



Basic Probability Concepts

Definitions:

- **Probability** – the chance or likelihood that an uncertain (particular) event will occur
- **Probability is always between 0 and 1, inclusive**
- **Sample Space** – the collection of all possible events
- **An Event** – Each possible type of occurrence or outcome from the sample space
- **Simple Event** – an event that can be described by a single characteristic
- **Complement of an event A** -- All outcomes that are not part of event A

Definitions:

- There are three approaches to assessing the probability of an uncertain event:

1. **Theoretical or a Priori or Classical Probability**–

based on a prior knowledge

each outcome is equally likely to occur

$$\text{prob. of occurrence} = \frac{X}{T} = \frac{\text{number of occurrence of the event}}{\text{total number of possible outcomes}}$$

2. **Empirical or Experimental or Relative Frequency Probability**– based on observed data

$$\text{prob. of occurrence} = \frac{\text{number of favorable outcomes observed}}{\text{total number of outcomes observed}}$$

3. **Subjective probability** – an individual judgment or opinion about the probability of occurrence

Contingency Tables:

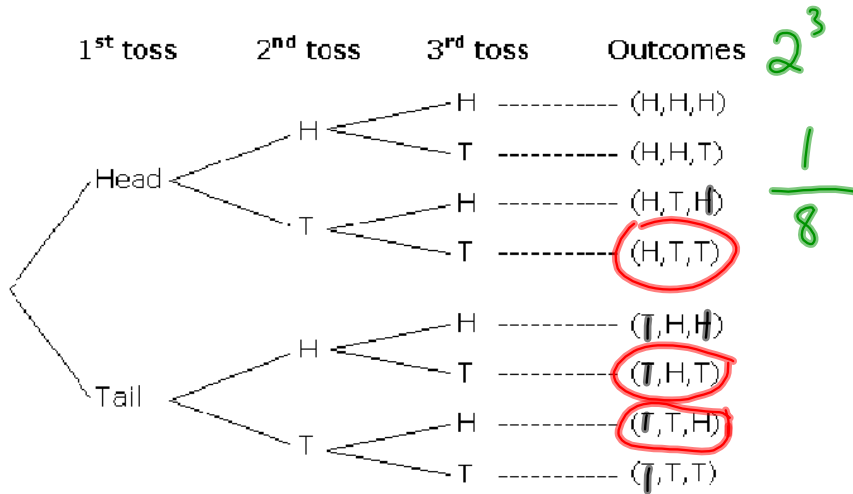
- A sample space can be presented by a **Contingency Table**
 - It is very useful for the study of empirical probabilities
- Example: 400 managers were surveyed about booking airline tickets and researching prices of tickets in the internet

Sample Space: Total Number of Managers Surveyed		Booked Airline Ticket in the Internet		Totals
		Yes, B1	No, B2	
Researched Prices in the Internet	Yes, A1	88	124	212
	No, A2	20	168	188
Totals		108	292	400

$$\frac{108}{400} = 27\%$$

Tree Diagram:

- A tree diagram can be used to illustrate all possible outcomes
- Example: Tossing of 3 coins



- What is the probability of tossing 3 heads? $\frac{1}{8}$

..... 2 Tails = $\frac{3}{8}$

2 dice \rightarrow Total outcomes

$(1,1)$ $(1,2)$ $(1,3)$, $(1,4)$, $(1,5)$, $(1,6)$

} 36

$(1,6)$

$(6,6)$

4. The town planning department surveyed residents of a town about home ownership. The table shows the results of the survey.

Residents	At Address Less Than 2 Years	At Address More Than 2 Years	Total for Category
Owners	2000	8000	10 000
Renters	4500	1500	6 000
Total	6500	9500	16 000

homeowners

Define
Sample
Space

Determine the following probabilities.

- a) $P(\text{resident owns home})$ $10000/16000$
- b) $P(\text{resident rents and has lived at present address less than two years})$ $4500/16000$
- c) $P(\text{homeowner has lived at present address more than two years})$ $8000/10000$