Homework #7

1. Determine if the statements below are true or false, and explain your reasoning.

   (a) If a fair coin is tossed many times and the last eight tosses are all heads, then the chance that the next toss will be heads is somewhat less than 50%.

   (b) Drawing a face card (jack, queen, or king) and drawing a red card from a full deck of playing cards are mutually exclusive events.

   (c) Drawing a face card and drawing an ace from a full deck of playing cards are mutually exclusive events.

2. If you flip a fair coin 10 times, what is the probability of

   (a) getting all tails? (b) getting all heads? (c) getting at least one tails?

3. The American Community Survey (ACS) is an ongoing survey that provides data every year to give communities the current information they need to plan investments and services. The 2010 American Community Survey estimates than 14.6% of Americans live below the poverty line, 20.7% speak a language other that English at home, and 4.2% fall into both categories.

   (a) Are living below the poverty line and speaking a language other than English at home disjoint?

   (b) Draw a Venn diagram summarizing the variables and their associated probabilities.

   (c) What percent of Americans live below the poverty line and only speak English at home?

   (d) What percent of Americans live below the poverty line or speak a language other than English at home?

   (e) What percent of Americans live above the poverty line and only speak English at home?

   (f) Is the event that someone lives below the poverty line independent of the event that the person speaks a language other than English at home?

4. The table below shows the distribution of education level attained by US residents by gender based on data collected during the 2010 American Community Survey.

		Gender	
		Male	Female
Highest education attained	Less than 9th grade	0.06	0.06
	9th to 12th grade, no diploma	0.10	0.09
	High school graduate, GED, or alternative	0.30	0.20
	Some college, no degree	0.22	0.24
	Associate's degree	0.06	0.08
	Bachelor's degree	0.16	0.17
	Graduate or professional degree	0.09	0.09
	Total	1.00	1.00

(a) What is the probability that a randomly chosen man has at least a Bachelor's degree?

(b) What is the probability that a randomly chosen woman has at least a Bachelor's degree?

(c) What is the probability that a man and a woman getting married both have at least a Bachelor's degree? Note any assumptions you make.

(d) If you made an assumption in part (c), do you think it was reasonable? If you didn't make an assumption, double check your earlier answer.

5. Each row in the table below is a proposed grade distribution for a class. Identify each as a valid or invalid probability distribution, and explain your reasoning.

	Grades				
	A	B	C	D	F
(a)	0.3	0.3	0.3	0.2	0.1
(b)	0	0	1	0	0
(c)	0.3	0.3	0.3	0	0
(d)	0.3	0.5	0.2	0.1	-0.1
(e)	0.2	0.4	0.2	0.1	0.1
(f)	0	-0.1	1.1	0	0