Probability 2/17/16

1. Probability = $\frac{\#\text{ of Expected Outcomes}}{\#\text{ of total Outcomes}}$

fate card: 21 total fate cards, 9 bad, 12 good

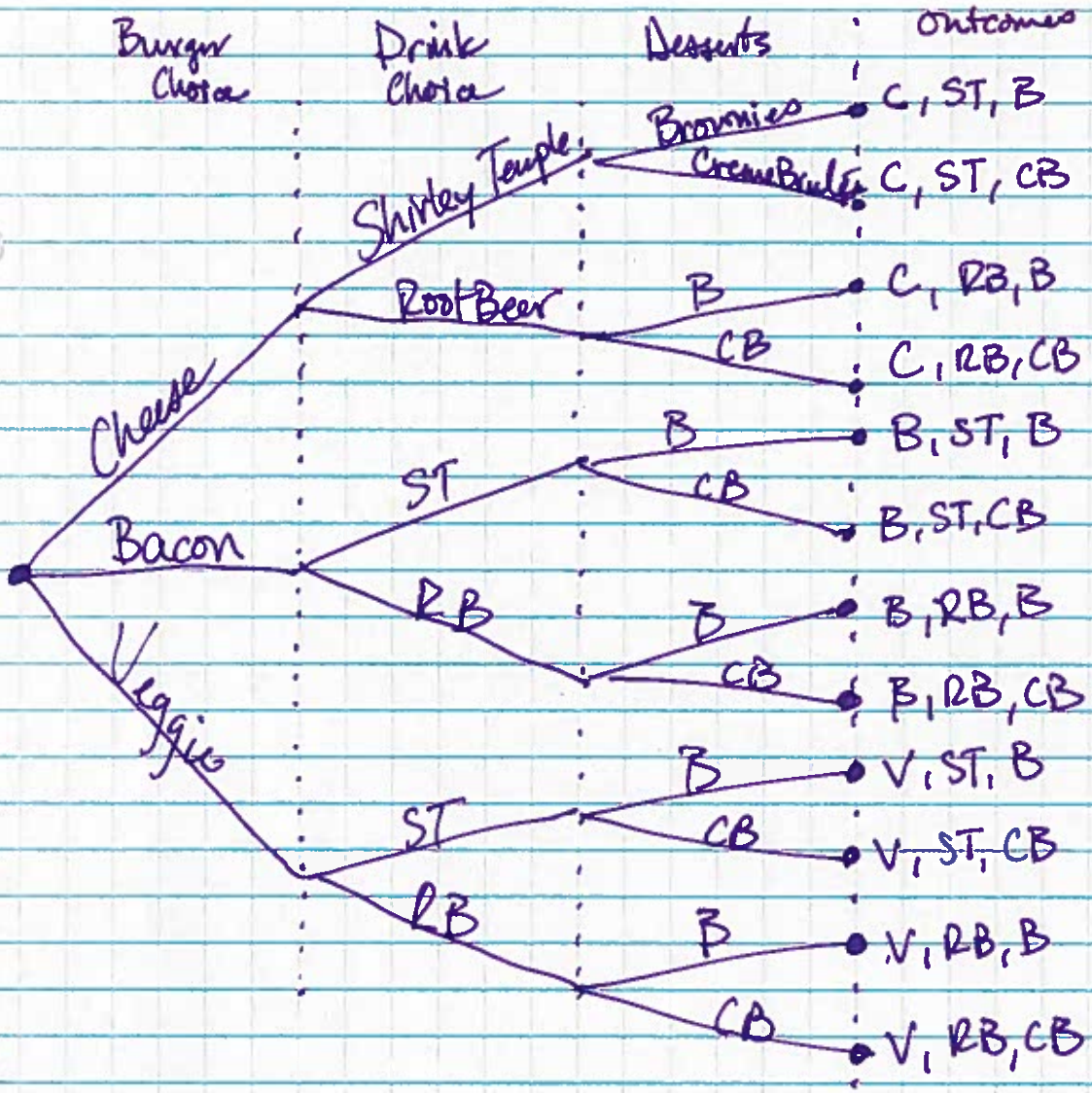
What is the probability of getting a good fate card?

$$\frac{EO}{TO} = \frac{12}{21} = \frac{4}{7}$$

2. Ways to find total Outcomes

a) Tree diagram

3 burgers	2 drinks	2 desserts
Cheese	Shirley Temple	Brownies
Bacon	Root Beer	Creme Brulee
Veggie		



12 total outcomes

★ Tree diagrams tell you total # of outcome and all the possible outcomes

b) Organized list

★
C, ST, B
C, ST, CB
C, RB, B
C, RB, CB
B, ST, B
B, ST, CB
B, RB, B
B, RB, CB
V, ST, B
V, ST, CB
V, RB, B
V, RB, CB

12 total outcomes!

