1. Two fair dice are rolled. Of the 36 equally likely outcomes, 15 result in a score greater than 7: (2,6), (3,6), (4,6), (5,6), (6,6), (3,5), (4,5), (5,5), (6,5), (4,4), (5,4), (6,4), (5,3), (6,3), (6,2). Five of these result in a score of 8. The probability that \( A = \) "the sum is 8" given that \( B = \) "the sum is greater than 7" is \( P(A \cap B)/P(B) = P(A)/P(B) = (5/36)/(15/36) = 5/15 = 1/3."

2. \( S = \{GGG, GGB, GBG, GBB, BGG, BGB, BBG, BBB\} \). The probability that only one is a girl given that at least one is a girl is \((3/8)/(7/8) = 3/7.\)

3. Using the tree diagram, the probability that the offspring will have red flowers is \((.2)(1) + (.8)(.5) = .2 + .4 = .6.\) By Bayes formula, the probability that the plant picked was CC given that the offspring was red is \((.2)(1)/[(.2)(1) + (.8)(.5)] = .2/.6 = 1/3 = .333....\)

4. \( P(A) = P(1) + P(2) + P(5) = .2 + .1 + .1 = .4; \) similarly \( P(B) = .1 + .2 + .1 = .4. \) Then \( P(A \cap B) = P(\{2, 5\}) = .2 \neq P(A)P(B) = .16. \) Thus \( A \) and \( B \) are not independent.

5. \( P(A) = 3/12 = 1/4 = P(B), \) but \( P(A \cap B) = \frac{2}{11} \neq P(A)P(B), \) so \( A \) and \( B \) are not independent (or the same conclusion follows from \( P(B|A) = \frac{2}{11} \neq P(B) \)). If the first ball is put back before the second ball is drawn, \( P(B|A) = \frac{3}{12} = P(B) \) so \( A \) and \( B \) are independent.

6. \( E(X) = 0 \cdot .4 + 1 \cdot .4 + 2 \cdot .2 = .8, \) \( E(X^2) = 0^2 \cdot .4 + 1^2 \cdot .4 + 2^2 \cdot .2 = 0 \cdot .4 + 1 \cdot .4 + 4 \cdot .2 = 1.2, \) so \( \text{Var}(X) = E(X^2) - E(X)^2 = 1.2 - .64 = .56. \) \( E(2X + 1) = 2E(X) + 1 = 2.6 \) and \( \text{Var}(2X + 1) = 4\text{Var}(X) = 2.24. \)

7. Let \( \int_0^3 kx \, dx = kx^2/2\big|_0^3 = 9k/2 = 1 \) if \( k = 2/9. \)

\( P(0 \leq X \leq 1) = \int_0^1 \frac{3}{2}x \, dx = \frac{1}{6}x^2\big|_0^1 = \frac{1}{6}. \)

\( E(X) = \int_0^3 \frac{3}{2}x \, dx = \int_0^3 \frac{3}{2}x^2 \, dx = \frac{2}{27}x^3\big|_0^3 = 2, \)

\( E(X^2) = \int_0^3 \frac{3}{2}x^2 \, dx = \int_0^3 \frac{3}{2}x^3 \, dx = \frac{1}{18}x^4\big|_0^3 = \frac{9}{2}, \) and so

\( \text{Var}(X) = E(X^2) - E(X)^2 = \frac{9}{2} - 4 = \frac{1}{2}. \)

8. If \( X \) has a normal distribution with mean 2 and standard deviation 3, then \( Z = (X - 2)/3 \) has the standard normal distribution. \( X < 8 \) if \( Z < (8 - 2)/3 = 2. \) So \( P(-\infty < X < 8) = P(-\infty < Z < 2) = .9772 \) (from the given table).