

BUS 232 - Probability

Terminology

random

- individuals outcomes are uncertain

Probability

- the proportion of times the outcome would occur in a very long series of repetitions

Sample space

- the set of all possible outcomes of a random phenomenon

Event

- a subset of a sample space

Probability model

- description of sample space
- a way to assign probabilities to events

Disjoint

- no elements in common
- if disjoint can add for *or*

Independent

- two events are independent if knowing that one occurs does not change the probability that the other occurs

Assigning probabilities to sample spaces

Assign a probability to each individual outcome.

Each probability is a number between 0 and 1 and they sum up to 1.

The probability of any event is the sum of the probabilities of the outcomes making up the event any event is the sum of the probabilities of the outcomes making up the event

Basic probability rules

probability always between 0-1

S is the sample space so the probability of S is 1

The complement means it doesn't happen and this is $1 - \Pr(a)$

Independent events

If events are disjoint they are not independent
because knowing one you can figure out the other

Can multiply events if events are independent

A and B are independent if and only if
 $P(A \text{ and } B) = P(A)P(B)$

if A and B are independent then: $P(A|B) = P(A)$ and $P(B|A) = P(B)$

Unions

$A \cup B$ at least one of A or B occurs

General addition rule for *non-disjoint*
 $P(A \cup B) = P(A) + P(B) - P(A \text{ and } B)$

Conditional Probability

$P(x|y)$ // probability of x given y

only meaningful for two non-independent events.

$$P(B | A) = P(B \& A) / P(A)$$

Multiplication rule

$$P(A \text{ and } B) = P(B) * P(A|B)$$

eg)

25% of students study at least 3 hours a day.

40% of those who study at least 3 hours per day have a 3.0+ gpa.

What is the probability a randomly chosen student studies at least 3 hours a day and has a 3.0+?

Probability trees

Expand em' into tree form.
Useful to visualize.