

STA 320

Fall 2013

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Tues, Dec 3rd 2013

Assigning Probabilities to Events

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- There are different approaches to assigning probabilities to events
- Objective
 - **equally likely outcomes (classical approach)**
 - **relative frequency**
- Subjective

Equally Likely Approach (Laplace)

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- The equally likely outcomes approach usually relies on symmetry/geometry to assign probabilities to events.
- As such, we do not need to conduct experiments to determine the probabilities.
- Suppose that an experiment has only n outcomes. The equally likely approach to probability assigns a probability of $1/n$ to each of the outcomes.
- Further, if an event A is made up of m outcomes, then $P(A) = m/n$.

Equally Likely Approach

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- Examples:

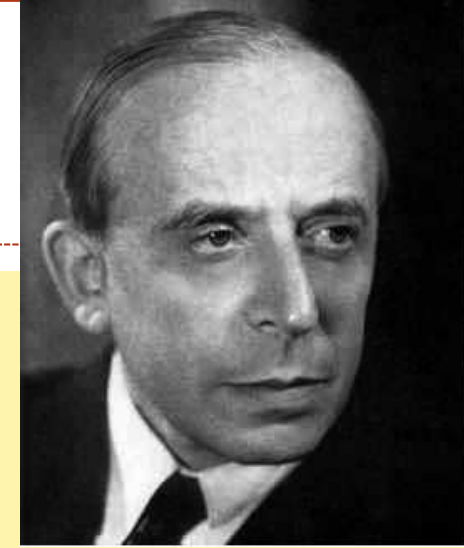
1. Roll a fair die

- The probability of getting “5” is $1/6$
- This does not mean that whenever you roll the die 6 times, you definitely get exactly one “5”

2. Select a SRS of size 2 from a population

Relative Frequency Approach (von Mises)

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- The relative frequency approach borrows from calculus' concept of limit.
- Here's the process:
 1. Repeat an experiment n times.
 2. Record the number of times an event A occurs. Denote that value by a .
 3. Calculate the value a/n

Relative Frequency Approach

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- We could then define the probability of an event A in the following manner:
- Typically, we can't do the “ n to infinity” in real-life situations, so instead we use a “large” n and say that

$$\text{Prob}(A) = \lim_{n \rightarrow \infty} \frac{a}{n}$$

$$\text{Prob}(A) \approx \frac{a}{n}$$

Relative Frequency Approach

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- What is the formal name of the device that allows us to use “large” n ?
- Law of Large Numbers:
 - As the number of repetitions of a random experiment increases,
 - the chance that the relative frequency of occurrences for an event will differ from the true probability of the event by more than any small number approaches 0.

Applet for rolling die(s)

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- http://bcs.whfreeman.com/pbs/cat_050/pbs/expectedvalue.html