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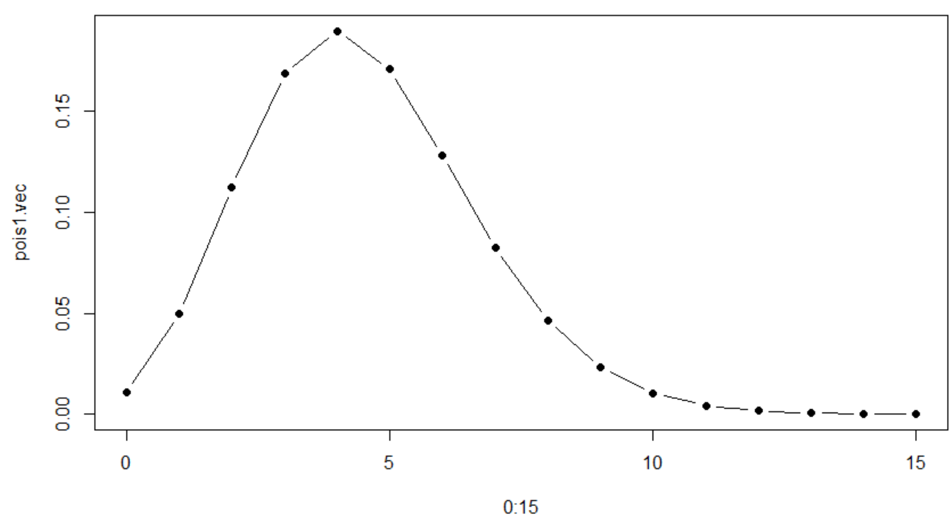
Assignment: TMATH 390 R Lab 5 Document.

Objectives
1. Use R to calculate probabilities for the Poisson and binomial distributions.
2. Use R to explore how the shape of the Poisson and binomial distributions change with different parameter values.
3. Use R to draw random numbers from the Poisson and binomial distributions.

C1. (4) Submit your R script to Canvas.

```
> #C1.
> #Submitted R Script.
> #Determine working directory with
> getwd()
[1] "C:/Users/steve/Desktop/UWT/Fall Classes/TMATH 390/R Documents/R Assignme
nts/R_Lab_5"
> #No need to setwd
> # 0:15 returns a vector of integers: (0,1,2,...,15). First we create an
> # object (x.vals) that contains this vector
> x.vals=0:15
> # The function dpois evaluates the Poisson mass function at
> # each value of x and returns a vector of probabilities
> pois1.vec=dpois(x = x.vals,lambda = 4.5)
> # And here we plot those values, with x.vals on the x-axis and
> # the Poisson probabilities on the y-axis. The argument type="b"
> # specifies that we want both points and lines.
> plot(0:15,pois1.vec,type="b",pch=16)
```

C2. (1) Copy and paste the plot generated using the code above.



C3. (1) Use R to find P(x=5) for Pois(4.5). Return your R command and the result.

```
> #C3. (1) Use R to find P(x=5) for Pois(4.5). Return your R command and the
result.
> dpois(5, 4.5)
[1] 0.1708269
```

C4. (2) Use this information to find P(x ≥ 3) (there are at least 3 clams) and explain how you got it.

