

Intro to Probability

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Defn.: **Probability Experiment** - Action or trial which specific results (counts, measurements, responses) are obtained

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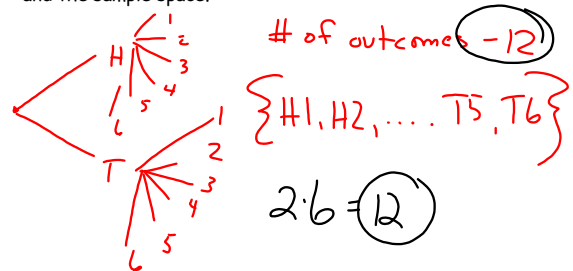
Outcome : results of a probability experiment

Sample Space: set of all possible outcomes

Event: subset of sample space - may consist of one or more options

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Example: A probability experiment consists of tossing a coin and rolling a six-sided die. Determine the number of outcomes and the sample space.



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Simple Event: an event that consists of a single outcome

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Fundamental Counting Principle :

If one event can occur m ways and a second event can occur n ways, the number of ways the two can occur is $(m)(n)$.

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Example: You are purchasing a new car. You have the following choices:

Manufacturer: Ford GM Honda 3

Size: compact midsize 2

Color: white red black green 4

How many different cars can you choose?

$$3 \cdot 2 \cdot 4 = 24$$

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Theoretical Probability: (Classical Probability)

$$P(E) = \frac{\text{Number of outcomes in event E}}{\text{Number of outcomes in sample space}}$$

Number of outcomes in sample space

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Empirical Probability: based on observations from an actual experiment (Statistical Probability)

$$P(E) = \frac{\text{frequency of E}}{\text{total frequency}}$$

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Range of Probability

$$0 - 1$$

$$0\% - 100\%$$

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Law of large numbers: As an experiment is repeated over and over, the empirical probability will approach the theoretical probability

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Complement of event E

Set of all outcomes in sample space not in E

Denoted E' (E prime)

$$P(E') = 1 - P(E)$$

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$$\begin{array}{l} \frac{H}{T} \quad \frac{H}{T} \quad \frac{H}{T} \\ 2 \cdot 2 \cdot 2 = 8 \\ \underline{4} \cdot \underline{2} \\ \underline{6} \cdot \underline{6} = 36 \\ \underline{9} \cdot \underline{15} = 135 \end{array}$$

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$$\begin{array}{l} \underline{3} \cdot \underline{6} \cdot \underline{4} = 72 \\ \underline{9} \cdot \underline{10} \cdot \underline{10} \cdot \underline{5} = 4500 \\ \underline{2} \cdot \underline{2} \cdot \underline{2} \cdot \underline{2} \cdot \underline{2} \cdot \underline{2} = 64 \end{array}$$

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