

1. (a)  $E$  and  $F$  are not mutually exclusive:  $P(E \cup F) = .55 \neq P(E) + P(F) = .4 + .3 = .7$   
 (b)  $E$  and  $F$  are not independent:  $P(EF) = P(E) + P(F) - P(E \cup F) = .15 \neq P(E)P(F) = .12$   
 (c)  $P(E^c \cup F^c) = P((EF)^c) = 1 - P(EF) = .85$   
 (d)  $P(E | F) = P(EF)/P(F) = .5$
2. (a)  $6! = 720$   
 (b)  $3!(3!2!1!) = 72$   
 (c)  $4!3! = 144$
3. (a)  $\frac{\binom{31}{3}\binom{21}{5}}{\binom{52}{8}} = .12155$   
 (b)  $\frac{\binom{31}{8} + \binom{11}{8} + \binom{10}{8}}{\binom{52}{8}} = .01048$   
 (c)  $\binom{31}{3}\binom{10}{2} [\binom{9}{3} + 2\binom{9}{2}] = 31554900$
4. Let  $H_i$  be the event that missile  $i$  hits the target, and  $M_i$  the event that it misses.  
 (a)  $P(\text{at least two hit}) = P(\text{two hit}) + P(\text{three hit})$   
 $= P(H_1H_2M_3 \cup H_1M_2H_3 \cup M_1H_2H_3) + P(H_1H_2H_3)$   
 $= P(H_1H_2M_3) + P(H_1M_2H_3) + P(M_1H_2H_3) + P(H_1H_2H_3)$   
 $= (.7)(.8)(.1) + (.7)(.2)(.9) + (.3)(.8)(.9) + (.7)(.8)(.9) = .902$   
 (b)  $P(M_1M_2M_3) = P(M_1)P(M_2)P(M_3) = (.3)(.2)(.1) = .006$
5. Let  $G$  be the event the breakdown occurs after Gonzales, and  $L$  the event it occurs after Laplace.  
 $P(G | L) = P(GL)/P(L) = P(G)/P(L) = (24/80)/(55/80) = 24/55 = .43636$
6. Let  $L$  be the event the chosen bulb lasts over 100 hours,  $A$  the event brand A is chosen,  $B$  the event brand B is chosen, and  $C$  the event brand C is chosen.  
 (a)  $P(L) = P(LA) + P(LB) + P(LC) = P(L | A)P(A) + P(L | B)P(B) + P(L | C)P(C)$   
 $= (.1)(.2) + (.4)(.3) + (.3)(.5) = .29$   
 (b)  $P(A | L) = P(AL)/P(L) = P(L | A)P(A)/P(L) = (.1)(.2)/(.29) = .06897$
7. (a)  $S = \{H, TH, TTH, TTTH, TTTTH, \dots\}$   
 (b) Possible values of  $X$  are 1, 2, 3, 4, ...  $P(X = 4) = P(TTTH) = (3/5)^3(2/5) = .0864$
8. (a) See Example 4.7 on pages 146–147 of the text.  
 (b)  $P(X \leq 2) = F(2) = 2/3$   $P(X < 2) = F(2-) = 1/2$   $P(X = 2) = F(2) - F(2-) = 1/6$   
 (c)  $P(X > 3/2) = 1 - F(3/2) = 1/2$   $P(X = 3/2) = 0$   $P(3/2 < X \leq 5) = F(5) - F(3/2) = 1/2$