Stata command

Stata uses something call the “gammap” function to calculate the Poisson density.

$P(X \geq k)$ is given by `gammap(k,lambda)`

$P(X = K) = \lambda^k e^{-\lambda} /k! = P(X \geq k) - P(X \geq k+1)$ is given by

```
di gammap(k,lambda)-gammap(k+1,lambda)
```


The probability of observing 3 births is

$P(X = 3) = \lambda^3 e^{-\lambda} /3! = 0.1804$ or 18%

```
. di gammap(3,2)-gammap(4,2)
.18044704
```

The probability of observing at least one birth is

⇨ $P(X \geq 1) = 1-P(X = 0)$

$= 1- \lambda^0 e^{-\lambda} /0! = 1- 0.1353 = 86.47\%$

```
. di gammap(1,2)
.86466472
```

Stata commands

So, P(You're in)= $\binom{199}{19} / \binom{200}{20}$ = $\frac{199!}{19!\,180!} \frac{20!\,180!}{200!}$

= 20/200

= 1/10

```
. di comb(199,19)/comb(200,20)
.1
```


Therefore the probability that I will select a sample containing no doctoral students is

$$\binom{165}{5} / \binom{200}{5} = \frac{958,683,033}{2,535,650,040} = 0.378$$

From this we get the probability that a simple random sample (without replacement) of size 5 from this class will include at least one doctoral student is

P(at least one)=1-P(none)=1-0.378 = 0.622

```
. di 1-comb(165,5)/comb(200,5)
.62191824
```


So, the probability of getting two doctoral students in a SRS of n = 5 is

$$\frac{\binom{35}{2}\binom{165}{3}}{\binom{200}{5}} = \frac{(595)(735,130)}{2,535,650,040} = \frac{437,402,350}{2,535,650,040} = 0.173$$

```
.di comb(35,2)*comb(165,3)/comb(200,5)
.17250107
```


P(X = k) = $\frac{\binom{7}{k}\binom{10-7}{2-k}}{\binom{10}{2}}$ for k = 0,1,2

For instance, P(X = 0) = $\frac{\binom{7}{0}\binom{3}{2}}{\binom{10}{2}} = \frac{3}{45} = 0.067$

```
. di comb(7,0)*comb(3,2)/comb(10,2)
.06666667
```