## Chapter 5 Quiz #1 Review

1. The TV weatherman says, "There's a 30% chance of rain tomorrow." Explain what this statement means.

When the weather conditions are like those seen today, it has rained on the following day about 30% of the time.

2. U.S. Census Bureau allows each person to choose from a long list of races. That is, in the eyes of the U.S. Census Bureau, you belong to whatever race you say you belong to. Hispanic/Latino is a separate category; Hispanics may be of any race. If we choose a resident of the United States at random, the U.S. Census Bureau gives these probabilities:

| | Hispanic | Not Hispanic |
|---|---|---|
| Asian | 0.001 | 0.044 |
| Black | 0.006 | 0.124 |
| White | 0.144 | $\boxed{0.667}$ |
| Other | 0.005 | 0.009 |

a) Verify that this is a legitimate assignment of probabilities.

$0.001+0.006+0.144+0.005+0.044+0.124+0.667+0.009=1$

b) What is the probability that a randomly chosen American is Hispanic?

$0.001+0.006+0.144+0.005=0.156$

c) Non-Hispanic whites are the historical majority in the United States. What is the probability that a randomly chosen American is not a member of this group?

$1-.667=0.333$

d) Explain why P(white or Hispanic) ≠ P(white) + P(Hispanic). Then find P(white or Hispanic.

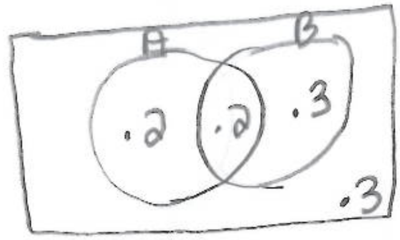
Being white or being Hispanic are not mutually exclusive events.

$(.114+.667)+(.001+.006+.144+.005)-.144=.793$

3. Ramon has applied to both Princeton and Stanford. According to his counselor, the probability that Princeton will admit him is 0.4, the probability that Stanford will admit him is 0.5, and the probability that both will admit him is 0.2.

   a) Make a Venn diagram to model this chance process.

   Let A = Princeton admit
   Let B = stanford admit




   b) What is the probability that neither university admits Ramon?

   $1-.7=.3$

   c) What is the probability that he gets into at least one of the two schools? Use the general addition rule to confirm that your answer is correct.

   $P(A \cup B)=.4+.5-.2=.7$

4. You work at Mike's pizza shop. You have the following information about the 7 pizzas in the oven: 3 of the 7 have thick crust, and of these 1 has only sausage and 2 have only mushrooms. The remaining 4 pizzas have regular crust, and of these 2 have only sausage and 2 have only mushrooms. Choose a pizza at random from the oven.

   a) Are the events "getting a thick-crust pizza" and "getting a pizza with mushrooms" independent? Let A = thick crust Let B = mushrooms

   $P(A|B)=P(A)$ $\quad$ $P(B|A)=P(B)$

   $\frac{2}{3} \neq \frac{4}{7}$ $\quad$ $\frac{1}{2} \neq \frac{3}{7}$

   Since the probabilities are not equal, these events are not independent.

   b) You add an eighth pizza to the oven. This pizza has thick crust with only cheese. Now are the events "getting a thick-crust pizza" and "getting a pizza with mushrooms" independent?

   $P(A|B)=P(A)$ $\quad$ $P(B|A)=P(B)$

   $\frac{2}{4}=\frac{4}{8}$ $\quad$ $\frac{2}{4}=\frac{4}{8}$

   $\frac{1}{2}=\frac{1}{2}$ $\quad$ $\frac{1}{2}=\frac{1}{2}$

   Since the probabilities are equal, the events are independent.

5. Choose an American adult at random. Define two events:

   A = The person has a cholesterol level of 20 milligrams per deciliter of blood (mg/dl) or above (high cholesterol)

   B = The person has a cholesterol level of 200 to 239 mg/dl (borderline high cholesterol)

   According to the American Heart Association, P(A) = 0.06, and P(B) = 0.29

   a) Explain why events A and B are mutually exclusive.

   A person cannot have a cholesterol level of both 240 or above and between 200 and 239 at the same time.

   b) What is P(A or B)?

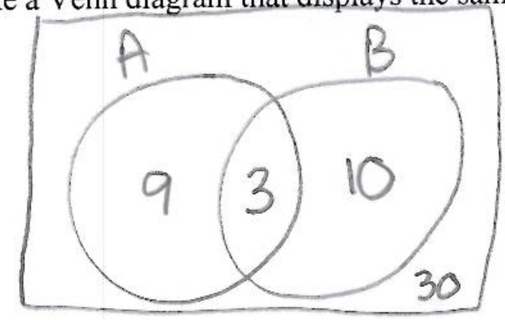
   $0.06 + 0.29 = 0.35$

   c) If C is the event that the person chosen has normal cholesterol (below 200 mg/dl), what is P(C)?

   $1 - 0.35 = 0.65$

6. A standard deck of playing cards (with jokers removed) consists of 52 cards. The jack, queen and king are referred to a "face cards." Imagine that we shuffle the deck and deal one card. Let's define events A: getting a face card and B: getting a heart.

   a) Make a Venn diagram that displays the sample space.




   b) Find P(A and B)

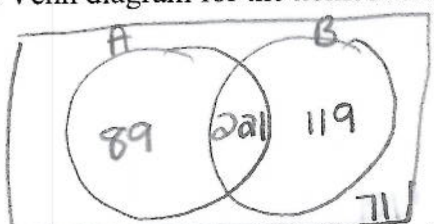
   $P(A) \cdot P(B|A) = \frac{12}{52} \cdot \frac{3}{12} = \frac{3}{52}$

7. What is the relationship between educational achievement and home ownership? A random sample of 500 people who participated in the 2000 census was chosen. Each member of the sample was identified as a high school graduate (or not) and as a home owner (or not). The two-way table displays the data. Define event A: graduating from high school and event B: owning a home.

| High School Graduate? | | | |
|---|---|---|---|
| **Homeownership Status** | **HS Grad** | **Not a HS Grad** | **Total** |
| Homeowner | 221 | 119 | 340 |
| Not a homeowner | 89 | 71 | 160 |
| **Total** | **310** | **190** | **500** |

Suppose we choose a member of the sample at random. Find the probability that each member…

a) Create a Venn diagram for the homeownership data above.




b) Find the probability that a person is a high school graduate. $P(A) = \frac{310}{500} = \frac{31}{50}$

c) Find the probability that a person is a high school graduate and owns a home.
$P(A \cap B) = \frac{310}{500} \cdot \frac{221}{310} = \frac{221}{500}$    $P(A) \cdot P(B|A)$

d) Find the probability that a person is a high school graduate or owns a home. $P(A \cup B) =$
$\frac{310}{500} + \frac{340}{500} - \frac{221}{500} = \frac{429}{500}$

e) Find the probability that a person is a high school graduate given that they own a home.
$P(A|B) = \frac{\frac{221}{500}}{\frac{340}{500}} = \frac{221}{340}$

f) Find the probability that a person owns a home given that they are a high school graduate. $P(A|B) = \frac{\frac{221}{500}}{\frac{310}{500}} = \frac{221}{310}$