Housekeeping:
- Homework 13 due in class today
- Homework 14 — " — Friday
- Week 6 writing summary + discussion due Monday on Canvas
- Extra credit due Monday on Canvas ("Wage Gap Rebuttal")
- Essay prompts on Canvas
- Exam 2 is Friday, March 31 — review W, Mar. 29.

Last time: Cond'l probability

Independent events

This time: More independent events

Difference btwn. independence & mutual exclusivity

Practice with independent events & cond'l probability

Recall: Two events are independent when one happening has no bearing on the likelihood of the other happening.

For example...

    In the U.S., if you live in Massachusetts, you are MORE LIKELY to own a snow shovel — so "living in MA" and "owning a snow shovel" are NOT independent events — they are dependent events.

    Among kindergarteners, the sex/gender of the student has no effect on that student's favorite animal. So, "being a little girl" and "preferring zebras" ARE independent events.

Ask yourself: Does knowing whether one event has occurred change the likelihood of the other occurring?

    - These are ways of knowing/predicting — before knowing the probabilities — whether pairs of events are likely to be independent.

Of course, the only way to know for sure whether events are really independent is to check & see whether they satisfy the definition:

If A & B are independent, then

$$P(A|B) = P(A)$$

and

$$P(B|A) = P(B) .$$

[Also, $P(A \text{ and } B) = P(A) \cdot P(B)$, when A & B are independent.]

If you don't verify, then after all...

    how do you KNOW that being a little girl doesn't make you more (or less) likely to prefer zebras?

Example: If $P(G) = 0.6$, $P(Z) = 0.6$, and

    $P(G \text{ and } Z) = 0.42$, are G and Z independent?

Check: $P(G \text{ and } Z) \neq P(G) P(Z)$

    $0.42 \neq 0.6 (0.6)$

    $0.42 \neq 0.36$, so, NO, G and Z are not indep.

The example from ~~yesterday~~ Monday:

	Injury	No injury	tot.
Stretch	55	295	350
No stretch	231	219	450
tot.	286	514	800

Why your coach/trainer cares about this data...

ARE   STRETCHING   &   BEING   INJURED   INDEPENDENT ?

- $P(S \text{ and } I) \overset{?}{\neq} P(S) \cdot P(I)$

$$\frac{55}{800} \overset{?}{\neq} \frac{350}{800} \cdot \frac{286}{800}$$

$$0.0687 \overset{?}{\neq} 0.158$$

$\left.\begin{array}{c} \\ \\ \\ \end{array}\right\}$ not independent.

- $P(I \mid S) \overset{?}{\neq} P(I)$

$$\frac{55}{350} \overset{?}{\neq} \frac{286}{800}$$

$$0.157 \overset{?}{\neq} 0.357$$

$\left.\begin{array}{c} \\ \\ \\ \end{array}\right\}$ not indep.

- $P(S \mid I) \overset{?}{\neq} P(S)$

$$\frac{55}{286} \overset{?}{\neq} \frac{350}{800}$$

$\left.\begin{array}{c} \\ \\ \end{array}\right\}$ not indep.

Quick reminder :

Mutually exclusive events cannot happen simultaneously ,
or cannot both happen.

i.e., A & B are mutually exclusive when P(A and B) = 0.

THIS   IS   A TOTALLY DIFFERENT CONCEPT
THAN   INDEPENDENCE !!

Two independent events sure can happen simultaneously —
being a girl and preferring zebras;

being tall and being hungry

. . .   etc.