

Warmup 8 Probability Tree

1. A real quarter and a 2-headed quarter are in a hat. You select one quarter at random and toss it twice. What is the probability that the fake quarter was tossed if the final outcome is HH?

Solution: Draw a tree. Then:

$$Pr(fake|HH) = \frac{Pr(fake \text{ and } HH)}{Pr(HH)} = \frac{(1/2) \cdot 1 \cdot 1}{(1/2) \cdot (1/2) \cdot (1/2) + (1/2) \cdot 1 \cdot 1} = \frac{4}{5}.$$

2. A cookie jar contains 8 chocolate chip and 7 peanut butter cookies. You really want a chocolate chip cookie. You reach in and select a cookie at random, and keep eating until you either find a chocolate chip cookie or you have eaten three cookies. Draw a tree diagram and label all the appropriate probabilities on the tree. What is the probability you will eat at most two cookies?

Solution: Draw a tree (note probabilities change with each draw). Then:

$$Pr(\leq 2) = Pr(1) + Pr(2) = \frac{8}{15} + \frac{7}{15} \cdot \frac{8}{14} = \frac{4}{5}.$$