Math 372: Homework 03

Due Friday, September 11

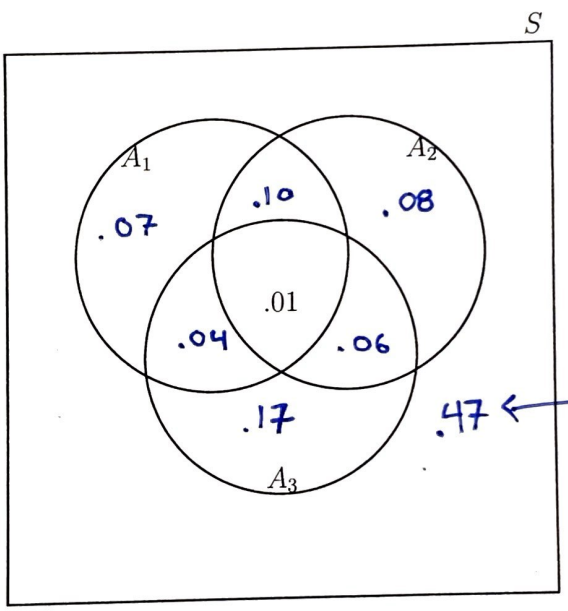
Problem 1 (Sets). A consulting firm has bids on 3 projects. Let

$$A_i = [\text{awarded project } i], \qquad i \in \{1, 2, 3\}$$

Suppose that

$$\mathbb{P}[A_1 \cap A_2 \cap A_3] = .01$$
$$\mathbb{P}[A_1] = .22, \qquad \mathbb{P}[A_2] = .25, \qquad \mathbb{P}[A_3] = .28$$
$$\mathbb{P}[A_1 \cap A_2] = .11, \qquad \mathbb{P}[A_1 \cap A_3] = .05, \qquad \mathbb{P}[A_2 \cap A_3] = .07$$

(a) In the following Venn diagram, the three overlapping circles represent events A_1, A_2, and A_3, all contained within the sample space box S. Each enclosed region represents an event, all of which have some probability of occurring. I've already filled in the probability of one of the events (namely, the event $A_1 \cap A_2 \cap A_3$). Using the probabilities above, fill in the probabilities of other 7 regions:



$1 - (.07 + .10 + .08 + .04 + .01 + .06 + .17)$
$= 1 - .53$
$= .47$

(b) Express in words each of the following events, and compute the probability of each event:

(i.) $A_1 \cup A_2$ $\quad \mathbb{P}[A_1 \cup A_2] = .07 + .10 + .08 + .04 + .01 + .06 = .36$

(ii.) $A_1^c \cap A_2^c$ $\quad = (A_1 \cup A_2)^c$ $\quad \mathbb{P}[(A_1 \cup A_2)^c] = 1 - \mathbb{P}[A_1 \cup A_2] = 1 - .36 = .64$

(iii.) $A_1 \cup A_2 \cup A_3$ $\quad \mathbb{P}[A_1 \cup A_2 \cup A_3] = .53$

(iv.) $A_1^c \cap A_2^c \cap A_3^c$ "didn't get any contract" Prob = .47

(v.) $A_1^c \cap A_2^c \cap A_3$ "got project 3 but not 1 or 2" Prob = .17

(vi.) $(A_1^c \cap A_2^c) \cup A_3$ "either got project 3, or didn't get 1 and 2"
Prob = .28 + .47 = .75