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> #---------------------------------------------------------------------
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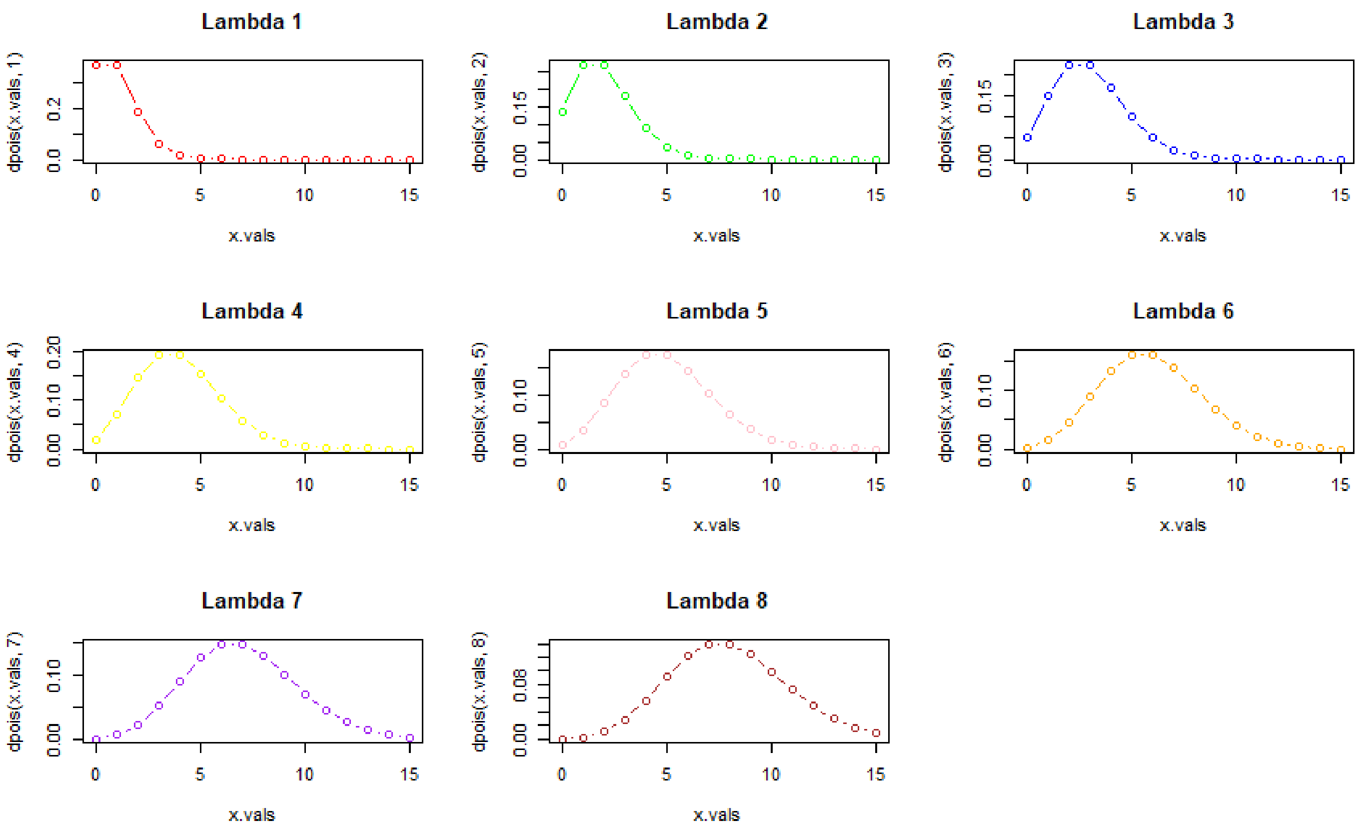
> #C4. (2) Use this information to find P(x ≥ 3) (there are at least 3 clams)
and explain how you got it.
> #Explanation: Get the difference between the overall probability and the pr
obability that you caught
> #at most 2 clams (the complement of P(x=>3))
> 1-ppois(2, 4.5)
[1] 0.8264219
```

C5. (2) Create and include a plot that explores how the Poisson distribution changes with different values of λ: {1,2,3,4,5,6,7,8}.



