1. A discrete r.v. has a set of possible values with gaps. A continuous r.v. has a set of possible values on an unbroken interval.

2. \( A = \{ \text{rain} \} \) \( B = \{ \text{over 65} \} \)
   (a) \( P(A \cup B) = P(A) + P(B) - P(A \cap B) \)
       \( = 0.4 + 0.35 - 0.15 = 0.6 \)
   (b) Need \( 1 - P(A \cup B) = 1 - 0.6 = 0.4 \)
   (c) \( P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{0.15}{0.4} = \frac{3}{8} \)
   (d) \( P(B|A) = 0.375 \), but \( P(B) = 0.35 \). Since \( P(B|A) \neq P(B) \), \( A \) and \( B \) are not independent.

3. About \( 80 + 190 = 270 \) measurements are under 100 grams, based on the histogram. \( \frac{270}{578} = 0.467 \) (anything near this is fine).
   (b) Skewed to the right (long right tail)
   (c) \( A \) Less than the mean

4. Since \( A \) and \( B \) are independent,
   \( P(A \cap B) = P(A)P(B) = (0.2)(0.7) = 0.14 \)
   \( \Rightarrow P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.2 + 0.7 - 0.14 = 0.76 \)
   \( P(A|B) = P(A) = 0.2 \) by independence.

5. \( X \) is binomial with \( n=9 \), \( p=0.6 \)
   (a) \( P(X \geq 5) = 1 - P(X \leq 4) = 1 - 0.267 = 0.733 \)
   (b) \( P(X < 2) = P(X \leq 1) = 0.004 \)
   (c) \( P(X=8) = P(X \leq 8) - P(X \leq 7) = 0.990 - 0.929 = 0.061 \)
   (d) \( \mu = np = (9)(0.6) = 5.4 \)
6. (A) (B) a) $\sum p(x) = 0.1 + 0.3 + 0.35 + 0.2 + 0.05 = 1$
   and all $p(x) \geq 0$. \underline{Valid}.
   
   (b) $\mu = (0)(.1) + (1)(.3) + (2)(.35) + (3)(.2) + (4)(.05)$
   $= .3 + .7 + .6 + .2 = 1.8$
   
   (C) $\sigma^2 = 0^2(.1) + 1^2(.3) + 2^2(.35) + 3^2(.2) + 4^2(.05) - (1.8)^2$
   $= 4.3 - 3.24 = 1.06$
   $\Rightarrow \sigma = \sqrt{1.06} = 1.0296$

7. (A) (B) Since $A \cup A^c$ is the whole sample space, $P(A \cup A^c) = 1$.

8. (A) (B) Hypergeometric with $N = 20$, $n = 4$, $r = 6$.

   $P(X > 2) = P(X = 3) + P(X = 4) = \binom{6}{3} \binom{14}{1} + \binom{6}{4} \binom{14}{0}$
   \[= \binom{20}{4} + \binom{20}{4} \binom{14}{0} \]

9. (A) (B) (a) $0.21 + 0.35 = 0.56$
   (b) $1 - 0.26 = 0.74$

10. Use Bayes Rule. Let $A = \{\text{defective}\}$, $B = \{\text{Houston}\}$

    $P(B|A) = \frac{P(A|B)P(B)}{P(A|B)P(B) + P(A|B^c)P(B^c)}$
    $= \frac{(0.02)(0.7)}{(0.02)(0.7) + (0.04)(0.3)} = \frac{0.14}{0.26} = 0.538$

11. $X \sim \text{Poisson} (\lambda = 2.6)$

   a) $P(X = 4) = P(X \leq 4) - P(X \leq 3) = 0.877 - 0.736 = 0.141$

   b) $P(X \geq 3) = 1 - P(X \leq 2) = 1 - 0.518 = 0.482$

   c) Let $X \sim \text{Poisson} (2.6)$

   Extra Credit: Now $\lambda = 5.2 \Rightarrow W \sim \text{Poisson} (5.2)$

   $P(W < 5) = P(W \leq 4) = 0.406$