Review of Probability Theory

Example: Figures provided by the Canadian Cancer Society indicate that 11% of Canadian women will develop breast cancer at some point in their lives. A mammogram test will result in a positive test (indicating the presence of BC) 90% of the time. For women who do not have breast cancer, a mammogram will result in a positive test 6% of the time.

A women suspected of having breast cancer (with probability 0.11) has a mammogram. It results in a *negative test*, indicating the woman does not have breast cancer. Compute the probability that she *does have* breast cancer.

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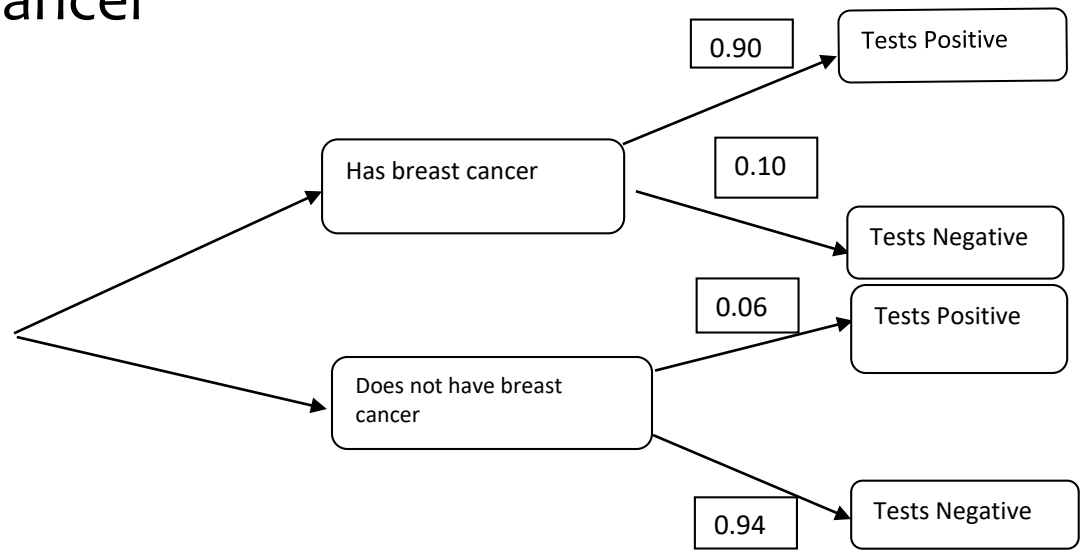
Answer: Define

BC = woman has breast cancer; + = tests positive for breast cancer



Given event: -, wish to find P(BC|-).

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$$P(BC|-) = \frac{P(BC \cap -)}{P(-)}$$

$$P(BC|-) = \frac{P(BC \cap -)}{P(BC \cap -) + P(not\ BC \cap -)}$$

$$P(-|BC) = \frac{(0.11 * 0.10)}{(0.11 * 0.10) + (0.89 * 0.94)}$$

$$P(-|BC) = \frac{0.011}{0.011 + 0.8366}$$

$$P(-|BC) = \frac{0.011}{0.011+0.8366} = 0.011/0.8476 = 0.01298$$

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Now, on your own:

Suppose the mammogram produced a positive test result. Compute the probability that the woman does not have breast cancer.