p. 303 #30

State: What is the probability a train with a 90% chance of arriving on time each day would be late on 2 or more of 6 days?

Plan: 0 through 8 on table D represent being on time. 9 on table D represents being late. Then I will choose 6 numbers from the table to represent the 6 days riding the train. I will record the number of days late. I will do the simulation 20 times.

Do:

Simulation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
# of days late	0	1	1	1	2	1	0	3	1	1	2	1	1	1	1	0	0	0	1	0

Conclusion: On 3 of 20 days, the train was late 2 or more times during the 6 days. The probability of a late train 2 or more times during the 6 days is .15 which means it is very unlikely to be late 2 or more days.

Nov 30-10:37 AM

5.2 Probability Rules

Sample space: S, is the set of all possible outcomes of a chance process.

Probability model: Description of a chance process that consists of sample space + probability of each outcome.

Ex: Make a probability for flipping 2 fair coins.

The sample space is $S = \{HH, TT, HT, TH\}$ with a probability for each event of .25.

Nov 30-11:14 AM

Event: A collection of outcomes from a chance process, i.e. a subset of the sample space.

The notation is capital letters. For example the probability of event A is $P(A)$

Ex: if event A is flipping a head and tail, find $P(A) = .5$

Ex: if event B is flipping 2 heads, find $P(B) = .25$

Ex: if event C is flipping the same side, find $P(C) = .5$

Nov 30-11:21 AM

Probability Rules

1. Probability of an event is between 0 + 1

$$0 \le P(A) \le 1$$

2. All possible outcomes must have a probability that adds to 1.

$$P(S) = 1$$

3. If all outcomes in S are equally likely,

$$P(A) = \frac{\#\text{ of outcomes for } A}{\#\text{ of outcomes in } S}$$

4. The probability that an event does not occur is 1 minus the probability that the event does occur. We refer to the event "not A" as the complement of event A, denoted as A^c.

$$P(A^c) = 1 - P(A)$$

$\cancel{P(A)^c}$

5. If two events have no outcomes in common the probability that one or the other occurring is the sum of the individual probabilities. These events are called mutually exclusive or disjoint that is $P(A \text{ and } B) = 0$

$$* \quad P(A \text{ or } B) = P(A) + P(B)$$

Dec 1-10:46 AM

p. 309 check for understanding.

Dec 1-10:59 AM

Two way tables: easilly displays sample space + eases probability calculation between 2 events.

Ex: A: Blue eyes

B: Female

	B	B^c	Total
A	7	5	12
A^c	10	11	21
Total	17	16	33

a) $P(A) = \frac{12}{33} = .36$

b) $P(B) = \frac{17}{33} = .52$

c) $P(A^c) = \frac{21}{33} = .64$

$= 1 - P(A)$

$= 1 - .36$

$= .64$

d) $P(A \text{ or } B)$

$P(A \text{ or } B) = P(A) + P(B) - P(A \cap B)$

$.36 + .52 - .21$

$.67$

$\frac{12 + 17 - 7}{33} = .67$

Dec 1-11:07 AM

If A + B are not mutually exclusive then they can occur together, like in the previous example. We had to get rid of values that were double counted.

Dec 1-11:24 AM

General Addition rule for 2 events

If A + B are any 2 events resulting from a chance process, then $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

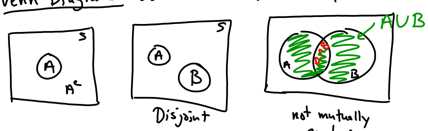
Ex: In December of 2012, 60% of US households had a landline, 89% had a cellphone, and 51% had both. Make a two way that displays the sample space of this process.

A = landline
B = cellphone

	A	A^c	Total
B	51%	38%	89%
B^c	9%	2%	11%
total	60%	40%	100%

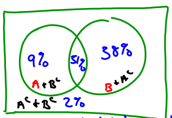
Dec 1-11:27 AM

Venn Diagrams: used similarly to 2 way tables.



$\cap$ = intersection
$\cup$ = union

Ex: Draw a Venn Diagram for the previous example.



Ex: Find the probability that a household has at least one of the devices.

$100\% - 2\% = 98\%$

$P(A) + P(B) - P(A \cap B) =$
$60\% + 89\% - 51\% = 98\%$

Dec 2-11:12 AM