Solutions

1. (a) (2 points) What is $B(4; 10, 0.3)$?

**Solution:** $B(4; 10, 0.3) = 0.8497$

(b) (3 points) What is the probability of getting at least three successes in seven trials with a probability of success of 0.45?

**Solution:** The opposite of at least three successes is at most two successes, so

$$\Pr(\text{At least three successes}) = 1 - \Pr(\text{At most two successes})$$

$$= 1 - B(2; 7, 0.45)$$

$$= 1 - 0.3164$$

$$= 0.6836.$$  

(c) (3 points) What is the probability of getting at least three successes in twelve trials with a probability of success of 0.6?

**Solution:** At least three successes is the same as at most nine failures. Since the probability of failure is $1 - 0.6 = 0.4$,

$$\Pr(\text{At least three successes}) = \Pr(\text{At most nine failure})$$

$$= B(9; 12, 0.4)$$

$$= 0.9972.$$
2. (a) Let $Z$ be a standard normal random variable, with $\mu = 0$ and $\sigma = 1$.
   i. (1 point) What is $\Pr(Z \leq 1)$?

   **Solution:** $\Pr(Z \leq 1) = 0.8413$

   ii. (3 points) What is $\Pr(-1 \leq Z \leq 2.5)$?

   **Solution:**
   
   $$
   \Pr(-1 \leq Z \leq 2.5) = \Pr(Z \leq 2.5) - \Pr(Z \leq -1) \\
   = 0.9938 - 0.1587 \\
   = 0.8361.
   $$

(b) (3 points) Let $X$ be a normal random variable with $\mu = 1$ and $\sigma = 0.5$. What is $\Pr(X > 2.5)$?

   **Solution:**
   
   $$
   \Pr(X > 2.5) = 1 - \Pr(X \leq 2.5) \\
   = 1 - \Pr \left( \frac{X - 1}{0.5} \leq \frac{2.5 - 1}{0.5} \right) \\
   = 1 - \Pr \left( Z \leq \frac{1.5}{0.5} \right) \\
   = 1 - \Pr(Z \leq 3) \\
   = 1 - 0.9987 \\
   = 0.0013
   $$