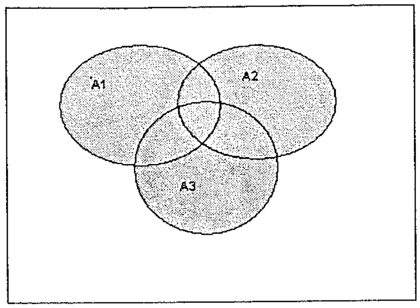
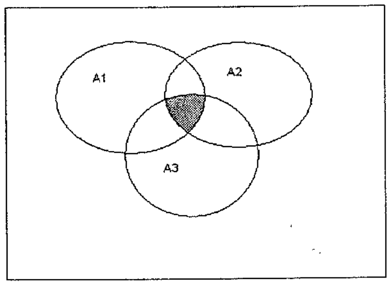
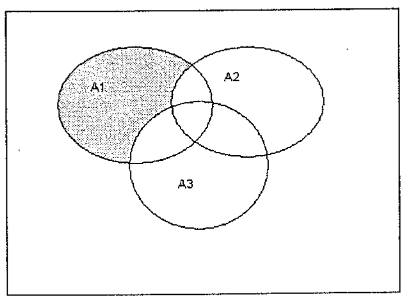
8.



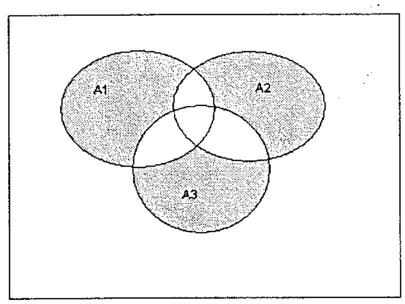
a. $A_1 \cup A_2 \cup A_3$



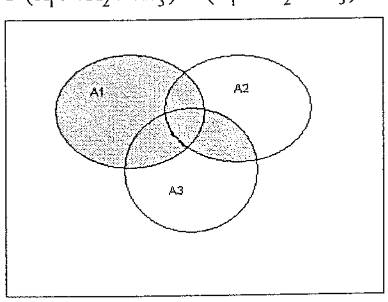
b. $A_1 \cap A_2 \cap A_3$



c. $A_1 \cap A_2' \cap A_3'$



d. $(A_1 \cap A_2' \cap A_3') \cup (A_1' \cap A_2 \cap A_3') \cup (A_1' \cap A_2' \cap A_3)$



e. $A_1 \cup (A_2 \cap A_3)$

12.

a. $P(A \cup B) = .50 + .40 - .25 = .65$.

b. $P(\text{neither } A \text{ nor } B) = P(A' \cap B') = P((A \cup B)') = 1 - P(A \cup B) = 1 - .65 = .35$.

c. The event of interest is $A \cap B'$; from a Venn diagram, we see $P(A \cap B') = P(A) - P(A \cap B) = .50 - .25 = .25$.

2.

a. $A = \{RRR, LLL, SSS\}$.

b. $B = \{RLS, RSL, LRS, LSR, SRL, SLR\}$.

c. $C = \{RRL, RRS, RLR, RSR, LRR, SRR\}$.

d. $D = \{RRL, RRS, RLR, RSR, LRR, SRR, LLR, LLS, LRL, LSL, RLL, SLL, SSR, SSL, SRS, SLS, RSS, LSS\}$

e. Event D' contains outcomes where either all cars go the same direction or they all go different directions:
$D' = \{RRR, LLL, SSS, RLS, RSL, LRS, LSR, SRL, SLR\}$.
Because event D totally encloses event C (see the lists above), the compound event $C \cup D$ is just event D:
$C \cup D = D = \{RRL, RRS, RLR, RSR, LRR, SRR, LLR, LLS, LRL, LSL, RLL, SLL, SSR, SSL, SRS, SLS, RSS, LSS\}$.
Using similar reasoning, we see that the compound event $C \cap D$ is just event C:
$C \cap D = C = \{RRL, RRS, RLR, RSR, LRR, SRR\}$.

