**Colorado Technical University**

 **Course:** MATH366 – Probability and Statistics

#### Unit 4 Part 08 Readings: Discrete Probability

**Probability**

**Probability** -likelihood of a favorable outcome or event:

**P(event occurring) = (# favorable events) / (total # of events)**

**independent events -** one does not affect another

**complement** of an event - all outcomes that are not included in an event

E ’ (pronounced "E prime") P(E’) = 1 – P(E)

**compound events -** several occur at the same time or sequentially

**addition** **rule** - if you have mutually exclusive events:

P(both occurring) = P(first occurring) + P(second occurring)

**multiplication rule** - if you have sequential random events:

P(one occurring, then another occurring) =

P(one occurring)  P(another occurring)

**Law of Averages** (and why it doesn't work the way people think it does)

**frequency distribution** => probability distribution

**random variable** - takes on a single value determined by chance

**discrete random variable** - has only certain possible values

**discrete probability distribution**:

 for the population 0 ≤ P(outcome) ≤ 1

Σ P(all outcomes) = 1

(1 means 100%, 0.5 means 50% ...)

the probability of an event occurring is:

freq of x/total freq

**Sources of probabilities:**

##### **classical probability -** based on theory

##### **statistical or empirical probability** - based on observations, not on theory

probability that an event E will occur:

P(E) = f / n

where f is the frequency of the event E occurring

n is the total frequency of the experiment

n = Σf

### subjective probability - an individual's personal judgment about the likelihood

of the occurrence of an event based on estimates, intuition, and educated

guess

**Conditional Probability**

The probability of an event happening, given that another event has already

occurred, and the first event has impacted the second event

You should have at least two events happening one after another to use conditional

probability

If the two events are unrelated and the probability of the second event is not affected

by the first event, then it is said to be independent

One event often changes the likelihood of another event happening

Notation: P(A|B) means: the probability of A given B

The formula: P(A|B) = $\frac{P(A and B) }{P(B)}$

 "B" is the first event that happens

 **Bayes’ Theorem**

P(A|B) =$\frac{P(B|A) P(A) }{P(B)}$

## Sources of Probability:

 classical probability – based on theory, assumes equal likelihood of events

 empirical probability – based on observations (not on theory)

 subjective probability – an individual's personal judgment about the likelihood

of the occurrence of an event based on estimates, intuition, and educated guesswork