S4.2-4: Let X be the length of the side of a randomly chosen plastic die manufactured by the factory, then $\mathbb{P}(X^3 > 1.424) = \mathbb{P}(X > 1.125) = \frac{1.25-1.125}{1.25-1} = 1/2$.

S4.2-6 Let F be the distribution function of X. Then

$$F(t) = \begin{cases} 0 & t < 0 \\ 1/8 & 0 \leq t < 1 \\ 1/2 & 1 \leq t < 2 \\ 7/8 & 2 \leq t < 3 \\ 1 & t \geq 3. \end{cases}$$

S4.3-4: Let p be the probability mass function of X. We have

x	-2	2	4	6
$p(x)$	1/2	1/10	13/45	1/9

S4.3-8: Let p be the probability mass function of X, then

$$p(i) = \mathbb{P}(X = i) = \frac{\binom{18}{i}\binom{28}{12-i}}{\binom{46}{12}}, \quad i = 0, 1, 2, ..., 12.$$

S4.4-6: The expected number of defective items is

$$\sum_{i=0}^{3} i \cdot \frac{\binom{5}{i}\binom{15}{3-i}}{\binom{20}{53}} = 3/4.$$

S4.4-12: $\mathbb{E}(X) = \sum_{i=1}^{10} i \cdot \frac{1}{10} = 11/2$ and $\mathbb{E}(X^2) = \sum_{i=1}^{10} i^2 \cdot \frac{1}{10} = 77/2$. So $\mathbb{E}(X(11-X)) = \mathbb{E}(11X - X^2) = 11 \cdot \mathbb{E}\,X - \mathbb{E}\,X^2 = 22$.

S4.5-4: The probability mass function of X is given by

x	-3	0	6
$p(x)$	3/8	3/8	2/8

Thus $\mathbb{E}(X) = (-3)\cdot\frac{3}{8} + 0\cdot\frac{3}{8} + 6\cdot\frac{2}{8} = 3/8$, $\mathbb{E}(X^2) = (-3)^2\cdot\frac{3}{8} + 0^2\cdot\frac{3}{8} + 6^2\cdot\frac{2}{8} = \frac{99}{8}$, $\text{Var}(X) = \mathbb{E}\,X^2 - (\mathbb{E}\,X)^2 = \frac{99}{8} - \frac{9}{64} = \frac{783}{64} = 12.234$, $\text{SD}(X) = \sqrt{\text{Var}(X)} = 3.498$.

S4.5-8: Let X be Harry's net gain. Then

$$X = \begin{cases} -2 & \text{with probability } 1/8 \\ 0.25 & \text{with probability } 3/8 \\ 0.50 & \text{with probability } 3/8 \\ 0.75 & \text{with probability } 1/8. \end{cases}$$

Thus $\mathbb{E}(X) = (-2)\cdot\frac{1}{8} + 0.25\cdot\frac{3}{8} + 0.50\cdot\frac{3}{8} + 0.75\cdot\frac{1}{8} = 0.125$, $\mathbb{E}(X^2) = (-2)^2\cdot\frac{1}{8} + 0.25^2\cdot\frac{3}{8} + 0.50^2\cdot\frac{3}{8} + 0.75^2\cdot\frac{1}{8} = 0.6875$. These show that the expected value of Harry's net gain is 12.5 cents. Its variance is $\text{Var}(X) = 0.6875 - 0.1252 = 0.671875$.

S4.6-2: Let X be the final grade comparable to Velma's 82 in the midterm. We must have

$$\frac{82-72}{12} = \frac{X-68}{15}.$$

This gives $X = 80.5$.

R4-6: (a). $1 - F(6) = 5/36$. (b). $F(9) = 76/81$. (c). $F(7) - F(2) = 44/49$.

R4-10: Let p be the probability mass function, and F be the distribution function of X. We have $p(0) = p(3) = \frac{1}{8}$, $p(1) = p(2) = \frac{3}{8}$, and

$$F(t) = \begin{cases} 0 & t < 0 \\ 1/8 & 0 \le t < 1 \\ 4/8 & 1 \le t < 2 \\ 7/8 & 2 \le t < 3 \\ 1 & t \ge 3. \end{cases}$$