STAT 1234 | SOME STATISTICS CLASS | SPRING 2013 | KERNS

Sample Quiz Template

Name: _____

Directions:[1] SHOW ALL WORK. You may use `R` for computations, but no other software (and in particular, not the Internet). If you use `R` to calculate something, then hand-write the `R` code that you typed, together with the numerical answer.

1. The following table categorizes a group of people based on the flavor of Kool-Aid they drink and whether or not they like President Barack Obama.

	grape	orange	cherry	Total
likes Obama	92	93	29	214
doesn't like Obama	84	64	51	199
Total	176	157	80	413

Our experiment will be to select one (1) person from the table out of the 413 people, at random.

a) What is the probability that the selected person likes cherry Kool-Aid?

Since all outcomes are equally likely, the marginal probability that the person likes cherry Kool-Aid is just the number of people who like cherry Kool-Aid divided by the total number of people in the study. In other words,

$$\mathbb{P}(\text{cherry}) = \frac{\#(\text{cherry})}{\text{Total \# of people}} = \frac{80}{413} \approx 0.194.$$

b) What is the probability that the selected person doesn't like Obama?

This problem is just like the last problem, but we are thinking about rows instead of columns. In particular,

$$\mathbb{P}(\text{doesn't like Obama}) = \frac{\#(\text{doesn't like Obama})}{\text{Total \# of people}} = \frac{199}{413} \approx 0.482.$$

c) What is the conditional probability that the person likes grape Kool-Aid, given that the person doesn't like Obama?

To calculate the conditional probability we restrict attention to the row that contains a person who doesn't like Obama, and out of those total people calculate the proportion of those who like grape Kool-Aid, that is,

$$\mathbb{P}(\text{ grape} \mid \text{doesn't like Obama }) = \frac{\mathbb{P}(\text{grape and doesn't like Obama})}{\mathbb{P}(\text{ doesn't like Obama})} = \frac{84}{199} \approx 0.422.$$

[1] more questions on the back.

2. We would like to feed baby "Aidan". At the dinner table, we get a spoon of food and make an airplane *swoop* as we move the spoon toward his mouth. Calling the event $E = \{\text{take a bite}\}$ a "success", it has been determined by experimentation that on any given airplane swoop, the probability of success is $p \approx 0.39$. Suppose that Aidan is in the high chair. Let Y denote the number of failed swoops ($E^c = \{\text{no bite}\}$) before the first 6 successful bites.

a) If the successive swoops were to constitute independent Bernoulli trials, what would be the distribution of Y? You should write the family name of the distribution and numerical value(s) of a(ny) parameter(s).

The distribution of Y is *negative binomial* with `size` equal to 6 and `prob` equal to 0.39. The following `R` code will suffice to communicate this to the computer.

```
library(distr)
Y <- Nbinom(size = 6, prob = 0.39)
```

b) Find the mean and variance of Y, denoted $\mathbb{E}Y$ and $\mathrm{Var}(Y)$, by any method you like.

The mean of the `Nbinom(size = r, prob = p)` distribution is $r(1-p)/p$ and the variance is $r(1-p)/p^2$. You can either calculate that by hand or you can use the computer via the `distrEx` package:

```
library(distrEx)
E(Y)
var(Y)
```

```
[1] 9.384615
[1] 24.06312
```

c) Sketch the probability mass function of Y (roughly). It does not have to be exact, but it should have the right support, be centered in the right place, and have the correct basic spread and shape.

See Figure 1; your sketch should look something like that. The `R` code you can use to make the figure is:

```
plot(Y, to.draw.arg = "d")
```

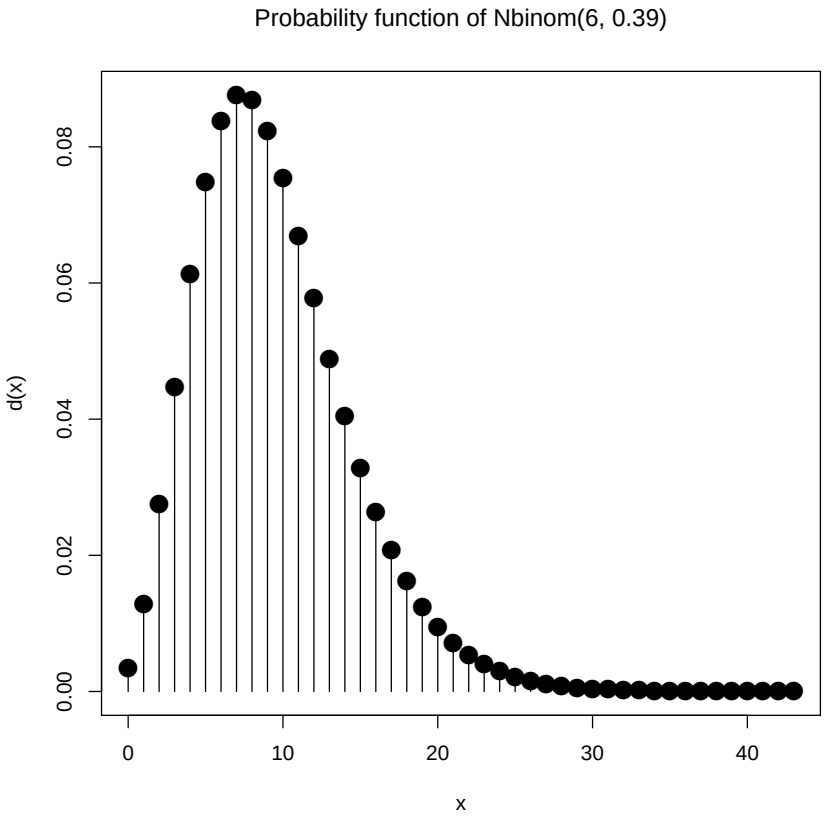

Figure 1: Plot of the probability mass function