# Prob and Stat Hmwk ch4

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Pg 212: 1,2,8,10

2) Let X~Bin(9,0.4). P(X>6)

```
pbinom(6,9,0.4,lower.tail = FALSE)
```

```
## [1] 0.02503475
```

P(X>=2)

```
1-pbinom(1,9,0.4)
```

```
## [1] 0.9294561
```

Pr(X>1) = Pr(X>=2)

P(2<=X<5)=> P(x<5)-P(x<=2)=>P(x<=4)-P(x<=2)

```
pbinom(4,9,0.4)-pbinom(2,9,0.4)
```

```
## [1] 0.5016453
```

P(2 P(x<=5)-P(x<2)=>P(x<=5)-P(x<=1)

```
pbinom(5,9,0.4)-pbinom(1,9,0.4)
```

```
## [1] 0.8301036
```

P(X=0)

```
pbinom(0,9,0.4)
```

```
## [1] 0.0100777
```

P(X=7)

```
dbinom(7,9,0.4)
```

```
## [1] 0.02123366
```

mu(x) = 3.6 Sigma^2(x) =2.16

8) A genreral contracting firm experiences cost overruns on 20% of its contracts. In acompany audit, 20 contracts are sampled at random.

P(X=4)

```
dbinom(4,20,0.2)
```

```
## [1] 0.2181994
```

P(X<3)

```
pbinom(2,20,0.2)
```

```
## [1] 0.2060847
```

P(X=0)

```r
dbinom(0,20,.2)
```

```
## [1] 0.01152922
```

mu(x) [Mean] = 4 Sigma^2(x) (Standard Deviation)= 1.78

10) A quality engineer takes a random sample of 100 steel rods from a day's production and finds that 92 of them meet specifications.

Estimate the proportion of that day's production that meets specifications and find the uncertainty in the estimate. a) 0.3119 Estimate the number of rods that must be sampled to reduce the uncertainty to 1%. b) 0.17679

Pg 227: 1,4,6,16 4)Geologists estimate the time since the most recent cooling of a mineral by counting the number of uranium fission tracks on the surface of the mineral. A certain mineral specimen is of such an afe that there should be an average of 6 trackes per cm^2 of surface area. Assume the number of tracks in an area follows a poission distribution. Let X represent the number of tracks counted in 1 cm^2 of surface area. Find… lambda = 6 A) P(X=7)

```r
dpois(7,6)
```

```
## [1] 0.137677
```

b) P(X>=3)

```r
ppois(2,6,lower.tail = FALSE)
```

```
## [1] 0.9380312
```

P(x>=3)= P(X>2)

c) P(2<X<7)

```r
ppois(6,6)-ppois(1,6)
```

```
## [1] 0.5889515
```

d)Mu(x) mu = lambda = 6 e) sigma(x)^2 = 6

6) one out of every 5000 individuals in a population carries a certain defective gene. A random sample of of 1000 indiviuals is studied. lambda = 1/5000

a) What is the probability that exactly one one of the sample individuals carries the gene?

```r
dpois(1,1/5000*1000)
```

```
## [1] 0.1637462
```

b) That none are carries the gene?

```r
dpois(0,1/5000*1000)
```

```
## [1] 0.8187308
```

C) that more than 2 carry the gene?

```r
ppois(2,1/5000*1000,lower.tail = FALSE)
```

```
## [1] 0.001148481
```

d) Mean = lambda = 1/5000*1000

```r
1/5000*1000
```

```
## [1] 0.2
```

e) SD = lambda = .2 = mean

16) Grandma is tyring out a new recipe for raisin bread. Each batch of bread dough makes 3 loaves and each loaf contains 20 slices of bread.

a) 100 raisins into a batch of dough, what is the proabbility that a eandomly chosen slice of bread conatains no raisins? average = 100/(3*20) = 1.666 raisins per slice.

```r
dpois(0,100/60)
```

```
## [1] 0.1888756
```

b) 200 raisins into a batch of dough, what is the proabbility that a eandomly chosen slice of bread conatains 5 raisins? average = 200/(3*20) = 3.33 raisins per slice.

```r
dpois(5,200/60)
```

```
## [1] 0.1223388
```

c) how many raisins must be put in a batch so the probability that a randomly selected slice will have no raisins is 0.01? lambda = -ln(P(X=0)) P(x=0)=0.01

```r
-log(0.01)
```

```
## [1] 4.60517
```