★ Organized lists tell you # of total outcomes and all the possible outcomes.

C) Fundamental Counting Principle

If you don't need to know what all the possible outcomes are, but only how many there are, use the FCP.

$$\underline{\quad} \cdot \underline{\quad} \cdot \underline{\quad} =$$

# of burger choices	# of drink choice	# of dessert choices

$$\underline{3} \cdot \underline{2} \cdot \underline{2} = 12$$

Ways to Count Total Outcomes (Continued)

d) Permutations

- You can not repeat your choice

  ex: Cassandra can't play all 3 parts

- Order you choose matters

  ex Cassandra - Good guy
  Michael - Bad guy
  Alli - Funny guy

  is different from

  Michal - good guy
  Alli - Bad guy
  Cassandra - Funny guy

5 people tried out for 3 parts in a Play

$_nP_r$ ~~$_nP_r$~~

n = # of choices you have = 5 (5 people trying out)

r = # of times you choose = 3 (3 parts in the play)

$$_5P_3 = 60$$

To use the Fundamental Counting Principle:

$$\underline{5} \cdot \underline{4} \cdot \underline{3} = 60$$

e) Combinations

- You can not repeat your choice

Ex: Brooks can not hold all 3 seats on the committee

- Order you choose doesn't matter

Ex: Brooks, Mason, Ethan } on a committee

is the same as

Mason, Ethan, Brooks } on a committee

* Because there are no specific roles

5 people ran for 3 spots on a committee

~~nCr~~ ~~nCR~~

n = # of choices you have = 5

r = # of times you choose = 3

$_5C_3 = 10$

Probability Notes (Continued)

1. Experimental vs. Theoretical Probability

↑ What actually happened when we collected data

↑ What "should" happen.

↑ The more times you do your experiment the closer your data will get to

2. What does probability of 1 or 0 mean?

1 → 100% chance that the expected outcome will happen

0 → 0% chance

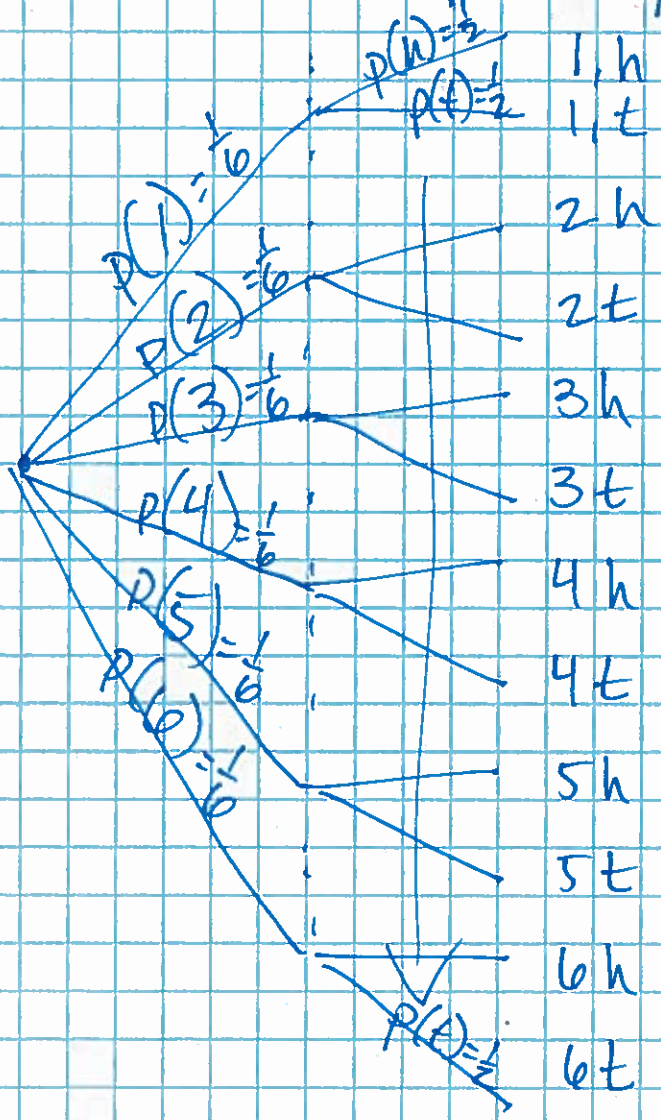
If the probability is close to 1, then it is very likely to happen

If the probability is close to 0, it is not very likely to happen.

