Test 1

Econometrics 3112.003, Spring 2019
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[1] Suppose that T is the number of tennis rackets and G is the number of golf clubs sold daily in a small sports store. The joint probability distribution of T and G is given in the table below

$T(row)/G(col.)$	0	5	10
5	.30	.18	.12
10	.15	.09	.06
15	.05	.03	.02

a) Determine the marginal probability distributions of T and G.

b) Calculate $E(T)$ and $E(G)$.

c) Calculate the conditional probability $P(G = 10|T = 15)$.

d) Calculate $E(T|G = 5)$.

e) Calculate $P(T = 10 \,|\, T + G = 15)$.

[2] Suppose that X is a random variable that takes on the values 0, 1 and 2 with the following probabilities

$$P[X = 0] = 0.3, \quad P[X = 1] = 0.20, \quad P[X = 2] = 0.50$$

Suppose we take two independent draws from this distribution, denoted by X_1 and X_2, and then compute the sample average $\overline{X} = (X_1 + X_2)/2$.

a) Find $E[X_2]$ and $Var[X_2]$.

b) Find the sampling distribution of $\overline{X}$.

c) Plot the distribution of $\overline{X}$.

d) Does the distribution of $\overline{X}$ look like a normal distribution? Explain why.

[3] The random variable Y has a mean of 30 and a variance of 16 and let $T = \frac{1}{2}Y + 3$.

a) Compute $E(T)$ and $Var(T)$.

b) Can you compute the following probability $P(8.5 \leq T \leq 10)$? Explain why.

For the rest of this problem assume: $Y \sim N(30, 16)$

c) Compute $P(T > 21)$?

d) Compute $P(14 \leq T \leq 20)$?

R questions:

[4] Suppose you are given `mydata <- 23, -15, -5, 8, 12, 9, 2, -20, 19` in R. For each of the following write R command that accomplishes the task described.

a) Use the R command `sum()` to verify that the sum of the values is 33.

b) Compute an average by using the R command `mean()`?

c) Compute the average with using the R command `sum()` and `length()`?

d) Use R to sum the positive values in `x`.

e) Use the `which()` command to get the average of the values ignoring the largest value.

f) Speculate about the values corresponding to the command `x[abs(x)>=8 & x<8]`.

[5] Lets say you have a data frame named `mydata`, with variables `x1` and `x2`, and you want to create a new variable `sumx` that adds these two variables and a new variable called `meanx` that averages the two variables. Write the code that computes `sumx` and `meanx`.

[6] What would be the output of following R commands:

```
vect <- c("foo" = 11, "bar" = 2, "norf" = NA)
vect
```

[7] Create a 3 by 2 matrix named `my_matrix` containing 6 random draws from the standard normal distribution. (Your answer should contain one line of R command)

[8] Make a script file which constructs two random normal vectors of length 10. Call these vectors `x1` and `x2`. Make a data frame called `myDataFrame` with two columns (called `a` and `b`) containing respectively `x1` and `x1 + x2`.

[9] What would be the output of following R commands:

```
x <- seq(from=1, to=10, by=1)
for (i in x){
  if (i<5 | i>8)
  {
    x[i] = 0.5*i
  }else{
    x[i] = 5*i
  }}
x
```

[10] When the function `head` called on the data frame `Orange` it produces the following output:

```
> head(Orange, n=2)
  Tree  age circumference
1    1  118            30
2    1  484            58
```

Write the command that adds up Y (defined as `circumference`) and X (defined as square root of `age`). (Your answer should contain at most three lines of R commands)