4.33 Let F = event fire occurs and T_i = event a type i furnace is in the home for i = 1, 2, 3, 4, where T_4 represents other types.

$$P(T_1|F) = \frac{P(F|T_1)P(T_1)}{P(F|T_1)P(T_1) + P(F|T_2)P(T_2) + P(F|T_3)P(T_3) + P(F|T_4)P(T_4)}$$

$$= \frac{(0.05)(0.30)}{(0.05)(0.30) + (0.03)(0.25) + (0.02)(0.15) + (0.04)(0.30)} = 0.40$$

4.41

a. $P(y > 3) = 0.067 + 0.021 + 0.014 = 0.102$
b. $P(2 \le y < 5) = 0.354 + 0.161 + 0.067 = 0.582$
c. $P(y > 4) = 0.021 + 0.014 = 0.035$

4.45 Binomial experiment with y = number that over the legal limit, n = 15 and π = 0.20.

a. $P(y = 15) = 0.2^{15} = 3.28 \times 10^{-11} \approx 0$
b. $P(y = 6) = \binom{15}{6} 0.2^{6}(1 - 0.2)^{15-6} = 0.043$
c. $P(y \ge 6) = \sum \binom{15}{y} 0.2^{y}(1 - 0.2)^{15-y} = 0.061$
d. $P(y = 0) = 0.8^{15} = 0.035$

4.48 Binomial experiment with y = number contracting infection, n = 50 and π = 0.1.

a. $P(y \ge 5) = \sum_{x=5}^{50} \binom{50}{y} 0.1^{y}(1 - 0.1)^{50-y} = 0.5688$ (using technology)
b. Infection after a one-week stay occurs with the same probability (0.1) for each individual and the occurrences of the infection are independent among individuals.

4.50 Assume y is Poisson with μ = 6

a. $P(y = 0) = 0.0025$
b. $P(y > 6) = 0.3937$
c. $P(y \le 3) = 0.1512$

4.52 $P(y \ge 1) = 1 - P(y = 0) = 1 - (0.9999)^{5000} = 0.3935$

We need to assume that outcomes of births are independent.

4.66 y is Normally distributed with μ=250 and σ=10

a. $y < 260 \Rightarrow \frac{y-250}{10} < \frac{260-250}{10} \Longrightarrow z < 1$

b. $y > 230 \Rightarrow \frac{y-230}{10} > \frac{230-250}{10} \Longrightarrow z > -2$

c. $P(y < 260) = P(z < 1) = 0.8413$ and $P(y > 230) = P(z > -2) = 0.9972$

d. $P(y > 265) = P\left(z > \frac{265-250}{10}\right) = P(z > 1.5) = 0.0668$

$$P(y < 242) = P\left(z < \frac{242-250}{10}\right) = P(z < -0.8) = 0.2119$$

$$\begin{aligned} P(242 < y < 265) &= 1 - P(y > 265) - P(y < 242) \\ &= 1 - 0.0668 - 0.2119 = 0.7213 \end{aligned}$$

4.70

a. $P(y > 600) = P\left(z > \dfrac{600-500}{100}\right) = P(z > 1.0) = 0.1587$

b. $P(y > 700) = P\left(z > \dfrac{700-500}{100}\right) = P(z > 2.0) = 0.0228$

c. $P(y < 450) = P\left(z < \dfrac{450-500}{100}\right) = P(z < -0.50) = 0.3085$

d. $P(450 < y < 600) = P\left(\dfrac{450-500}{100} < z < \dfrac{600-500}{100}\right) = P(-0.5 < z < 1.0) = 0.5328$