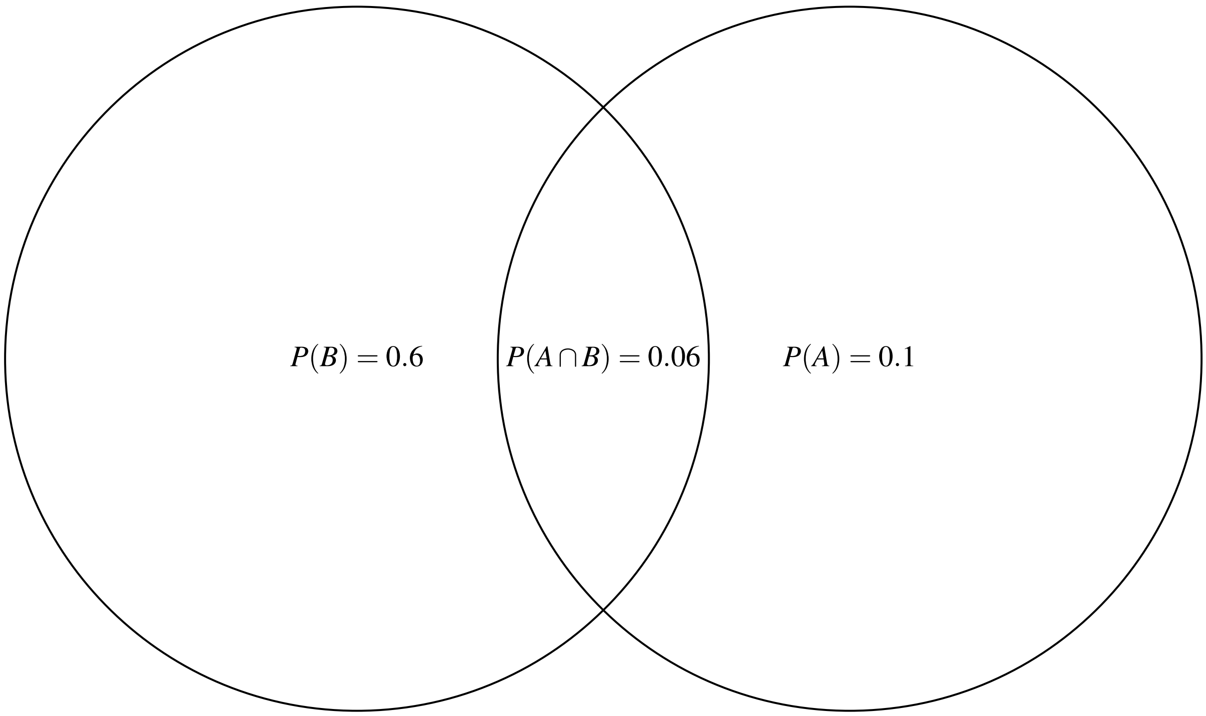
Kaleb Burris
STAT F300 Statistics, Dr. Short
Worksheet 4, due Friday January 27, 4:15pm

---

1. If A and B are events such that $P(A) = 0.10$, $P(B) = 0.60$, and $P(A \cup B) = 0.64$, then:

(a) Sketch and label a Venn diagram appropriately. (That is, your diagram should have the overlapping events, with 4 probabilities written in the correct places and these 4 numbers must sum to 1.) Please ask me if you are unsure what I'm asking for.



$P(A^c \cup B^c) = 0.36$

$$P(A^c \cap B^c) = 1 - (P(A \cup B)) = 1 - 0.64 = 0.36$$
$$P(A \cap B) = (P(A) + P(B)) - P(A \cup B) = (0.1 + 0.6) - 0.64 = 0.06$$

(b) Find $P(A \cap B)$.

$$P(A) = 0.1, P(B) = 0.6, P(A \cup B) = 0.64$$
$$P(A \cap B) = (P(A) + P(B)) - P(A \cup B) = (0.1 + 0.6) - 0.64 = \boxed{0.06}$$

(c) Find $P(B \cap A^c)$.

$$P(B \cap A^c) = P(B) - P(A \cap B)$$
$$P(B \cap A^c) = 0.1 - 0.06 = \boxed{0.04}$$

Kaleb Burris
STAT F300 Statistics, Dr. Short
Worksheet 4, due Friday January 27, 4:15pm

2. Consider an experiment in which we roll two 4-sided dice, one red, one green. Let A be the event that the red die is 2; let B be the event that the sum is at most 4, and let C be the event that the product is odd.

(a) Find $P(A \cup B)$. Be sure to show your work; for example, $A \cup B = \{\}$, all the outcomes are equally likely, therefore $P(A \cup B) = \ldots$

$$P = \left\{ \begin{matrix} \{1,1\},\{1,2\},\{1,3\},\{1,4\}, \\ \{2,1\},\{2,2\},\{2,3\},\{2,4\}, \\ \{3,1\},\{3,2\},\{3,3\},\{3,4\}, \\ \{4,1\},\{4,2\},\{4,3\},\{4,4\} \end{matrix} \right\} \quad \#P = 16$$

$$A = \{\{2,1\},\{2,2\},\{2,3\},\{2,4\}\} \quad \#A = 4 \quad P(A) = 0.25$$

$$B = \left\{ \begin{matrix} \{1,1\},\{1,2\},\{1,3\},\{2,1\}, \\ \{2,2\},\{3,1\} \end{matrix} \right\} \quad \#B = 6 \quad P(B) = 0.375$$

$$P(A \cup B) = \left\{ \begin{matrix} \{1,1\},\{1,2\},\{1,3\},\{2,1\}, \\ \{2,2\},\{2,3\},\{2,4\},\{3,1\} \end{matrix} \right\} \quad \#(A \cup B) = 8 \quad \boxed{P(A \cup B) = 0.5}$$

(b) Find $P(B \cap A^c)$

$$P(B \cup A^c) = \frac{\#\{\{1,1\},\{1,2\},\{1,3\},\{3,1\}\}}{16} = \frac{4}{16} = \boxed{0.25}$$

3.

(a) $\boxed{\text{True}}$ / False: If $A = \emptyset$ then $P(A) = 0$.

(b) True / $\boxed{\text{False}}$: If $P(A) = 0$ then $A = \emptyset$; if true, state why; if false, give an example that shows the statement is false. (Hint: The answer is False.)

If A contains elements of an uncountably infinite set, then any single element n will have $P(n) = 0$.