Conditional Probability

Breast Cancer Among Women Aged 40-50

- P(breast cancer) = 0.8% = 0.008
- P(pos. mam., given breast cancer) = 90% = 0.9
- P(pos. mam., given no breast cancer) = 7% = 0.07

Question: P(_____, given _____) = ?

Strategy: Consider hypothetical population of 1000 women

- How many (expected to) have breast cancer?

$$(0.8\%)(1000) = (0.008)(1000) = 8$$

	B. Cancer	No B. Cancer	Total
Pos. Mam.			
Neg. Mam			
Total	8	992	1000

- Of those <u>with</u> breast cancer, how many (expected to) have a positive mammogram?

$$(90\%)(8) = (0.9)(8) = 7.2 \approx 7$$

- Of those <u>without</u> breast cancer, how many (expected to) have a positive mammogram?

$$(7\%)(992) = (0.07)(992) = 69.44 \approx 69$$

	B. Cancer	No B. Cancer	Total
Pos. Mam.	7	69	
Neg. Mam			
Total	8	992	1000

Fill in:

	B. Cancer	No B. Cancer	Total
Pos. Mam.	7	69	76
Neg. Mam	1	923	924
Total	8	992	1000

P(b. cancer, given pos. mam.) = ____ = ____ = ____

Summary

The mammogram test has a 90% true positivity rate, meaning that if a woman _____, the _____ 90% of the time. (Also called "sensitivity" of test.)

- This does NOT mean that if a woman _____ _____ she has a 90% chance of _____.

For a woman between the ages of 40 & 50:

- The probability that she has breast cancer is $^{8}/_{1000}$ (.8%).
- However, if she has _____, the probability that she _____ increases to $^{9}/_{100}$ (9%).

Activity #4: Conditional Probs. in Real Life

Question: P(on drugs, given pos. test)?

Strategy: Consider hypothetical population of 10,000 & make a contingency table.

	On Drugs	Not On Drugs	Total
Pos. Test	③	⑥	⑦
Neg. Test	④	⑤	⑧
Total	①	②	10,000