EXERCISES

1. The random variable x, defined below, gives the average grade of 12th grade students in U.S. high schools. The probability distribution for x is given in Table 20.11.

$$x = \begin{cases} 4, & \text{if A average} \\ 3, & \text{if B average} \\ 2, & \text{if C average} \\ 1, & \text{if D average} \end{cases}$$

x	1	2	3	4
$p(x)$	0.01	0.15	0.49	0.35

Table 20.11. Probability of grade averages.

a. Find $P(x \geq 3)$, the probability that a randomly selected student has a B or better average.

b. Find $P(x < 3)$, the probability that a randomly selected student has a below B average. How is this probability related to your answer to (a)?

c. Make a probability histogram for the distribution of x. What does your graphic display tell you about the distribution of average grades?

2. The U.S. government collects data on many variables having to do with households. Let x = the number of children under 15 in a household. The probability distribution for x is shown in Table 20.12.

x	0	1	2	3	4	5	6	7	8
$p(x)$	0.468	0.200	0.199	0.087	0.031	0.009	0.003	0.002	0.001

Table 20.12. Probability distribution for x.

a. What is the probability that a randomly selected household has at least one child under 15?

b. What is the probability that a randomly selected household has between two and four children under 15? In other words, find $P(2 \leq x \leq 4)$.

c. Draw a probability histogram that represents the probability distribution shown in Table 20.12. Describe the shape of the histogram.

d. What is the mean number of children under 15 per U.S. household? Show your calculations.

3. A DVD manufacturer receives certain components in lots of four from two different distributors. Let x and y represent the number of defective components in each lot from Distributor 1 and Distributor 2, respectively. The probability distributions for x and y are given in Tables 20.13.

x or y	p(x)	p(y)
0	0.40	0.15
1	0.33	0.70
2	0.18	0.15
3	0.05	0
4	0.04	0

Table 20.13. Probability distributions of x and y.

a. Draw probability histograms for the probability distributions of x and y (Table 20.13).

b. Find the mean number of defects in lots of four for both distributors. In other words, find the mean values of both x and y.

c. Find the standard deviations of x and y. Show your calculations.

d. Given the results in (b) and (c), which distributor should the DVD manufacturer rely on more heavily? Explain.

4. Assume that the distribution of weight for 7½-week old hens is normally distributed with mean 544 grams and standard deviation 49 grams. Let w = weight of a randomly selected hen.

a. Sketch normal density curve representing the distribution of w.

Use technology or the standard normal table to find the probabilities in (b) – (d). On a copy of the normal density curve that you sketched for (a), shade the area under the curve that represents each probability.

b. $P(w < 500)$

c. $P(w \geq 580)$

d. $P(500 \leq w \leq 580)$