1. **4.35** The random variable X, representing the number of errors per 100 lines of software code, has the following probability distribution:

x	2	3	4	5	6
$f(x)$	0.01	0.25	0.4	0.3	0.04

   Using Theorem 4.2 on page 121, find the variance of X.

2. **4.36** Suppose that the probabilities are $0.4, 0.3, 0.2,$ and 0.1, respectively, that $0, 1, 2,$ or 3 power failures will strike a certain subdivision in any given year.

   Find the mean and variance of the random variable X representing the number of power failures striking this subdivision.

3. **4.37** A dealer's profit, in units of \$5000, on a new automobile is a random variable X having the density function given in Exercise 4.12 on page 117.

   Find the variance of X.

4. **4.38** The proportion of people who respond to a certain mail-order solicitation is a random variable X having the density function given in Exercise 4.14 on page 117.

   Find the variance of X.

5. **4.43 (Bonus)** The length of time, in minutes, for an airplane to obtain clearance for takeoff at a certain airport is a random variable $Y = 3X - 2$, where X has the density function

$$f(x) = \begin{cases} \frac{1}{4}e^{-\frac{x}{4}}, & x > 0 \\ 0, & \text{elsewhere} \end{cases}$$

   Find the mean and variance of the random variable Y.

6. **4.50** For a laboratory assignment, if the equipment is working, the density function of the observed outcome X is

$$f(x) = \begin{cases} 2(1-x), & 0 < x < 1, \\ O, & \text{elsewhere} \end{cases}$$

   Find the variance and standard deviation of X.

7. **4.54** Using Theorem 4.5 and Corollary 4.6, find the mean and variance of the random variable $Z = 5X + 3$, where X has the probability distribution of Exercise 4.36 on page 127.

8. **4.71 (Bonus)** The length of time Y, in minutes, required to generate a human reflex to tear gas has the density function

$$f(y) = \begin{cases} \frac{1}{4}e^{-\frac{y}{4}}, & 0 \leq y < \infty \\ 0, & \text{elsewhere} \end{cases}$$

   (a) What is the mean time to reflex?

   (b) Find $E(Y^2)$ and $\text{var}(Y)$.

9. **4.101** Consider Review Exercise 3.73 on page 108. It involved Y, the proportion of impurities in a batch, and the density function is given by

$$f(y) = \begin{cases} 10(1-y)^9, & 0 \leq y < 1, \\ 0, & \text{elsewhere} \end{cases}$$

   (a) Find the expected percentage of impurities.

   (b) Find expected value of proportion of quality material, i.e., $E(1 - Y)$.

10. **4.62** If X and Y are independent random variables with variances $\sigma_X^2 = 5$ and $\sigma_Y^2 = 3$, find the variance of the random variable $Z = -2X + 4Y - 3$.

11. **4.63** Repeat Exercise 4.62 if X and Y are not independent and $\sigma_{XY} = 1$.

12. Let X and Y be random variables with the following information:

$$E(X) = 6, \quad E(Y) = -\frac{1}{2}, \quad \text{var}(X) = 4, \quad \text{var}(Y) = 6, \quad \text{cov}(X, Y) = 2$$

   (a) Compute $E(3X - 4Y)$
   (b) Compute $\text{var}(3X - 4Y)$
   (c) Compute $E(2X - Y^2)$

13. Let X and Y be independent random variables with the following information:

$$E(X) = -1, \quad E(Y) = 4, \quad \text{var}(X) = 6, \quad \text{var}(Y) = 8$$

   (a) Compute $E(9X + 2Y)$

   (b) Compute $\text{var}(9X + 2Y)$

14. **6.3** The daily amount of coffee, in liters, dispensed by a machine located in an airport lobby is a random variable X having a continuous uniform distribution with $A = 7$ and $B = 10$.

   Find the probability that on a given day the amount of coffee dispensed by this machine will be

   (a) at most 8.8 liters;

   (b) more than 7.4 liters but less than 9.5 liters;

   (c) at least 8.5 liters.

15. **6.4** A bus arrives every 10 minutes at a bus stop. It is assumed that the waiting time for a particular individual is a random variable with a continuous uniform

   (a) What is the probability that the individual waits more than 7 minutes?

   (b) What is the probability that the individual waits between 2 and 7 minutes?