

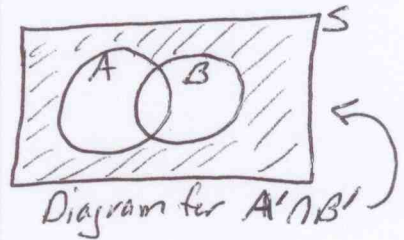
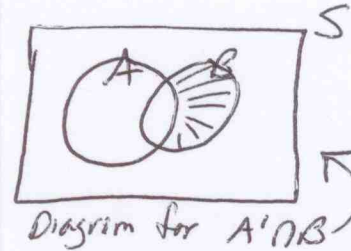
I. Suppose A and B are events in a sample space S and P is a probability function on S such that $P(A) = .45$, $P(B) = .75$, and $P(A \cup B) = .95$. Find the indicated probabilities. You must show at least one intermediate step on each problem to receive full credit. (13 points total)

(a) $P(A \cap B) = P(A) + P(B) - P(A \cup B)$
(3 points)
 $= .45 + .75 - .95 = \boxed{.25}$

(b) $P(A' \cap B)$
(4 points) $\hookrightarrow = P(B) - P(A \cap B)$
 $= .75 - .25 = \boxed{.50}$

(c) $P(A' \cap B')$
(4 points) $\rightarrow P((A \cup B)') = 1 - P(A \cup B)$
 $= 1 - .95 = \boxed{.05}$
DeMorgan's Law
or see Venn Diagram

(d) $P(B')$
(2 points) $= 1 - P(B) = 1 - .75$
 $= \boxed{.25}$



II. The chair of the mathematics department must assign professors to teach three different upper level mathematics courses. Given that there are six professors who can teach the courses and that at most one course will be assigned to a single professor, how many possible ways can the department chair assign the professors to teach the courses? (3 points)

Sampling w/out replacement, order matters, permuting 6 objects 3 at a time...

$$\frac{6!}{(6-3)!} = 6 \cdot 5 \cdot 4 = \boxed{120}$$

III. While at Walmart one Saturday afternoon, Dr. L. encounters a person trying to give away 10 kittens (all in a large cardboard box). Four of the kittens have yellow stripes and the others are solid grey. Being in the market for two new cats and believing that all kittens are equally worthy of human adoration, Dr. L. closes her eyes and randomly draws two kittens from the box. What is the probability that she will get two kittens with yellow stripes? (4 points)

Sampling w/out replacement, order does not matter.

$$\frac{\binom{4}{2}}{\binom{10}{2}} \leftarrow \begin{array}{l} \text{\# ways to get 2 yellow striped kittens} \\ \text{\# ways (equally likely!) to draw 2 kittens from 10} \end{array} = \frac{\frac{4!}{2!2!}}{\frac{10!}{2!8!}} = \frac{4 \cdot 3}{10 \cdot 9} = \frac{2}{15} = .1\bar{3}$$

OR $\rightarrow \frac{4}{10} \cdot \frac{3}{9} = \frac{2}{15}$ } Here we are using the multiplication rule!
 \leftarrow Prob of yellow kitten on 1st draw } \leftarrow with conditional probabilities!
 \leftarrow Prob of yellow kitten on 2nd draw given yellow on 1st!