AP Statistics: 5.2 Homework Worksheet

Probability Rules

1. In each of the following situations, state whether or not the given assignment of probabilities to individual outcomes is legitimate, that is, satisfies the rules of probability. If not, give specific reasons for your answer.
   a. Roll a die and record the count of spots on the up-face:
   $P(1) = 0, P(2) = \frac{1}{6}, P(3) = \frac{1}{3}, P(4) = \frac{1}{3}, P(5) = \frac{1}{6}, P(6) = 0$
   b. Choose a college student at random and record gender and enrollment status:
   $P(female\ full - time) = 0.56, P(Male\ Full - time) = 0.44, P(female\ part - time) = 0.24, P(male\ part - time) = 0.17$

2.

Event	Type of Birth	Number of Births
A	Single Birth	41,500,000
B	Twins	500,000
C	Triplets	5,000
D	Quadruplets	100

Use this information to **approximate** the probability that a randomly selected pregnant woman who reaches full term has the following probabilities: a) P(D) b) P(AUB) c) $P(A^c)$

3. All human blood can be typed as one of O, A, B, or AB, but the distribution of the types varies a bit with race. Here is the distribution of the blood type of a randomly chosen American.

Blood Type:	O	A	B	AB
Probability:	0.49	0.27	0.20	?

   a. What is the probability of type AB blood? Why?
   b. What is the probability that the person chosen does not have type AB blood?
   c. Maria has type B blood. She can safety receive blood transfusion from people with blood type O and B. What is the probability that a randomly chosen American can donate blood to Maria?

4. In a survey, 200 students are asked whether or not they like to watch basketball or football on television. Of the 200 students, 110 like to watch football, 80 like to watch basketball and 50 like to watch both.
   a) Draw a Venn diagram to describe the results of the survey.
   b) What is the probability that a student liked to watch football?
   c) What is the probability that a student liked to watch only football?
   d) What is the probability that a student liked to watch football or basketball?
   e) What is the probability that a student did not like to watch either sport?

5. A veterinarian tells you that if you breed two cream-colored guinea pigs, the probability that an offspring will be pure white is 0.25. What is the probability that it will not be pure white?

6. Choose a young adult (age 25 to 29) at random. The probability is 0.13 that the person chosen did not complete high school, 0.29 that the person has a high school diploma but no further education, and 0.30 that the person has at least a bachelor's degree.
   a. What must be the probably that a randomly chosen young adult has some education beyond high school but does not have a bachelor's degree? Why?

   b. What is the probability that a randomly chosen young adult has at least a high school education? Which rule of probability did you use to find the answer?

7. How do you find out about a job? The national Center for Career Strategies, Inc., has data on information sources that have led to actual jobs. Data adapted from a report in *USA Today* show sources for 1,000 jobs selected at random:

Source	Number of Jobs Obtained from Source
Mass mailing	50
Help-wanted ads	140
Executive search firms	110
Networking	700

a) Use these data to estimate the probability that a job selected at random would be obtained through mass mailing or help wanted ads.

b) What is the probability of someone obtaining a job that did not network? Describe (or show) two ways of making this calculation.

8. Students in an urban school were curious about how many children regularly eat breakfast. They conducted a survey, asking "do you eat breakfast on a regular basis?" all 595 students in the school responded to the survey. The resulting data are shown in the two-way table below:

	Male	**Female**	**Total**
Eats Breakfast Regularly	190	110	**300**
Doesn't Eat Breakfast Regularly	130	165	**295**
Total	**320**	**275**	**595**

   a. Who are the individuals? What variables are being measured?
   b. If we selected from the school at random, what is the probability that we choose
      i. A female
      ii. Someone who eats breakfast regularly?
      iii. A female who eats breakfast regularly?
      iv. A female or someone who eats breakfast regularly?

9. Isabel Briggs Myers was a pioneer in the study of personality types. The personality types are broadly defined accord to four main preferences. Do married couples choose similar or different personality types in the mates? The following is the distribution of similar preferences:

Number of Similar Preferences	**All four**	**Three**	**Two**	**One**	**None**
Probability	.09	?	.35	.33	.19

a. What is the probability that a married couple had no preferences in common?
b. What is the probability that a married couple had no more than two preferences in common?
c. What is the probability that a married couple had at least two preferences in common? Name two ways to make this calculation.
d. What is the probability that a married couple had either all four or no preferences in common?

10. The two way table below describes the members of the U.S senate in a recent year.

	Male	**Female**
Democrats	0.47	0.13
Republicans	0.36	0.04

a. If we select a U.S. senator at random, what's the probability that we chose
   i. A democrat?
   ii. A female?
   iii. A female democrat?
   iv. A female or a democrat?

11. Refer to the previous problem (#10)
   a. Construct a Venn diagram that models the chance process of using event R: is a Republican, and F: is female

   b. Find $P(R\ U\ F)$

   c. Find $P(R^C \cap F^C)$

   d. Explain, in short, how you could figure out part (c) by either looking at the two way table, or the Venn diagram.