C6. (1) Describe what happens to the shape of Poisson distribution with increasing λ (increasing expected value).

As the λ increases, the distribution seems to become more symmetrical, like how a normal distribution appears (from being positively skewed, to almost no discernible skews). Also, the maximum point of the distribution lowers (from above 0.3 at Lambda 1, to less than 0.1 at Lambda 8).

C7. (1) What do “size” and “prob” represent in these function calls?

`size`	number of trials (zero or more).
`prob`	probability of success on each trial.

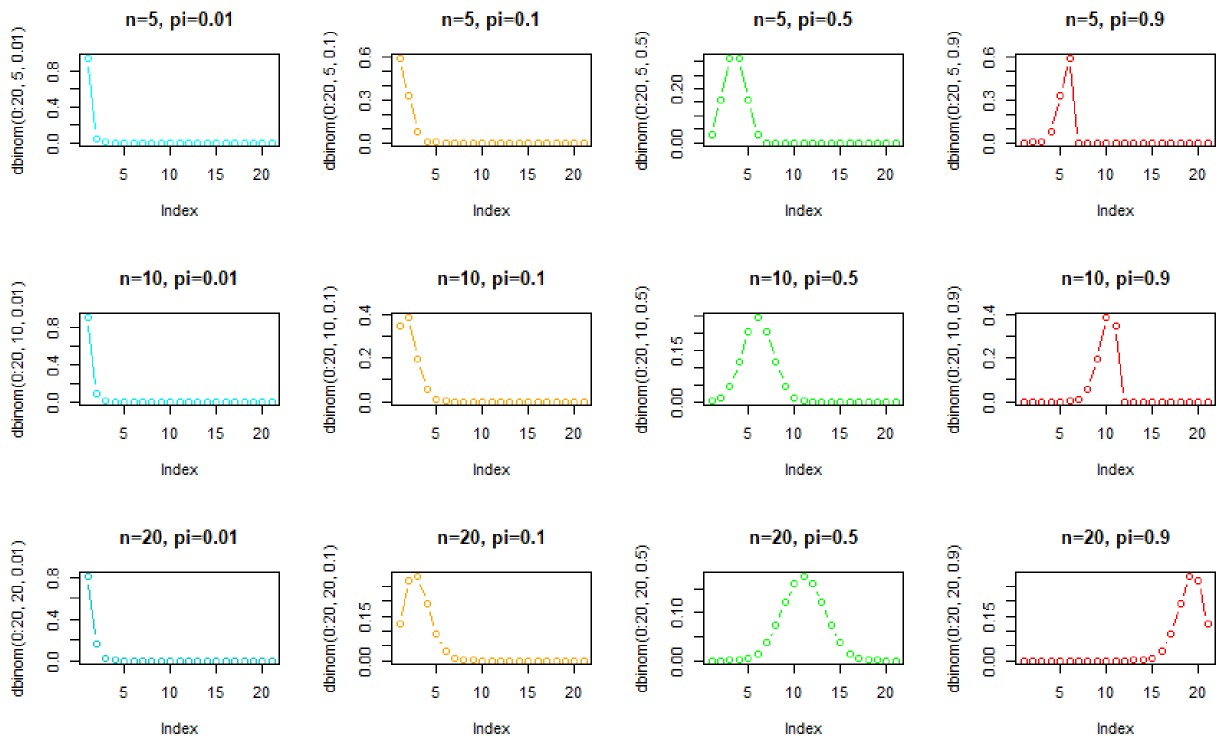
C8. (1) Using R, determine the probability x ≤ 3, where X~binom(100,0.005). Hint: adapt the code from C4 above.

