Problem #23, p. 230: Let \( T_n \) be the game on which the better team wins its \( n \)th game. Then, in first case, the better team wins the series on the \( i \) game if and only if \( T_4 = i \) and \( 4 \leq i \leq 7 \), in which case the probability that it does so is \( \Pr(T_4 = i) = \binom{1}{3}(.6)^3(.4)^{i-4} \). In particular, the probability that the stronger team wins is \( \sum_{i=4}^{7} \binom{1}{3}(.6)^3(.4)^{i-4} \). In the second case one should calculate \( \Pr(T_2 = i) = \binom{1}{2}(.6)^2(.4)^{i-2} \) for \( i \in \{2,3\} \) and conclude that, in this case, the stronger team wins with probability \( \sum_{i=2}^{3} \binom{1}{2}(.6)^2(.4)^{i-2} \).

Problem #5, p. 228: We are looking for \( x \in (0,1) \) so that

\[
.01 = 5 \int_{x}^{1} (1-t)^4 \, dt = (1-x)^5.
\]

Equivalently, \( 1 - x = (0.1)^{\frac{1}{5}} \), and so \( x = 1 - (0.1)^{\frac{1}{5}} \).

Problem #10, p. 229: In both cases, out of each fifteen minute period, there are ten minutes during which the it will take train \( A \): in case (a), the initial five minutes in each period, and, in case (b), the middle five minute period. Hence, in both cases, the probability of taking train \( A \) is \( \frac{2}{5} \).

Problem #15, p. 229: Let \( X_0 \) be a standard, normal random variable.

(a) \( \Pr(X > 5) = \Pr(6X_0 + 10 > 5) = \Pr(X_0 > -\frac{5}{6}) \Pr(X_0 < \frac{5}{6}) \approx .7976 \).

(b) \( \Pr(4 < X < 16) = \Pr(X < 16) - \Pr(X < 4) = \Pr(X_0 < 1) - \Pr(X_0 < -1) = \Pr(X_0 < 1) - \Pr(X_0 > 1) = 2\Pr(X_0 < 1) - 1 \approx .6824 \).

(c) \( \Pr(X < 8) = \Pr(X_0 < -\frac{4}{6}) = \Pr(X_0 > \frac{4}{6}) = 1 - \Pr(X_0 \leq \frac{4}{6}) \approx .3694 \).

(d) \( \Pr(X < 20) = \Pr(X_0 < \frac{2}{6}) \approx .9521 \).

(e) \( \Pr(X > 16) = \Pr(X_0 > 1) = 1 - \Pr(X_0 \leq 1) \approx .1587 \).

Problem #23, p. 230: Let \( X_0 \) be a standard, normal random variable, and let \( N_6 \) be the number of 6’s which occur in \( 10^4 \) rolls. Then, by the C.L.T.,

\[
\Pr \left( \frac{150 - 10^3}{\sqrt{10^3 \times \frac{5}{36}}} \leq \frac{N_6 - 10^3}{\sqrt{10^3 \times \frac{5}{36}}} \leq \frac{200 - 10^3}{\sqrt{10^3 \times \frac{5}{36}}} \right) \approx \Pr \left( \frac{150 - 10^3}{\sqrt{10^3 \times \frac{5}{36}}} \leq X_0 \leq \frac{200 - 10^3}{\sqrt{10^3 \times \frac{5}{36}}} \right)
\]

\[
= \Pr(-2\sqrt{.5} \leq X_0 \leq 4\sqrt{.5}) = \Pr(X_0 \leq 4\sqrt{.5}) + \Pr(X_0 \leq 2\sqrt{.5}) - 1.
\]

Given that \( N_6 = 200 \), the conditional probability that \( N_5 \leq 150 \) is the same as the probability that a five sided die comes up 5 on 150 out of 800 rolls. Thus, by the C.L.T., this conditional probability is approximately

\[
\Pr \left( X_0 \leq \frac{150 - \frac{800}{8}}{\sqrt{800 \times \frac{5}{8}}} \right) = \Pr \left( X_0 < -\frac{5\sqrt{2}}{8} \right) = 1 - \Pr \left( X_0 < \frac{5\sqrt{2}}{8} \right).
\]