**8.4** #50 [10 pts] There are $\binom{6}{3}$ ways to select the three mice that will recover. Each way occurs with probability $(0.70)^3(0.30)^3$. Thus,

$$P(\text{exactly 3 of 6 mice recover}) = \binom{6}{3}(0.70)^3(0.30)^3 \approx .185.$$

**8.4** #56 [5 pts each] (a) There are $\binom{83}{10}$ ways to select the ten inoculated people that will get the flu. Each way occurs with probability $(0.20)^{10}(0.80)^{73}$. Thus,

$$P(\text{exactly 10 people inoculated get the flu}) = \binom{83}{10}(0.20)^{10}(0.80)^{73} \approx .0210.$$

(b) Note that $P\{\text{no more than } 4\} = P\{\text{exactly } 0\} + P\{\text{exactly } 1\} + P\{\text{exactly } 2\} + P\{\text{exactly } 3\} + P\{\text{exactly } 4\}$. Therefore,

$$\begin{aligned} &P(\text{no more than 4 people inoculated get the flu}) = \\ &\binom{83}{0}(0.20)^0(0.80)^{83} + \binom{83}{1}(0.20)^1(0.80)^{82} + \binom{83}{2}(0.20)^2(0.80)^{81} \\ &\quad + \binom{83}{3}(0.20)^3(0.80)^{80} + \binom{83}{4}(0.20)^4(0.80)^{79} \\ &\approx 8.004 \times 10^{-5}. \end{aligned}$$

(c) There is only one way (i.e., $\binom{83}{0}$ ways) in which no one gets the flu. Thus,

$$P(\text{no people inoculated get the flu}) = \binom{83}{0}(0.20)^{83}(0.80)^0 = (0.20)^{83} \approx 9.046 \times 10^{-9}.$$

**8.4** #64 [10 pts] Note that $\{\text{fewer than } 8\} = \{\text{at least } 8\}'$. Thus, $P(\text{fewer than } 8) = 1 - P(\text{at least } 8) = 1 - P(\text{exactly } 8) - P(\text{exactly } 9) - P(\text{exactly } 10)$. Therefore,

$$P(\text{fewer than } 8) = 1 - \binom{10}{8}(0.2)^8(0.8)^2 - \binom{10}{9}(0.2)^9(0.8)^1 - \binom{10}{10}(0.2)^{10}(0.8)^0 \approx .999922.$$

**8.5** #4 [10 pts] Let $X$ be the number of black balls drawn. Then the possible values of $X$ are 0, 1, or 2. Thus,

$$P(X=0) = \frac{4}{6}\cdot\frac{3}{5} = \frac{6}{15}, \quad P(X=1) = \frac{4}{6}\cdot\frac{2}{5} + \frac{2}{6}\cdot\frac{4}{5} = \frac{8}{15}, \quad P(X=2) = \frac{2}{6}\cdot\frac{1}{5} = \frac{1}{15}.$$

**8.5** #10 [10 pts] By definition we have,

$$E(y) = y_1P(y_1) + y_2P(y_2) + y_3P(y_3) + y_4P(y_4) = 4 \times .4 + 6 \times .4 + 8 \times .05 + 10 \times .15 = 5.9.$$

**8.5** #14 [10 pts] By definition, $E(x) = x_1P(x_1) + x_2P(x_2) + x_3P(x_3) + x_4P(x_4) + x_5P(x_5)$. We can read the appropriate probabilities from the histogram to find that

$$E(x) = 2 \times .2 + 4 \times .3 + 6 \times .2 + 8 \times .1 + 10 \times .2 = 5.6.$$

**8.5** #22 [15 pts] Let $W$ be the number of women selected. The possible values for $W$ are 0, 1, or 2. We can compute the probability distribution of $W$ as

$$P(W = 0) = \frac{5}{7} \cdot \frac{4}{6} = \frac{10}{21}, \quad P(W = 1) = \frac{5}{7} \cdot \frac{2}{6} + \frac{2}{7} \cdot \frac{5}{6} = \frac{10}{21}, \quad P(W = 2) = \frac{2}{7} \cdot \frac{1}{6} = \frac{1}{21}.$$

Thus,

$$E(W) = 0 \times P(W = 0) + 1 \times P(W = 1) + 2 \times P(W = 2) = \frac{10}{21} + \frac{2}{21} = \frac{12}{21} \approx .5714.$$

**8.5** #34 [5 pts each] (a) Let $X$ be the amount of damage (in millions of dollars) under seeding and let $Y$ be the amount of damage (in millions of dollars) under not seeding. Then

$$E(X) = .038 \times 335.8 + .143 \times 191.1 + .392 \times 100 + .255 \times 46.7 + .172 \times 16.3 \approx 94.0,$$

and

$$E(Y) = .054 \times 335.8 + .206 \times 191.1 + .480 \times 100 + .206 \times 46.7 + .054 \times 16.3 \approx 116.0.$$

(b) The option to **seed** should therefore be chosen (since $94 < 116$).

**8.5** #48 [10 pts] Let $X$ be the expected payout (in \$) from the lottery. We easily compute $E(X)$ to be

$$E(X) = 100\,000 \times \frac{1}{2\,000\,000} + 40\,000 \times \frac{2}{2\,000\,000} + 10\,000 \times \frac{2}{2\,000\,000} = \frac{200\,000}{2\,000\,000} = 0.10.$$

Thus, since it costs 50¢ in time, paper, and stamps to enter, and your expected winnings are only 10¢, it is **not** worth entering the lottery. (On the average, you can expect to win −40¢!)