1. For coin A, the probability of landing on a head is equal to $\frac{1}{4}$ and the probability of landing on a tail is equal to $\frac{3}{4}$; coin B is a fair coin. Each coin is flipped 5 times. Let the random variable $X$ denote the number of heads resulting from coin A, and $Y$ denote the number of heads from coin B.
   a) What is the probability that $X = Y = 2$?
   b) What is the probability that $X = Y$?
   c) What is the probability that $X > Y$?
   d) What is the probability that $X + 5 \leq 5$?

2. $X$ is a Gaussian random variable with mean 4 and variance 9, i.e., $X \sim N(4, 9)$. Determine
   a) $P(X > 7)$
   b) $P(0 < X < 9)$

3. Two random variables $X$ and $Y$ are distributed according to
   
   $f_{X,Y}(x,y) = \begin{cases} 
   k(x+y) & 0 \leq x, y \leq 1 \\
   0 & \text{otherwise}
   \end{cases}$

   a) Find $k$
   b) What is $P(X + Y > 1)$?
   c) Find $P(X > Y)$
   d) Find $P(X > Y | X + 2Y > 1)$?
   e) Find $P(X = Y)$
   f) What is $P(X > 0.5 | X = Y)$
   g) Find $f_X(x)$ and $f_Y(y)$
   h) Find $f_X(x | X + 2Y > 1)$ and $E[X | X + 2Y > 1]$

4. Let $\Theta$ be uniformly distributed on $[0, \pi]$, and let the random variables $X$ and $Y$ be defined by $X = \cos(\Theta)$ and $Y = \sin(\Theta)$. Show that $X$ and $Y$ are uncorrelated, but not independent.

5. Let $X$ and $Y$ be independent Gaussian random variables, each distributed according to $N(0, \sigma^2)$. Define $Z = X + Y$ and $W = 2X - Y$. What is the joint PDF of $Z$ and $W$? What is the covariance of $Z$ and $W$?

6. Let the random process $X(t)$ be defined by $X(t) = A + Bt$ where $A$ and $B$ are independent random variables, each uniformly distributed on $(-1, 1)$. Find $R_X(t_1, t_2)$ and $E[X(t)]$. Is $X(t)$ WSS?

7. Haykin, Problem 1.3.

8. Haykin, Problem 1.4. (Check for WSS. If a Gaussian Process is WSS $\Rightarrow$ it is SSS)