Stat 205 Quiz 4

The following table cross-classifies 6549 subjects living in Massachusetts according to health risk (stressed or not stressed) and income (low, medium, or high):

		Income		
Stress level	Low	Medium	High	Total
Stressed	526	274	216	1016
Not Stressed	1954	1680	1899	5533
Total	2480	1954	2115	6549

This is turned into a table of probabilities by dividing each cell by the total sample size 6549:

		Income		
Stress level	Low	Medium	High	Total
Stressed	0.08	0.04	0.03	0.15
Not Stressed	0.30	0.26	0.29	0.85
Total	0.38	0.30	0.32	1.00

Let S be the event that a randomly selected individual is stressed and let L be the event that a randomly selected individual has low income. Use the table to answer the following questions.

1. What is the probability that someone in this study is stressed, $Pr\{S\}$? Answer: 1016

 $\frac{1016}{6549} = 0.15$ (first table) or 0.15 (second table).

2. What is the probability that someone is stressed and has low income, $Pr{S \text{ and } L}$?

Answer:

$$\frac{526}{6549} = 0.08$$
 (first table) or 0.08 (second table).

3. What is the probability that someone with a low income in this study is stressed, $Pr\{S|L\}$? Answer:

$$\frac{526}{2480} = 0.21$$
 (first table) or $\frac{0.08}{0.38} = 0.21$ (second table).

4. What is the probability that someone in this study is stressed or has low income, $Pr\{S \text{ or } L\}$? Answer:

$$\frac{526 + 274 + 216 + 1954}{6549} = 0.45$$
 (first table) or $0.08 + 0.04 + 0.04 + 0.30$ (second table).

You can also use the formula

$$Pr{S \text{ or } L} = Pr{\text{stressed or low income}}$$

= Pr{stressed} + Pr{low income} - Pr{stressed and low income}
= 0.15 + 0.38 - 0.08
= 0.45.

- Use 1 and 3 to determine whether being stressed and having low income are independent.
 Answer: Pr{stressed|low income} ≠ Pr{stressed} so they are *dependent*, i.e. *not* independent.
- 6. Is having low income independent of having high income? Why or why not? Answer: They are disjoint events, so they are *dependent*. If you have low income, you cannot have high income (Pr{low income|high income} = 0), one event tells you everything about the other. Formally,

 $Pr\{low income | high income\} \neq Pr\{low income\} implies dependence.$