Basic Probability

Events

Each possible outcome of a variable is an event.

- Simple event
  - An event described by a single characteristic
  - e.g., A day in January from all days in 2013
- Joint event
  - An event described by two or more characteristics
  - e.g. A day in January that is also a Wednesday from all days in 2013
- Complement of an event A (denoted A')
  - All events that are not part of event A
  - e.g., All days from 2013 that are not in January

Computing Joint and Marginal Probabilities

- The probability of a joint event, A and B:

$$P(A \text{ and } B) = \frac{\text{number of outcomes satisfying A and B}}{\text{total number of elementary outcomes}}$$

- Computing a marginal (or simple) probability:

$$P(A) = P(A \text{ and } B_1) + P(A \text{ and } B_2) + \cdots + P(A \text{ and } B_k)$$

  - Where B_1, B_2, …, B_k are k mutually exclusive and collectively exhaustive events

Conditional Probability Example

- Of the cars on a used car lot, 70% have air conditioning (AC) and 40% have a GPS. 20% of the cars have both.

- What is the probability that a car has a GPS, given that it has AC ?

i.e., we want to find P(GPS | AC)

Multiplication Rules

- Multiplication rule for two events A and B:

$$P(A \text{ and } B) = P(A \mid B)P(B)$$

Note: If A and B are independent, then $P(A \mid B) = P(A)$ and the multiplication rule simplifies to

$$P(A \text{ and } B) = P(A)P(B)$$

Statistics for Managers using Microsoft Excel

7th Edition

Online Topic

Counting Rules

Counting Rules

- Rules for counting the number of possible outcomes
- Counting Rule 1:
  - If any one of k different mutually exclusive and collectively exhaustive events can occur on each of n trials, the number of possible outcomes is equal to

$$k^n$$

  - Example
    - If you roll a fair die 3 times then there are $6^3 = 216$ possible outcomes