In-class Worksheet 6

1. Consider the following events for a college student selected at random:

$$\begin{aligned} A &= \text{student is female} \\ B &= \text{student is majoring in business} \end{aligned}$$

   (a) Describe with an English phrase, what quantity each of the following expressions describes.

   i. $P(A \mid B)$

   ii. $P(A \text{ and } B)$

   iii. $P(A \text{ or } B^c)$

   iv. $P(A^c \text{ and } B)$

   (b) Given the following contingency table, compute the value of each of the following expressions.

	MAJOR			
GENDER	Business	Biology	Psychology	Row Total
Female	30	47	50	127
Male	41	45	20	106
Column Total	71	92	70	233

   i. $P(A \mid B)$

   ii. $P(A \text{ and } B)$

   iii. $P(A \text{ or } B^c)$

   iv. $P(A^c \text{ and } B)$

2. In a sales effectiveness seminar, a group of sales representatives tried two approaches to selling a customer a new automobile: the aggressive approach and the passive approach. For 1160 customers, the following record was kept.

	Sale	No Sale	Row Total
Aggressive	270	310	580
Passive	416	164	580
Column Total	686	474	1160

Suppose that a customer is selected at random from the 1160 participating customers. Let us use the following notation for events: A = the aggressive approach, Pa = the passive approach, S = sale, and N = no sale.

(a) Compute the probability that a sale was made to the customer, $P(S)$.

(b) Compute the probabilities $P(S \mid A)$ and $P(S \mid Pa)$.

(c) Are the events S = sale and Pa = passive approach independent? Explain.

(d) Compute the probability $P(A \text{ and } S)$.

(e) Compute the probability $P(A \text{ or } S)$.

3. You draw two cards from a standard deck of 52 cards **without** replacing the first one before drawing the second.

   (a) Are the outcomes on the two cards independent? Why?

   (b) Find P(3 on the 1st card *and* 10 on the 2nd).

   (c) Find P(10 on the 1st card *and* 3 on the 2nd).

   (d) Find the probability of drawing a 10 *and* a 3 in either order.

4. Suppose you have a standard deck of 52 cards from which you are drawing cards at random (without replacement).

   (a) How many cards must you draw so that the probability of drawing "at least one ace" is 1?

   (b) What is the probability that if you draw 5 cards that you have NO aces?

5. Suppose for two events A and B we know that $P(A) = 0.67$ and $P(B) = 0.5$.

   (a) Can events A and B be mutually exclusive? Explain.

   (b) If we further know that A and B are independent, compute $P(A$ and $B)$ and $P(A$ or $B)$.