Homework 2
Due Thursday, September 18

1. Find $E(Y)$ and $\text{Var}(Y)$ for the data given on page 3 of Lecture 2.

2. Let Y be the life length of a new drug (in years), with the following probabilities:

Y	3	4	5	6	7	8	9	10	11	12	13
$P(Y=y)$	0.03	0.05	0.07	0.10	0.14	0.20	0.18	0.12	0.07	0.03	0.01

   (a) Find $P(Y \le 4)$, $P(Y > 10)$, $P(4 < Y \le 10)$.

   (b) Find the expected life length of a new drug.

   (c) Find the standard deviation of Y.

3. A single fair die is tossed once. Let Y be the number facing up. Find the expected value and variance of Y.

4. Suppose that a random variable Y has the probability function

$$P(Y = y) = \frac{1}{(y+1)(y+2)}, \quad y = 0, 1, 2, \ldots$$

   Find (a) $P(Y = 4)$, (b) $P(Y < 3)$, (c) $P(Y \ge 1)$.

5. Consider a random variable Y with the probability function

$$P(Y = y) = (1 - p)^{y-1}p, \quad y = 1, 2, \ldots$$

   where $0 \le p \le 1$. If $p = 1/3$, find (a) $P(Y = 4)$, (b) $P(Y \le 3)$, (c) $P(Y > 10)$,
   (d) $P(3 \le Y < 10)$. (HINT: Use of the geometric series from Calculus 2 may be useful).

6. Consider $Y \sim \text{Binomial}(10, 0.2)$. Find (a) $P(Y = 5)$, (b) $P(Y \le 2)$, (c) $P(3 < Y \le 6)$.
   Please write out your answers in terms of appropriate probability functions.

7. Repeat the previous problem using R, providing the codes and numerical answers.

8. The probability that a patient recovers from a stomach disease is 0.7. Suppose 10 people are
   known to have contracted this disease. What is the probability that

   (a) exactly 4 recover?

   (b) at least 3 recover?

   (c) at least 5 but not more than 7 recover?

   (d) at most 8 recover?

   (Which probability distribution should you assume?)

9. Let $Y \sim$ Poisson(2). Find (a) $P(Y = 4)$, (b) $P(Y < 3)$, (c) $P(Y \geq 2)$. Please write out your answers in terms of appropriate probability functions.

10. Repeat the previous problem using R, providing the codes and numerical answers.

11. The monthly worldwide average number of airplane crashes of commercial airlines is 3.5. What is the probability that there will be

    (a) at least 2 such accidents in the next month?
    (b) at most 1 accident in the next month?

    Assume Poisson distribution.