

Name: _____

1. **Simpson's paradox** In 1973, UC Berkeley was sued for sex discrimination based on the fact that graduate school admission rates were 44% for men and 35% for women. The paradox was that if you look at the level of departments, women were generally being admitted at a (slightly) higher rate than men. The resolution of the paradox is to observe that women were applying to competitive departments (acceptance rate was low for both genders) and men were applying to less competitive departments (acceptance rate was relatively high for both genders). We can model this with probability.

Consider the following: Men and women are equally likely. Women prefer department a : female applicants apply to a with probability $\frac{3}{4}$ and b with probability $\frac{1}{4}$. Men prefer department b : male applicants apply to a with probability $\frac{1}{4}$ and b with probability $\frac{3}{4}$. The departments admissions process is non-discriminating but random: department a admits any applicant with probability $\frac{1}{2}$; department b admits any applicant with probability $\frac{3}{4}$.

- (a) What is the probability that the applicant is a woman, applies to department b and gets accepted? (Hint: use the chain rule / tree diagram.)
- (b) What is the probability of being accepted given that the applicant is a woman? (Hint: use the definition of conditional probability and your answer to Part (a). Also, use the total law of probability to handle the random choice of department.)
- (c) What is the probability of being accepted given that the applicant is a man?
- (d) What is the probability of an applicant being accepted? (Hint: you should be able to leverage your answers in the previous two parts.)