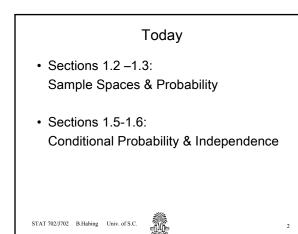
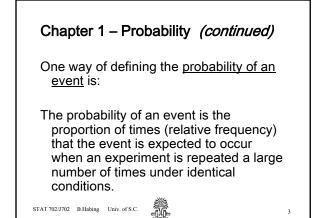
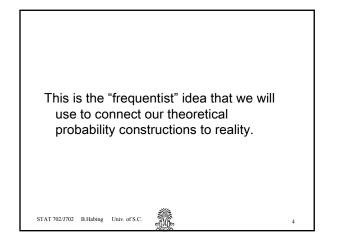


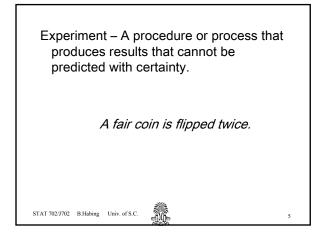
Instructor: Brian Habing Department of Statistics LeConte 203 Telephone: 803-777-3578 E-mail: habing@stat.sc.edu

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Sample Space – The set Ω of all the possible outcomes (sample points) ω of the experiment.

{(HH), (HT), (TH), (TT)}

Sample spaces can be either discrete or continuous.

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An event (usually denoted by capital letters at the beginning of the alphabet) is a set of sample points.

A=Exactly one Head = {(HT),(TH)} B=First flip was a Head = {(HH),(HT)}

We will discuss several particular kinds of events later.

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A <u>probability measure</u> on Ω is a function, P, from (events) subsets of Ω to the real numbers (0 to 1) satisfying the following three axioms: 1. $P(\Omega) = 1$ 2. $P(A) \ge 0$ for any event $A (\subset \Omega)$ 3. If A_1 and A_2 disjoint, then $P(A_1 \cup A_2) = P(A_1) + P(A_2)$. If A_1, \dots, A_n, \dots are <u>mutually disjoint</u>, then $P(A_1 \cup A_2 \cup \dots \cup A_n \cup \dots) = \sum_{i=1 \text{ to } \infty} P(A_i)$.

The coin flipping example is discrete, so we can define the probability measure by giving a probability to each of the sample points so that the sum is 1.

P(HH)=P(HT)=P(TH)=P(TT)=0.25

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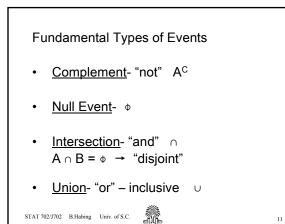
We would get the probability of the events *A* and *B* simply by adding the probabilities assigned to their sample points.

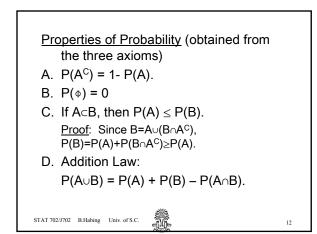
A=Exactly one Head = {(HT),(TH)}
P(A) =
$$\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$$

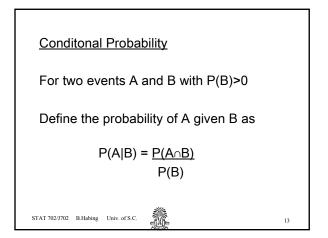
B=First flip was a Head = {(HH),(HT)} P(B) = $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$

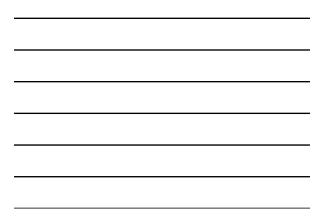
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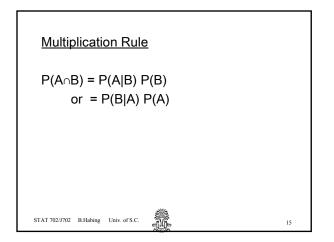


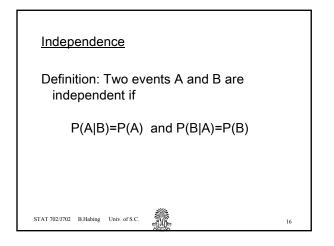


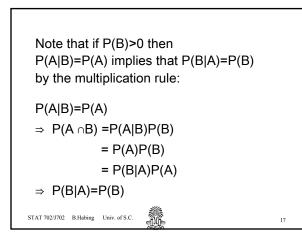


A=Exactly one Head = {(HT),(TH)} B=First flip was a Head = {(HH),(HT)} $P(A|B) = P(A \cap B) / P(B)$ = P(HT)/P(B)= 1/4 / 1/2 = 1/2

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 $\begin{array}{l} \underline{\text{Definition:}} \quad A_1, \ \dots, \ A_n \ \text{are} \ \underline{\text{mutually}} \\ \underline{\text{independent}} \ \text{events if and only if for} \\ every \ \text{subcollection} \ A_{i1}, \ \dots, \ A_{ik} \ \text{of size} \\ k=2, \ \dots, \ n. \end{array}$

$$\mathsf{P}(\mathsf{A}_{i1} \cap \mathsf{A}_{i2} \cap \dots \cap \mathsf{A}_{ik}) = \mathsf{P}(\mathsf{A}_{i1}) \mathsf{P}(\mathsf{A}_{i2}) \dots \mathsf{P}(\mathsf{A}_{ik})$$

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