

Section 4: cont'd

Friday, March 24, 2017 2:31 PM

we will be omitting the

hypergeometric distribution

lecture notes/handout:

omit questions 6-10

I will email the questions from the statistics exercises that you should omit

note: if you have 7 marbles in a bag and you draw two of them at - without replacement, what does it look like if there were 2 red and 5 yellow to begin with?

- not binomial

if the first one is yellow ($5/7$ prob) the probability that the second is yellow is ($4/6 = 2/3$), NOT THE SAME!

Poisson distribution

Poisson distribution

- good model for data that represent the number of occurrences of a specified event in a given unit of time or space

- examples -
- number of car accidents at a particular intersection during a given period of time
 - number of people standing at a certain street corner at a given time
 - number of pieces of litter in a given area of park at a certain time

then $x =$ number of events occurring in the period of time or space

and $\mu =$ average number of such events expected to occur

and

$$P(x = k) = \frac{\mu^k e^{-\mu}}{k!}$$

$$k! = k(k-1)(k-2) \dots 3 \cdot 2 \cdot 1$$

note: k has no max value

→ unbounded

- (11) website receives on average 7 visits per hour
→ find the probability that there are less than 2 visits in the next hour

Poisson $\mu = 7$

$$P(X=k) = \frac{\mu^k e^{-\mu}}{k!}$$

$$P(X < 2) = P(0) + P(1)$$

$$= \frac{7^0 e^{-7}}{0!} + \frac{7^1 e^{-7}}{1!}$$

$$= 0.007295$$

or $\boxed{0.7\%}$

- (12) average number of cracks in concrete is 1.9

find $P(2 \text{ or } 3)$
find $P(\text{at least } 1)$

$$\begin{aligned} \text{a) } P(2 \text{ or } 3) &= P(X=2) + P(X=3) \\ &= 1.9^2 e^{-1.9} + 1.9^3 e^{-1.9} \end{aligned}$$

$$= \frac{1.9^2 e^{-1.9}}{2!} + \frac{1.9^3 e^{-1.9}}{3!}$$

$$= 0.440953$$

$$= 0.44 \text{ or } 44\%$$

$$b) P(x=0) = \frac{1.9^0 e^{-1.9}}{0!}$$

$$P(x \geq 1) = 1 - P(x=0)$$

$$= 0.850431$$

$$= 0.85 \text{ or } 85\%$$

summary:

- ① binomial
 - n identical trials
 - 2 possible outcomes
 - probability does not change from trial to trial

~~② hypergeometric~~

- ③ Poisson: number of occurrences of a specific event in given time or space