

Weekly Problems #3

1) There are two stables on a farm, one that houses 20 horses and 13 mules, the other with 25 horses and 8 mules. Without any pattern, animals occasionally leave their stables and then return to their stables. Suppose that during a period when all the animals are in their stables, a horse comes out of a stable and then goes back. What is the probability that the next animal coming out of the same stable will also be a horse?

2) The R code below begins with the definition of a function called `first.digit`. Type this into R line by line. After each enter key except the last, R will prompt you with a plus sign (+). This simply indicates that R knows you are not finished. (Alternatively, you can cut and paste from a text file.) After typing in the function, figure out what it does by inputting some positive real numbers on a trial and error basis. What does it do? Prove it does what you claim.

Now, consider the next 6 lines of code. Figure out what these lines do and explain carefully what probability experiment is being simulated and what results you obtain. Are you at all surprised by the results? What happens if you use other three digit numbers in place of 432? Note: I put `n` at 100 so you could easily look at output. I would suggest bigger `n` values once you figure out what the simulation is doing.

```
first.digit <- function(y) {  
  # y should be a positive real number.  
  k <- floor(log10(y))  
  floor(y/(10^k))  
}  
  
n <- 100  
x <- runif(n,0,432)  
y <- numeric(n)  
for (i in 1:n) y[i] <- first.digit(x[i])  
table(y)  
table(y)/n
```