Goals

- Apply Permutation and Combination Rules
- Calculate probabilities of events happening.

Announcements:

- Test next week. Material through pset 7, today.
- Will provide practice problems and solutions.
- Extended Office Hours
- Practice practice practice.

Problems

- How many DNA strings of length 4 (strings in $\{C, T, G, A\}^4$) have exactly 2 C's or exactly 2 T's? (Use product rule and combinations!)
- How many DNA strings of length 4 (strings in $\{C, T, G, A\}^4$) have at least 2 C's or at least 2 T's?

$$P(n, k) = \frac{n!}{(n-k)!}$$

$$C(n, k) = \frac{n!}{(n-k)!k!}$$

Hint:
Suppose I choose to put Ts in position 3 and position 2. If I put the T into position 3 first and then position 2, is that different than if I put the T into position 2 first and then position 3? (Answer: No!)

Probability Questions

- Suppose there is a lottery where the winning 4 digit number is chosen randomly. You win money if you match the winning number in at least 3 places. If you buy ticket 0313, what is the probability that you don't win any money?

Probability Questions

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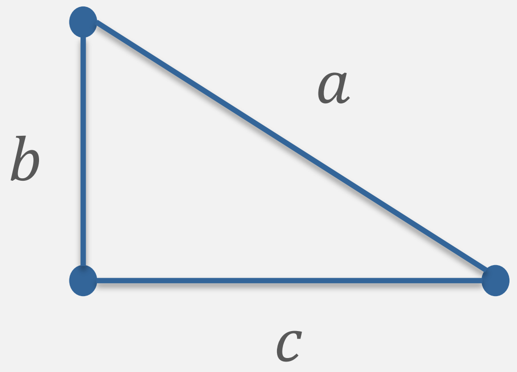
- Suppose you have a six-sided weighted die, where 6 is twice as likely to be rolled as every other outcome. What is the probability of rolling at least a 5?

Probability Questions

- Midd is in a quidditch series again Skidmore. The first team to win 2 games is the champion.
  - Midd has a ½ chance of winning the first game.
  - If Midd won the previous game, we have a 2/3 chance of winning the next game
  - If Midd lost the previous game, we have a 1/3 chance of winning the next game
- What is the probability that Midd is the Champion?

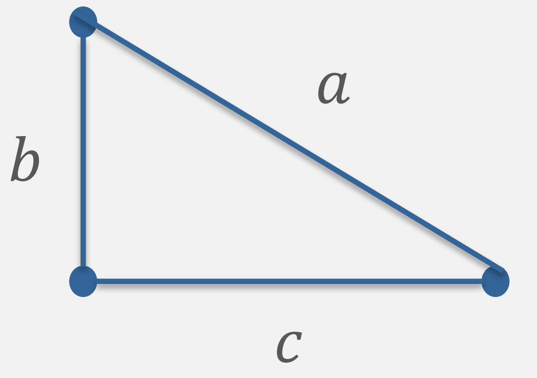
Percolation Question

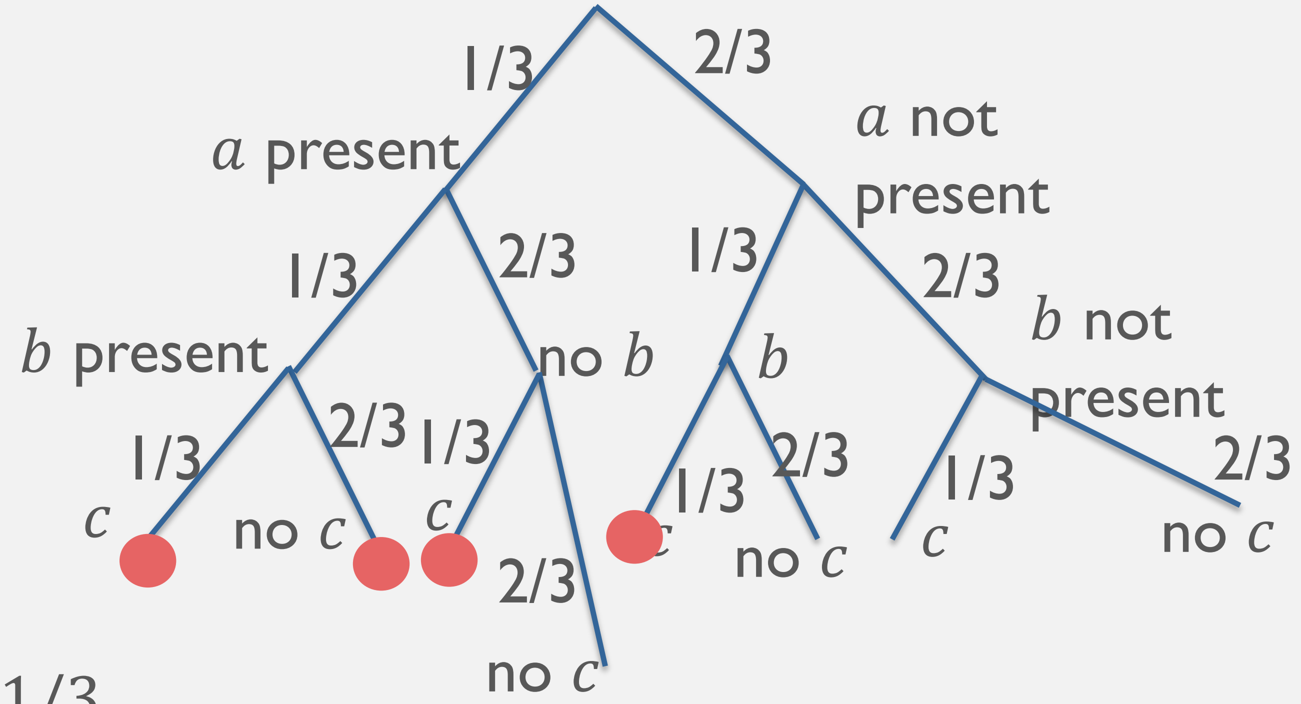


- a, b, c are each present with probability $1/3$.

