Homework 5 Key

3.2 (3-10, 17, 18, 23, 24, 64a-g)
3.3 (9-14, 21-24, 39-42)

Section 3.2

4) $S = \{x \mid x \text{ is a jellybean in the jar}\}$
$R = \{x \mid x \text{ is a red jellybean}\}$
$B = \{x \mid x \text{ is a black jellybean}\}$
$Y = \{x \mid x \text{ is a yellow jellybean}\}$
$G = \{x \mid x \text{ is a green jellybean}\}$

$$P(G) = \frac{n(G)}{n(S)} = \frac{5}{35} \approx .14$$

6) $P(R \cup B) = \frac{n(R \cup B)}{n(S)} = \frac{20}{35} \approx .57$

8) $P(R') = \frac{n(R')}{n(S)} = \frac{27}{35} \approx .77$

10) There are no white jellybeans in the jar, so the event "you don't pick a white jellybean" has probability 1

18a) $S = \{x \mid x$ is a card in a standard deck$\}$

$H = \{x \mid x$ is a heart$\}$

$P(H) = \dfrac{n(H)}{n(S)} = \dfrac{13}{52} = .25$

b) $O(H) = n(H) : n(H') = 13 : 39 \to 1 : 3$

c) If you repeat the experiment of drawing a single card from a well-shuffled deck many times, the relative frequency of drawing a heart will approach .25

24a) $N = \{x \mid x$ is a card below a 9$\}$

Then $n(N) = 28$ because there are 7 cards below a 9 in each of the 4 suits.

Hence, $P(N) = \dfrac{28}{52} \approx .54$

b) $O(N) = n(N) : n(N') = 28 : 24 \to 7 : 6$

c) If you repeat the experiment of drawing a single card from a well-shuffled deck many times, the relative frequency of drawing a card below a 9 will approach .54.

64a) $S = \{(H,H,H), (H,H,T), (H,T,H), (T,H,H),$
$(H,T,T), (T,H,T), (T,T,H), (T,T,T)\}$

b) $E = \{(H,H,T), (H,T,H), (T,H,H)\}$

c) $F = \{(H,H,T), (H,T,H), (T,H,H), (H,H,H)\}$

d) $G = \{(H,H,H)\}$

e) $p(E) = \dfrac{n(E)}{n(s)} = \dfrac{3}{8} \approx .38$

f) $p(F) = \dfrac{n(F)}{n(s)} = \dfrac{4}{8} = .5$

g) $p(G) = \dfrac{n(G)}{n(s)} = \dfrac{1}{8} \approx .13$

Section 3.3

10) E and F are not mutally exclusive because the outcome ~~~~ 4 is ~~~~ an element of both sets

12a) $S = \{x \mid x$ is a card in a standard deck$\}$
$H = \{x \mid x$ is a heart$\}$
$J = \{x \mid x$ is a jack$\}$

$p(J \cap H) = \dfrac{n(J \cap H)}{n(s)} = \dfrac{1}{52} \approx .02$

b) $p(J \cup H) = p(J) + p(H) - p(J \cap H)$
$= \dfrac{4}{52} + \dfrac{13}{52} - \dfrac{1}{52} = \dfrac{16}{52} \approx .31$

12c) $P\left((J \cap H)'\right) = 1 - P(J \cap H) = 1 - \frac{1}{52} = \frac{51}{52} \approx .98$

14a) $F = \{x \mid x \text{ is a five}\}$

$B = \{x \mid x \text{ is black}\}$

$P(F \cap B) = \dfrac{n(F \cap B)}{n(S)} = \dfrac{2}{52} \approx .04$

b) $P(F \cup B) = P(F) + P(B) - P(F \cap B)$

$\qquad = \dfrac{4}{52} + \dfrac{26}{52} - \dfrac{2}{52}$

$\qquad = \dfrac{28}{52} \approx .54$

c) $P\left((F \cap B)'\right) = 1 - P(F \cap B) = 1 - \dfrac{2}{52} = \dfrac{50}{52} \approx .96$

22) $P(H') = \dfrac{n(H')}{n(S)} = \dfrac{39}{52} = .75$

24) $Q = \{x \mid x \text{ is below a queen}\}$

Note that $n(Q') = 12$ because there are three cards not below a queen in each of the 4 suits (Q, K, A). Hence, $P(Q') = \frac{12}{52}$

$P(Q) = 1 - P(Q') = 1 - \dfrac{12}{52} = \dfrac{40}{52} \approx .77$

40a) There were $151 + 201 = 352$ happy customers, so the probability that a shopper was happy with the service is $\frac{352}{700} \approx .50$

b) The probability that a shopper was unhappy is $1 - .50 = .50$

42a) There were 215 customers who made no purchase and were unhappy with the service. Hence, the probability that a shopper was unhappy and made no purchase is $\frac{215}{700} \approx .31$

b) There were $215 + 201 + 133 = 549$ customers who either made no purchase or were unhappy. Hence the probability that a customer is either unhappy or made no purchase is $\frac{549}{700} \approx .78$