```
> #C8. (1) Using R, determine the probability x ≤ 3, where X~binom(100,0.005)
> #Hint: adapt the code from C4 above.
> sum(dbinom(0:3, 100, 0.005))
[1] 0.9983267
> #Get cumulative probability associated with the binomial upto 3
> pbinom(3, 100, 0.005)
[1] 0.9983267
```

C9. (2) Create and include a plot that explores how the binomial distribution changes with different values of π and n. Plot all of the distributions on one sheet for the following combinations of n and π (with x = 0:20):

n 5 5 5 5 10 10 10 10 20 20 20 20
pi 0.01 0.1 0.5 0.9 0.01 0.1 0.5 0.9 0.01 0.1 0.5 0.9

The first few lines of code are given below. Complete for the remaining values of n and π.



C10. (1) Describe what happens to the shape of the binomial distribution with increasing expected value ($n\pi$).

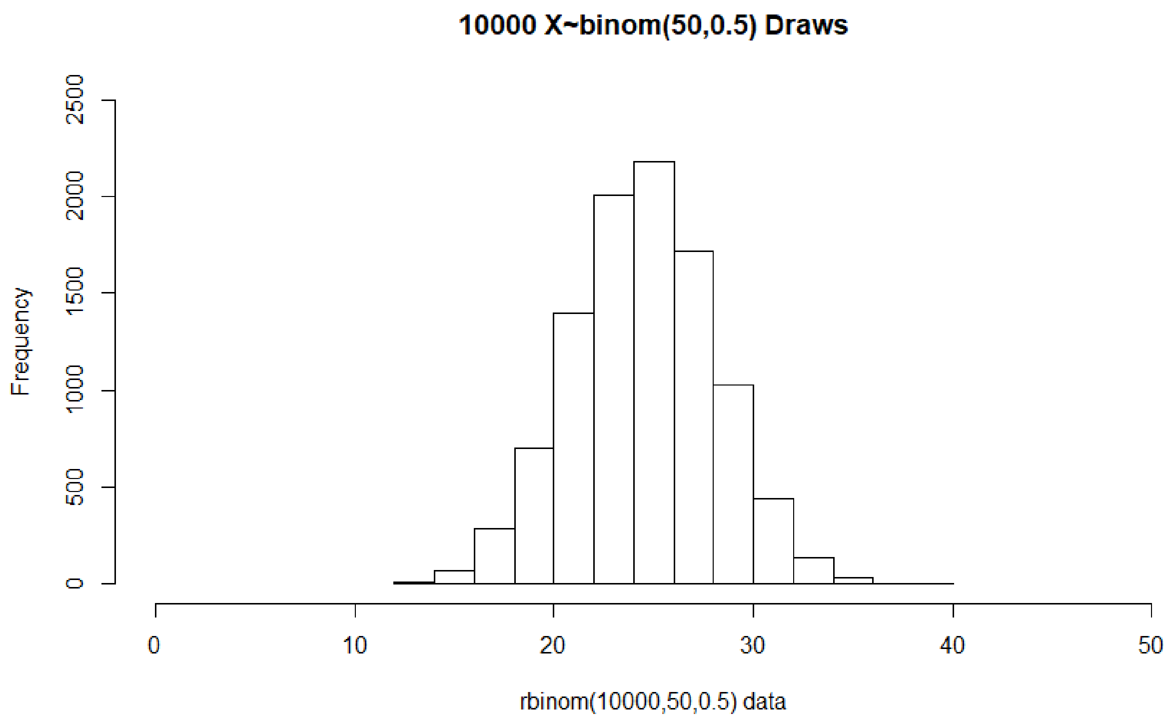
For small $\pi = 0.01$, 0.1 and 0.5, and very small n=5, distribution is right skewed.

As π and n increases, the distribution becomes more symmetric. At [n =10 & n=20 but $\pi = 0.5$] and at n = 10 and $\pi = 0.9$.

For very large $\pi = 0.9$ and very large n = 20, distribution is left skewed.

C11. (2) X~binom(50,0.5) (rbinom) (histogram)

```
#C11. (2) X~binom(50,0.5) (rbinom) (histogram)
> hist(rbinom(10000,50,0.5),
+      xlab ="rbinom(10000,50,0.5) data",
+      xlim = c(0, 50),
+      ylim = c(0, 2500),
+      main = "10000 X~binom(50,0.5) Draws")
```



C12. (2) X~Pois(3.2) (rpois) (histogram)

```
> #C12. (2) X~Pois(3.2) (rpois) (histogram)
> hist(rpois(10000,3.2),
+      xlim = c(0, 12),
+      ylim = c(0, 2500),
+      main = "10000 X~Pois(3.2) Draws")
```