Stat 1: Conditional Probability Practice Problem

Suppose that 9% of women age 40-50 have breast cancer (this estimate is probably too high). For a women with breast cancer, a mammogram will indicate cancer with probability 0.8. For a woman without breast cancer, a mammogram will indicate cancer with probability 0.1. A positive test might be a true positive (woman actually has cancer) or a false positive (the mammogram gave an incorrect indication).

Define "cancer" to be the event that the woman has breast cancer, and "pos" to be the event that the mammogram indicates breast cancer.

a) For a randomly chosen women age 40-50, what is the probability that a mammogram will indicate cancer? That is, find $P(\text{pos})$.

b) If the mammogram indicates cancer, what is the conditional probability the woman actually has cancer? That is, find $P(\text{cancer} \mid \text{pos})$.

To answer these questions, make a hypothetical table of counts for 1000 women age 40-50. Assume that the proportions work out exactly as the probabilities predict (i.e., exactly 90, or 9%, of the 1000 women have cancer, etc.).

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