N=Lambda*3*20

```r
(-log(0.01)*3*20)
```

```
## [1] 276.3102
```

Pg 240: 1, 2, 12 2) There are 30 restaunts in a certain town. Assume that four of them have heath code violations. A health inspector chooses 10 restaurant at random to visit. a) what is the probability that two of the restaurants with health code violations will be visited. X~Hyper(30,4,10) … P(X=2) m = 4, n = 26, k = 10 dhyper(X,m,n,k) = dhyper(X_value, of sucess, failures,Sample size)

```r
dhyper(2,4,26,10)
```

```
## [1] 0.3119869
```

B) What is the probability that none of the restaurants that are visted will have health code violations?

```r
dhyper(0,4,26,10)
```

```
## [1] 0.1767926
```

12) A lot of parts contains 500 items, 100 of which are defective. Suppose that 20 are selected at random. Let X be the number of selected items that are defective. m = 100 n = 400 k = 20

a) express the quanity P(X=5) using factorials. P(X=5)= (m|x)(n|(k-x))/(N|k); (100|5)(400|20-5)/(500|20) (A|W)=A!/(W!(A-W)!)
b) 100!*400!*20!*480!/(5!*95!*15!*385!*500!)
c) Use the binomial approximations to compute an approximation to P(X=5)

```r
dbinom(5,20,100/500)
```

```
## [1] 0.1745595
```

Pg 252: 1,4,8,9,12,15,22

4) If X~N(2,9), compute

a) P(X>=2)

```r
pnorm(1,2,9)
```

```
## [1] 0.4557641
```

b) P(1<=X<7) = P(X<=6)-P(x<=1)

```r
pnorm(6,2,9)-pnorm(1,2,9)
```

```
## [1] 0.2158752
```

C) P(-2.5<=X<-1)

```r
pnorm(-2,2,9)-pnorm(-2.5,2,9)
```

```
## [1] 0.0198231
```

d) P(-3<=X-2<3)

8) weights of female cats of a certain breed are normally distibuted with mean 4.1kg and a SD of 0.6kg

A) What proportion of female cats have weights between 3.7 and 4.4kg? P(3.7<X<4.4)

```r
pnorm(4.4,4.1,0.6)-pnorm(3.7,4.1,0.6)
```

```
## [1] 0.4389699
```

b) P(X> 4.1+0.6*0.5)

```r
pnorm(4.1+0.6*0.5,4.1,0.6)
```

```
## [1] 0.6914625
```

c) Z=(x-mu)/sigma

```r
pnorm(0.8416215)
```

```
## [1] 0.8000001
```

Z=0.84163 = (x-4.1)/0.6

```r
0.8416215*0.6+4.1
```

```
## [1] 4.604973
```

answer for c is 4.6kg

d) a female cate is chosen at random. what is the probability that she weighs more than 4.5kg?

```r
pnorm(4.5,4.1,0.6,lower.tail = FALSE)
```

```
## [1] 0.2524925
```

e) Six female cats are chosen at random, what is the probability that exactly one of them weighs more than 4.5kg? -not sure-

12)Specifications for an aircraft bolt require that the ultimate tensile strenght be at least 18kN It is known that 10% of the bolts have strengths less than 18.3 and that 5% of the bolts have strengths greater than 19.76kN. It is also that the strengths of these bolts are normally distributed.

a) Find the mean and standard deviation of the strengths.
b) Mean = 18.9 and Sd = 0.5
c) what proportion of the bolts meet the strength specification?
d) 0.97

22) Two resistors with resistances R1 and R2, are conected in series. R1 is normally distributed with mean 100ohm and sd of 5 ohm. R2 is normally distibuted with mean 120ohm and sd 10ohm.

a) what is the probability that R2 > R1? 0.475
b) what is the probability that R2 exceeds R1 by more than 30ohm? 0.238

pg 270: 2,4,9,10

2)

A) lambda = 1/0.5

```r
1/0.5
```

```
## [1] 2
```

B)

```r
0.5
```

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

c) sd =1/lambda^2

```r
1/2^2
```

```
## [1] 0.25
```

Pg 300 4)
a) 0.841 b) 0.606

6)

a) 0.238
b) 1.295
c) 1076

16)

a) 0
b) Yes
c) 0
d) 0.344
e) No
f) 0.344