Math 151- Probability
Spring 2015 Jo Hardin

Example, T/F Quiz

Baumgartner, Prosser, and Crowell are grading a calculus exam. There is a true-false question with ten parts. Baumgartner notices that one student has only two out of the ten correct and remarks, `The student was not even bright enough to have flipped a coin to determine his answers.`"Not so clear,'' says Prosser. `With 340 students I bet that if they all flipped coins to determine their answers there would be at least one exam with two or fewer answers correct."` `Crowell says,`I'm with Prosser. In fact, I bet that we should expect at least one exam in which no answer is correct if everyone is just guessing." Who is right in all of this?

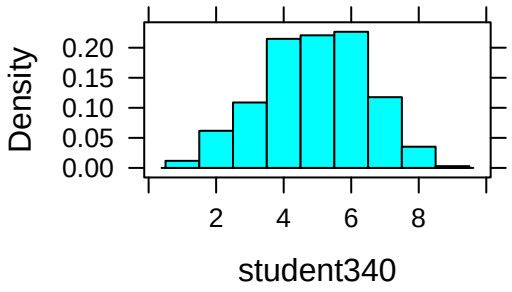
```
library(mosaic)
student1 = rbinom(1,10,.5)
student1
```

```
## [1] 4
```

```
student340 = rbinom(340,10,.5)
student340[1:10]
```

```
##  [1] 3 3 4 6 3 6 5 5 5 7
```

```
histogram(student340 )
```




```
tally(~student340)
```

```
##
##  1  2  3  4  5  6  7  8  9
##  4 21 37 73 75 77 40 12  1
```

```
favstats(~student340)
```

```
##  min Q1 median Q3 max     mean       sd   n missing
##    1  4      5  6   9 4.914706 1.567109 340       0
```

But that's only for one class... we'd want to repeat the simulation to understand how *likely* it is for a class to have a student (who is guessing) with no correct answers.

```
n.reps = 10
allscores = array(dim=c(n.reps,7))
for(i in 1:n.reps){
  allscores[i,] = rbinom(7,10,.5)
}

allscores
```

```
##       [,1] [,2] [,3] [,4] [,5] [,6] [,7]
##  [1,]    1    6    4    6    4    5    6
##  [2,]    7    3    6    3    5    6    2
##  [3,]    5    4    3    5    8    5    6
##  [4,]    7    7    4    4    4    6    6
##  [5,]    4    3    3    6    3    3    3
##  [6,]    5    3    5    5    5    6    2
##  [7,]    5    6    6    4    5    5    4
##  [8,]    7    2    3    3    3    5    4
##  [9,]    5    6    4    6    5    3    4
## [10,]    5    6    2    4    4    3    4
```

```
numZero = apply(allscores ==0, 1,sum )
numZero
```

```
##  [1] 0 0 0 0 0 0 0 0 0 0
```

```
sum(numZero > 0)/n.reps
```

```
## [1] 0
```

```
numFew = apply(allscores <=2, 1,sum )
numFew
```

```
##  [1] 1 1 0 0 0 1 0 1 0 1
```

```
sum(numFew > 0)/n.reps
```

```
## [1] 0.5
```