complementation
  • DeMorgan’s Law

• Sample spaces and events