3. Multi-Stage events

To find the probability ~~of~~ of an outcome in a Multi-Stage event, use the multiplication rule.

Ex: Roll a die, then flip a coin. What is the probability of getting a 6 and a tails?



$P(6,t) = \frac{1}{6} \cdot \frac{1}{2} = \frac{1}{12}$

There are 12 total outcomes and they are all equally likely, so you can put the 12 in the denominator and a 1 in the numerator $P(6t) = \frac{1}{12}$ or use the multiplication rule $P(6) = \frac{1}{6}$ $P(t) = \frac{1}{2}$

$$\frac{1}{6} \cdot \frac{1}{2} = \frac{1}{12}$$

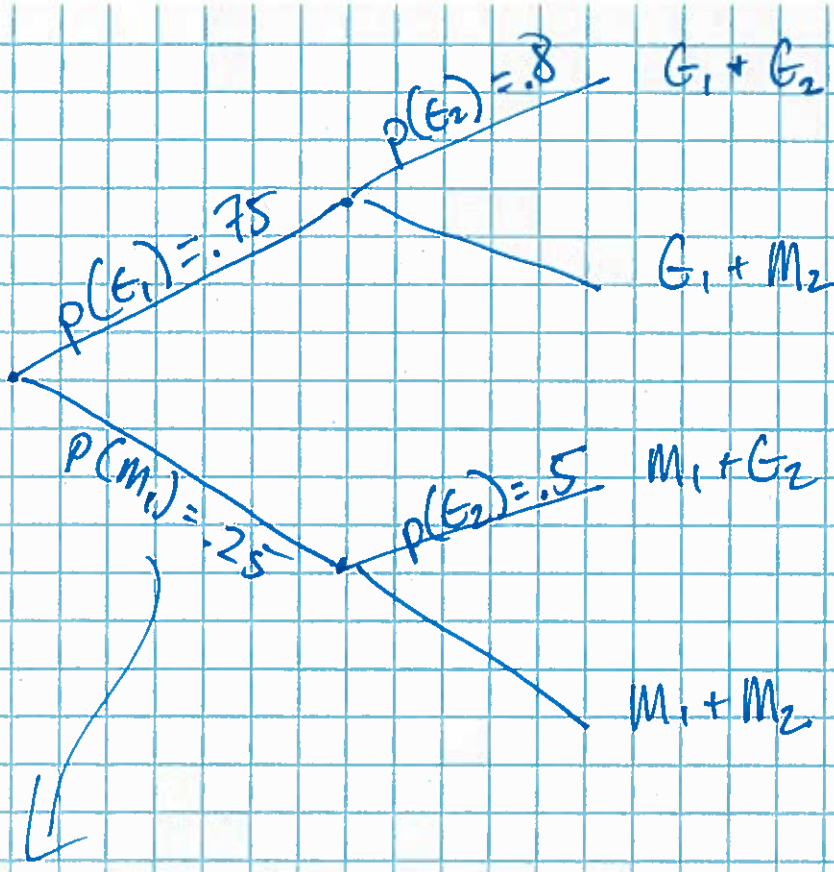
4. Independent vs. dependent

a) Independent: Events are independent when the occurance of one event has no influence on the occurance of the next event. ex: Rolling a die + flipping a coin.

b) Dependent: The probability of an event is influenced by the outcome of a previous event.

Ex: Cheryll's Free Throws

Cheryll makes 75% of her first tries at the free throw line. However, her records indicate that her sucess on the second shot depends on whether her first shot was good (G) or a miss (M). Cheryll makes 80% of her second shots when she makes the first shot, but only 50% of her second shots when she misses her first shot. What is the probability of Cheryll making 2 good shots?



The reads: The probability of a missed first shot is .25 or 25%. If she makes them 75% of the time, she misses 25%.

$$P(G_1 + G_2) = .75 \cdot .8 = .6 = 60\%$$

We use the multiplication rule to find the probability of 2 good shots.

The 2nd shot was influenced by the 1st, so these are dependent events.