What is the sample space?
What is the probability of the graph being connected? (A graph is connected if there is an path – not necessarily an edge – between every pair of vertices.)

Percolation Question





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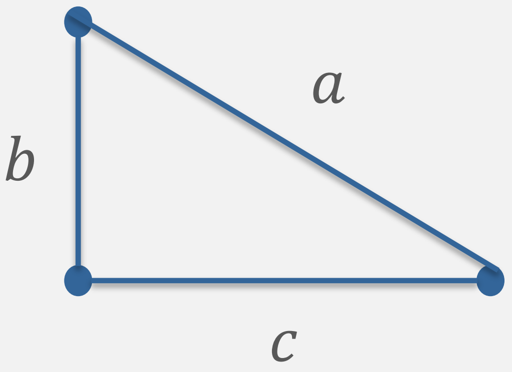
Signifies an element of Event

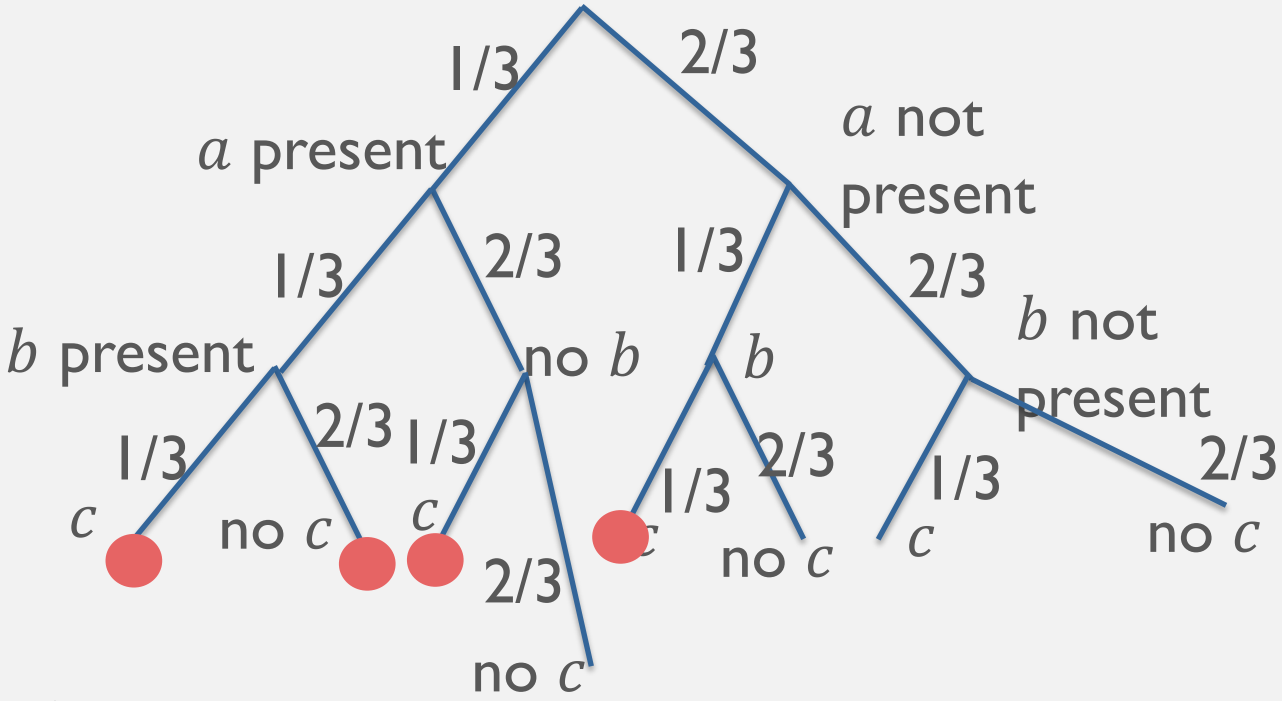
What is the sample space? $\{\{a,b,c\},\{a,b\},\{a,c\},\{a\},\{b,c\},\{b\},\{c\},\emptyset\}$

Probability the graph is connected? $\Pr(\{a,b,c\} + \Pr(\{a,b\}) + \Pr(\{b,c\}) + \Pr(\{a,c\}) =$

$$\frac{1}{3}\times\frac{1}{3}\times\frac{1}{3}+\frac{1}{3}\times\frac{1}{3}\times\frac{2}{3}+\frac{2}{3}\times\frac{1}{3}\times\frac{1}{3}+\frac{1}{3}\times\frac{2}{3}\times\frac{1}{3} = 5/27.$$

Percolation Question





$$\frac{1}{3}\times\frac{1}{3}\times\frac{1}{3}+\frac{1}{3}\times\frac{1}{3}\times\frac{2}{3}+\frac{2}{3}\times\frac{1}{3}\times\frac{1}{3}+\frac{1}{3}\times\frac{2}{3}\times\frac{1}{3}=5/27.$$

Signifies an element of Event

What is general form for a graph with k edges present and g edges missing, if each edge is included with probability p?

$p^k(1-p)^g$