3-10. The possible totals for two orders are 1/8 + 1/8 = 1/4, 1/8 + 1/4 = 3/8, 1/8 + 3/8 = 1/2, 1/4 + 1/4 = 1/2, 1/4 + 3/8 = 5/8, 3/8 + 3/8 = 6/8.

Therefore the range of X is $\left\{\frac{1}{4}, \frac{3}{8}, \frac{1}{2}, \frac{5}{8}, \frac{6}{8}\right\}$

3-18. Probabilities are nonnegative and sum to one.

a) $P(X = 2) = 3/4(1/4)^2 = 3/64$

b) $P(X \le 2) = 3/4[1+1/4+(1/4)^2] = 63/64$

c) $P(X > 2) = 1 - P(X \le 2) = 1/64$

d) $P(X \ge 1) = 1 - P(X \le 0) = 1 - (3/4) = 1/4$

3-26. X = number of components that meet specifications

$P(X=0) = (0.05)(0.02) = 0.001$

$P(X=1) = (0.05)(0.98) + (0.95)(0.02) = 0.068$

$P(X=2) = (0.95)(0.98) = 0.931$

3-36. The sum of the probabilities is 1 and all probabilities are greater than or equal to zero; pmf: $f(1) = 0.7$, $f(4) = 0.2$, $f(7) = 0.1$

a) $P(X \le 4) = 0.9$

b) $P(X > 7) = 0$

c) $P(X \le 5) = 0.9$

d) $P(X>4) = 0.1$

e) $P(X\le 2) = 0.7$

3-46. Mean and variance for exercise 3-20

$$\begin{aligned}
\mu &= E(X) = 0f(0) + 1f(1) + 2f(2) + 3f(3) \\
&= 0(8\times 10^{-6}) + 1(0.0012) + 2(0.0576) + 3(0.9412) \\
&= 2.940008
\end{aligned}$$

$$\begin{aligned}
V(X) &= 0^2 f(0) + 1^2 f(1) + 2^2 f(2) + 3^2 f(3) - \mu^2 \\
&= 0.05876096
\end{aligned}$$

3-50. $\mu = E(X) = 350*0.06 + 450*0.1 + 550*0.47 + 650*0.37 = 565$

$V(X) = \sum_{i=1}^{4} f(x_i)(x-\mu)^2 = 6875$

$\sigma = \sqrt{V(X)} = 82.92$

3-59. The range of Y is 0, 5, 10, ..., 45, $E(X) = (0+9)/2 = 4.5$

$$\begin{aligned}
E(Y) &= 0(1/10) + 5(1/10) + ... + 45(1/10) \\
&= 5[0(0.1) + 1(0.1) + ... + 9(0.1)] \\
&= 5E(X) \\
&= 5(4.5) \\
&= 22.5
\end{aligned}$$

$V(X) = 8.25$, $V(Y) = 5^2(8.25) = 206.25$, $\sigma_Y = 14.36$

3-68. $n = 3$ and $p = 0.5$

$$F(x) = \begin{cases} 0 & x < 0 \\ 0.125 & 0 \le x < 1 \\ 0.5 & 1 \le x < 2 \\ 0.875 & 2 \le x < 3 \\ 1 & 3 \le x \end{cases} \quad \text{where} \quad \begin{aligned} f(0) &= \left(\frac{1}{2}\right)^3 = \frac{1}{8} \\ f(1) &= 3\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^2 = \frac{3}{8} \\ f(2) &= 3\left(\frac{1}{4}\right)^2\left(\frac{3}{4}\right) = \frac{3}{8} \\ f(3) &= \left(\frac{1}{4}\right)^3 = \frac{1}{8} \end{aligned}$$

3-76. $n = 20$, $p = 0.13$

(a) $P(X = 3) = \binom{20}{3} p^3 (1-p)^{17} = 0.235$

(b) $P(X \ge 3) = 1 - P(X < 3) = 0.492$

(c) $\mu = E(X) = np = 20 * 0.13 = 2.6$

$V(X) = np(1 - p) = 2.262$

$\sigma = \sqrt{V(X)} = 1.504$