

MATH 5: HANDOUT 19
PROBABILITY REVIEW.

1. You know that the family next door has two children. You know that one of them is a boy, what is the probability that the other is a girl?

2. Half the people who contracted a certain disease which is spreading across the country have died and half got better on their own. Two medicines have been developed, A and B, but not actually tested. A was administered to three patients, and all survived. B was administered to 8 patients of which seven survived. If you contract the disease, which medicine would you choose?

3. What's wrong with the following argument:

Question: A bag contains two chess pieces. Ascertain their colors without taking them out of the bag.

Assertion: One is white and the other is black.

Argument: Note that, if a bag contained three chess pieces, two being black and the other one white, the probability of drawing a black piece from the bag would be $\frac{2}{3}$ and that *any other state of things* would not give this probability. Now, the probability that the bag contains **BB**, **BW** or **WW** are $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{1}{4}$ respectively. Add a third, black, piece. Then the chances that the bag contains **BBB**, **BBW** or **BWW** are, again, $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{1}{4}$ respectively. The probability of drawing a black piece from the bag now is therefore $\frac{1}{4} \times 1 + \frac{1}{2} \times \frac{2}{3} + \frac{1}{4} \times \frac{1}{3} = \frac{2}{3}$. Hence the bag must contain **BBW** (since earlier we established that any other state of things would not give this probability). Thus, before one black piece was added the bag contained **BW**. Q.E.D.

4. Jimmy grows up on a farm and loves animals. Which is more likely?

A. When Jimmy grows up, he moves to a big city,

B. When Jimmy grows up, he moves to a big city and brings his dog.

5. (Challenge) Prof X has 5 yellow balls in bag 1. He transfers 1 to bag 2, which contained an unknown number of green balls. After shaking up bag 2, he selected a ball at random and, without looking at it, transferred it to bag 1. He now mixed the balls in bag 1 and selected a ball from it at random and without looking put it in bag 2. Prof X told the class that if he were to select a ball at random from bag 2, the chances it would be a green ball were 3:2. How many green were originally in bag 2?