1) A bag contains 5 red and 10 black marbles. (4 decimal places)
   a) If we randomly pick 3 marbles out of the bag (without replacement),
      then find the probability that exactly 2 are red.
   b) If we randomly pick 3 marbles out of the bag (with replacement),
      then find the probability that exactly 2 are red.

2) Martians lay eggs. Only 14% of Martian eggs hatch as female (independent of anything else). If a Martian
   lays 12 eggs; (4 decimal places)
   a) On average, how many of them would we expect to be female?
   b) What would the standard deviation be?
   c) Find the probability that none are female.
   d) Find the probability that exactly 2 are female.
   e) Find the probability that more than 2 are female.

3) If a fair six-sided die is rolled 90 times, and the number of 1’s is recorded. (4 decimal places)
   a) Find the expected number of 1’s.
   b) What would the standard deviation be?
   c) Find the probability that we get 15 ones.

4) For what value of c would \( f(x) = c(2x + 5) \) \( 1 \leq x \leq 3 \) be a (continuous) probability density function?
   Answer in fraction form if necessary.

5) For what value of c would \( f(x) = \frac{2x+1}{30} \) \( 0 \leq x \leq c \) be a (continuous) probability density function?
   Answer in fraction form if necessary.
6) Given the continuous probability density function 
\[ f(x) = \frac{1}{5}, \quad 1 \leq x \leq 6 \]

Answer each of the following in FRACTION FORM.

a) Find the probability that \( x \) is less than 1.

b) Find the probability that \( x \) is less than 4.

c) Find the probability that \( x \) is greater than or equal to 4.

d) Find the probability that \( x \) is 4.

e) Find the cumulative distribution function.

7) Given the continuous probability density function 
\[ f(x) = \frac{x + 2}{70}, \quad 0 \leq x \leq 10 \]

Answer each of the following in FRACTION FORM.

a) Find \( P(x < 3) \).

b) Find \( P(2 < x \leq 4) \).

c) Find \( P(8 < x \leq 12) \).

d) Find \( P(x = 5) \).

e) Find the cumulative distribution function.
1a) .2198   b) .2222
2a) 1.68   b) 1.2020   c) .1637   d) .2863   e) .2303
3a) 15   b) 3.5355   c) .1122
4) $1 / 18$
5) 5

6a) 0   b) $3/5$   c) $2/5$   d) 0
    e) $\text{cdf}(x) = \begin{cases} 0 & \text{if } x < 1 \\ x/5 - 1/5 & \text{if } 1 \leq x \leq 6 \\ 1 & \text{if } x > 6 \end{cases}$

7a) $\frac{3}{20}$   b) $\frac{1}{7}$   c) $\frac{11}{35}$   d) 0
    e) $\text{cdf}(x) = \begin{cases} 0 & \text{if } x < 0 \\ (x^2 + 4x)/140 & \text{if } 0 \leq x \leq 10 \\ 1 & \text{if } x > 10 \end{cases}$