1. SW, Chapter 2, 2.1
   a) Prob. distribution of \( Y \)

   | Outcome (\# of heads) | \( Y = 0 \) | \( Y = 1 \) | \( Y = 2 \) |
   | Probability           | 0.25       | 0.5        | 0.25       |

   b) Cumulative prob. distribution of \( Y \)

   | Outcome (\# of heads) | \( Y < 1 \) | \( Y \leq 2 \) |
   | Probability           | 0          | 0.75       |

   c) \( \mu_Y = E(Y) = \text{weighted average} = 0.25(Y=0) + 0.5(Y=1) + 0.25(Y=2) = 1.00 \)

   \[ \text{Var}(Y) = E[(Y - \mu_Y)^2] = 0.25(0-1)^2 + 0.5(1-1)^2 + 0.25(2-1)^2 = 0.50 \]

2. SW, Chapter 2, 2.4
   a) \( E(Y) = P_r(Y=1) \times 1 = 0.954 \)

   b) UE Rate = \( \frac{\text{Unemployed}}{\text{Active force}} = P_r(Y=0) = 1 - P_r(Y=1) = 1 - 0.954 = 0.046 \)

   c) \( E(Y|X=1) = 0 \times P_r(Y=0|X=1) + 1 \times P_r(Y=1|X=1) = \frac{P_r(Y=1|X=1)}{P_r(X=1)} = \frac{0.332}{0.241} = 0.944 \)

   \[ E(Y|X=0) = 0 \times P_r(Y=0|X=0) + 1 \times P_r(Y=1|X=0) = \frac{P_r(Y=1|X=0)}{P_r(X=0)} = \frac{0.624}{0.659} = 0.944 \]

   d) UE Rate | College Grad (X=1) \( \Rightarrow 1 - E(Y|X=1) = 1 - 0.944 = 0.056 \)
e) Randomly selected number is unemployed \( (Y=0) \).
\[
\Pr(X=1|Y=0) = \frac{\Pr(X=1, Y=0)}{\Pr(Y=0)} = \frac{0.009}{0.046} = 0.196
\]
\[
\Pr(X>0|Y=0) = 1 - \Pr(X=1|Y=0) = 1 - 0.196 = 0.804
\]

f) Are \( X \) & \( Y \) independent?
\[
\Pr(X=x|Y=y) = \Pr(X=x)
\]
\[
\Pr(X=0|Y=0) = 0.804 \neq \Pr(X=0) = 0.659
\]
Non-independent

3.据SW，Chapter 2, 2.10
a) \( N(1,4), \Pr(Y \leq 3) \)
\[
\Pr(Y \leq 3) = \Pr(\frac{Y-1}{\sqrt{4}} \leq \frac{3 - 1}{\sqrt{4}}) = \Pr(z \leq 1) = \Phi(1) = 0.8413
\]

b) \( N(3,9), \Pr(Y \geq 0) \)
\[
\Pr(Y \geq 0) = \Pr\left(\frac{Y-3}{\sqrt{9}} > \frac{0 - 3}{\sqrt{9}}\right) = \Pr(z > -1) = 1 - \Pr(z < -1) = 0.8413
\]

c) \( N(5,2), \Pr(6 \leq Y \leq 8) \)
\[
\Pr(6 \leq Y \leq 8) = \Pr\left(\frac{6 - 5}{\sqrt{2}} \leq \frac{Y-5}{\sqrt{2}} \leq \frac{8 - 5}{\sqrt{2}}\right) = \Phi(2.121) - \Phi(0.7071) = 0.9831 - 0.7602 = 0.2229
\]

4.据SW，Chapter 2, 2.18
a) \( EY = 0 \times \Pr(Y=0) + 20000 \times \Pr(Y=20000) = 20000 \times 0.05 = 1000 \)
\( b) \ n = 100 \)

1) \( E(\bar{Y}) = \mu = 1000 \)
\( \sigma^2 = \frac{\sigma^2}{n} = \frac{43}{100} = 0.43 \)

\( i) \ P_r(\bar{Y} > 2000) = 1 - P_r(\bar{Y} \leq 2000) = 1 - P_r \left( \frac{\bar{Y} - 1000}{\sqrt{n} \sigma^2} \geq \frac{2000 - 1000}{\sqrt{n} \sigma^2} \right) = 1 - \Phi \left( \frac{2000 - 1000}{\sqrt{0.43}} \right) = 1 - 0.9891 = 0.0109 \)

5. Sw, Chapter 3, 3.1

\( \mu = 1000 \quad \sigma^2 = 43 \)

\( a) \ n = 100, \quad \sigma^2 = 43/100 = 0.43 \)

\( P_r(\bar{Y} \leq 101) = P_r \left( \frac{\bar{Y} - 100}{\sqrt{0.43}} \leq \frac{101 - 100}{\sqrt{0.43}} \right) = \Phi \left( \frac{101 - 100}{\sqrt{0.43}} \right) = 0.9364 \)

\( b) n = 165, \quad \sigma^2 = 43/165 = 0.2606 \)

\( P_r(\bar{Y} \geq 98) = 1 - P_r(\bar{Y} \leq 98) = 1 - P_r \left( \frac{\bar{Y} - 100}{\sqrt{0.2606}} \leq \frac{98 - 100}{\sqrt{0.2606}} \right) = 1 - \Phi \left( \frac{98 - 100}{\sqrt{0.2606}} \right) = 1 - 0.00 \)

\( c) n = 64, \quad \sigma^2 = 43/64 = 0.6719 \)

\( P_r(101 \leq \bar{Y} \leq 103) = P_r \left( \frac{101 - 100}{\sqrt{0.6719}} \leq \frac{\bar{Y} - 100}{\sqrt{0.6719}} \leq \frac{103 - 100}{\sqrt{0.6719}} \right) = \Phi \left( 3.6599 \right) - \Phi \left( 1.2200 \right) = 1 - 0.8888 = 0.1111 \)
6. SW, Chapter 3, 3.6
a) P-value = 0.03 \Rightarrow \text{Reject } \mu = 5 \text{ at 5\% level } \Rightarrow \text{not in 95\% CI}

b) In order to determine whether \mu = 6 is in CI, we need \overline{Y} and SE(\overline{Y}). We only have the p-value for \mu = 5.

7. SW, Chapter 3, 3.7
Ho: Survey is random drawn with p = 0.11

\[ t = \frac{\hat{p} - 0.11}{\text{SE}(\hat{p})} \]
\[ \text{SE}(\hat{p}) = \frac{\hat{p}(1-\hat{p})}{\sqrt{n}} = \frac{0.11(1-0.11)}{100} \]
\[ t = 2.71 \Rightarrow \text{p-value < 0.01. Reject that survey is unbiased.} \]