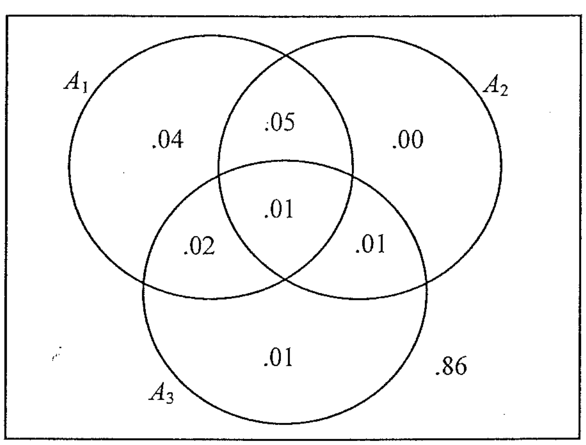
26. These questions can be solved algebraically, or with the Venn diagram below.

a. $P(A_1') = 1 - P(A_1) = 1 - .12 = .88$.

b. The addition rule says $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. Solving for the intersection ("and") probability, you get $P(A_1 \cap A_2) = P(A_1) + P(A_2) - P(A_1 \cup A_2) = .12 + .07 - .13 = .06$.

c. A Venn diagram shows that $P(A \cap B') = P(A) - P(A \cap B)$. Applying that here with $A = A_1 \cap A_2$ and $B = A_3$, you get $P([A_1 \cap A_2] \cap A_3') = P(A_1 \cap A_2) - P(A_1 \cap A_2 \cap A_3) = .06 - .01 = .05$.

d. The event "at most two defects" is the complement of "all three defects," so the answer is just $1 - P(A_1 \cap A_2 \cap A_3) = 1 - .01 = .99$.



32.

a. Since there are 5 receivers, 4 CD players, 3 speakers, and 4 turntables, the total number of possible selections is (5)(4)(3)(4) = 240.

b. We now only have 1 choice for the receiver and CD player: (1)(1)(3)(4) = 12.

c. Eliminating Sony leaves 4, 3, 3, and 3 choices for the four pieces of equipment, respectively: (4)(3)(3)(3) = 108.

d. From **a**, there are 240 possible configurations. From **c**, 108 of them involve zero Sony products. So, the number of configurations with at least one Sony product is 240 – 108 = 132.

e. Assuming all 240 arrangements are equally likely, $P(\text{at least one Sony}) = \frac{132}{240} = .55$.

Next, P(exactly one component Sony) = P(only the receiver is Sony) + P(only the CD player is Sony) + P(only the turntable is Sony). Counting from the available options gives

$$P(\text{exactly one component Sony}) = \frac{(1)(3)(3)(3)+(4)(1)(3)(3)+(4)(3)(3)(1)}{240} = \frac{99}{240} = .413.$$

38.

a. There are 6 75W bulbs and 9 other bulbs. So, P(select exactly 2 75W bulbs) = P(select exactly 2 75W bulbs and 1 other bulb) $= \frac{\binom{6}{2}\binom{9}{1}}{\binom{15}{3}} = \frac{(15)(9)}{455} = .2967$.

b. P(all three are the same rating) = P(all 3 are 40W or all 3 are 60W or all 3 are 75W) =

$$\frac{\binom{4}{3}+\binom{5}{3}+\binom{6}{3}}{\binom{15}{3}} = \frac{4+10+20}{455} = .0747.$$

c. $P(\text{one of each type is selected}) = \frac{\binom{4}{1}\binom{5}{1}\binom{6}{1}}{\binom{15}{3}} = \frac{120}{455} = .2637$.

d. It is necessary to examine at least six bulbs if and only if the first five light bulbs were all of the 40W or 60W variety. Since there are 9 such bulbs, the chance of this event is

$$\frac{\binom{9}{5}}{\binom{15}{5}} = \frac{126}{3003} = .042.$$