

Directions:

- **Examples** are demonstrated by TA. You should watch the TA working through the problem and takes notes.
- **Exercises** are for you to work on with/without the help of TA. You will be graded on your work for the exercises. Always show your work!
- Each part is worth 1 point. There are 10 parts in total.

Example 1:

A laboratory has 15 rats: 7 white, 6 gray and 2 brown. Suppose 5 rats will be selected at random and assigned to an experimental drug.

- a) Find the probability that 2 white, 2 gray and 1 brown rats were selected.
- b) Find the probability that 3 white and 2 gray rats were selected.
- c) Find the probability that all five rats selected have the same color.
- d) Find the probability that all five rats selected have different color.

Exercise 1:

The label on a small package of *Bertie Bott's Every Flavour Beans* claims that 3 beans are caramel flavored, 6 are butterscotch, and 4 are earwax. Unable to tell them apart just by looking at them, Ron Weasley selects 5 beans at random. Find the probability that Ron ends up with

(a) ... 1 caramel flavored, 2 butterscotch, and 2 earwax beans.

(b) ... no earwax flavored beans.

(c) ... at least 2 caramel flavored beans.

Exercise 2:

Ha loves her Play Station 4. She spends most of her free time playing *The Outer World* or *Horizon: Zero Dawn*. Let X denote the number of hours Ha plays video game per week (rounded up to the nearest whole number).

Suppose X has the following probability mass function:

x	$f(x)$
0	0.01
1	0.32
2	0.25
3	0.30
4	0.10
5	0.02

a) Find the cumulative probability function (CDF) of X , $F(X)$.

b) Graph $F(X)$.

Example 2:

Consider a random variable X with the probability mass function

$$f(x) = \frac{6}{3^x}, \quad x = 2, 3, 4, 5, \dots$$

Compute the expected value of X .

Exercise 3:

Consider a random variable X with the probability mass function

$$f(x) = \frac{(x-4)^2}{4!}, \quad x = 0, 2, 4, 6$$

a) Compute the expected value of X , $E(X)$.

b) Compute the variance of X , $Var(X)$.

Example 3:

When Stéphane plays chess against his favorite computer program, he wins with probability 0.60, loses with probability 0.10, and 30% of the games result is a draw. Assume independence.

Answer the following questions using 2 methods: by-hand calculation and using R.

a) Find the probability that Stéphane's first win happens when he plays his third game.

b) Find the probability that Stéphane's fifth win happens when he plays his eighth game.

- c) Find the probability that Stéphane wins 7 games, if he plays 10 games.

Exercise 4:

David sells “Statistics: A New Dawn” video games over the phone to earn some extra cash during the pandemic. Only 15% of all calls result in a sale. Assume that the outcome of each call is independent of the others.

Answer the following questions using 2 methods: by-hand calculation and using R.

- *For by-hand calculation, write your answer on lab sheet/paper and submit the scanned PDF to Compass.*
 - *For R method, write your code in a R script (.R file) and submit the R script to Compass.*
- a) What is the probability that David makes his first sale on his third call?

- b) What is the probability that it takes David at least 10 calls to make his first sale?

- c) If David makes 20 calls, what is the probability that he makes at least 2 sales?