STATS 3600 Online Assignment 4

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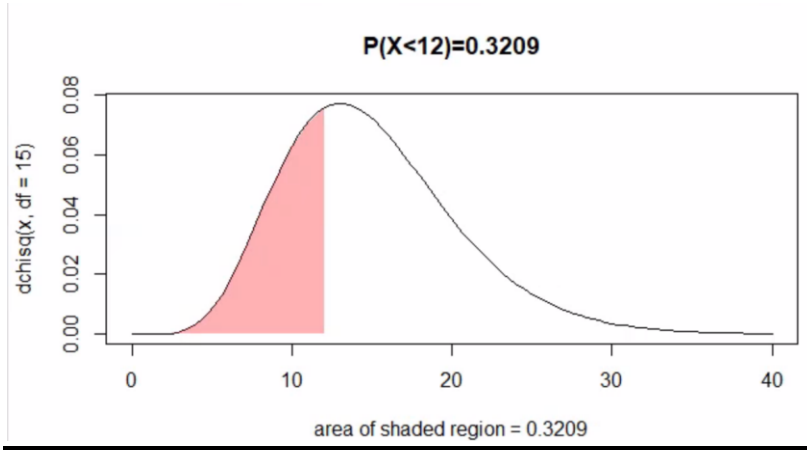
X has a Chi-square distribution with 15 degrees of freedom.

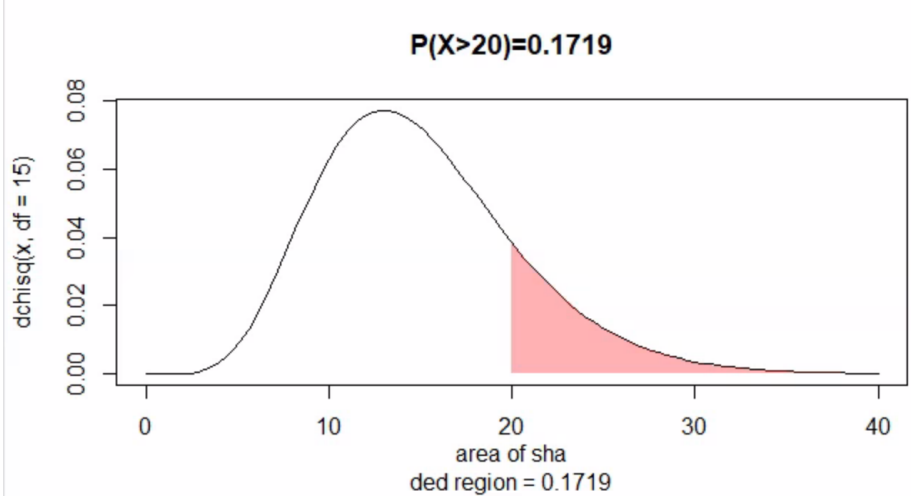
1. P(X < 12)

```
> #X-Chi square distribution with 15 degrees of freedom
> #calculate P(X <12)
> pchisq(12, df=15)
[1] 0.3209709
> #Illustrate with shaded density curve
> curve(dchisq(x, df = 15), from=0, to=40, main='P(X<12)=0.3209', xlab='area of shaded region = 0.3209')
> #create a vector of x values
> x_vector<-seq(0, 12)
> #create vector of CHi-square density values
> p_vector<-dchisq(x_vector, df=15)
> #fill portion of density plot from 0 to 12
> polygon(c(x_vector,rev(x_vector)), c(p_vector,
rep(0,length(p_vector))),col=adjustcolor('red',alpha=0.3), border=NA)
```



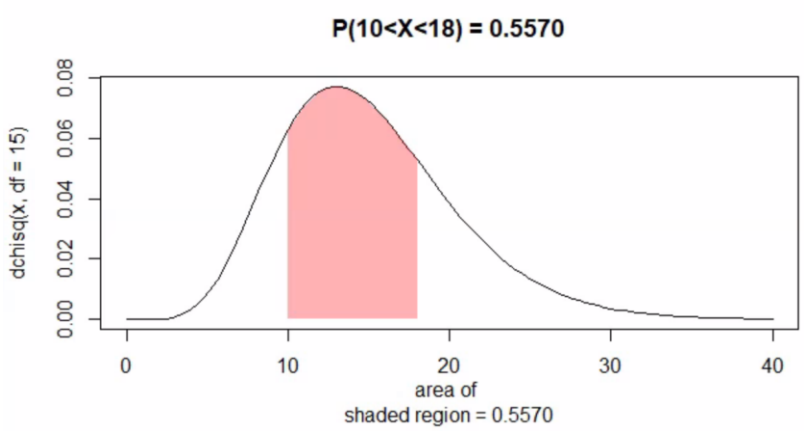
2. P(X > 20)

```
> #Calculate P(X>20)
> pchisq(20, df=15, lower.tail=FALSE)
[1] 0.1719327
> #Illustrate with a shaded density curve
> x1_vector=seq(20,40)
> p1_vector<-dchisq(x1_vector,df=15)
> curve(dchisq(x,df=15),from=0,to=40,main='P(X>20)=0.1719',xlab='area of sha
+ ded region = 0.1719')
> polygon(c(x1_vector,rev(x1_vector)),c(p1_vector,rep(0,length(p1_vector))),
col=adjustcolor('red',alpha=0.3),border=NA)
```



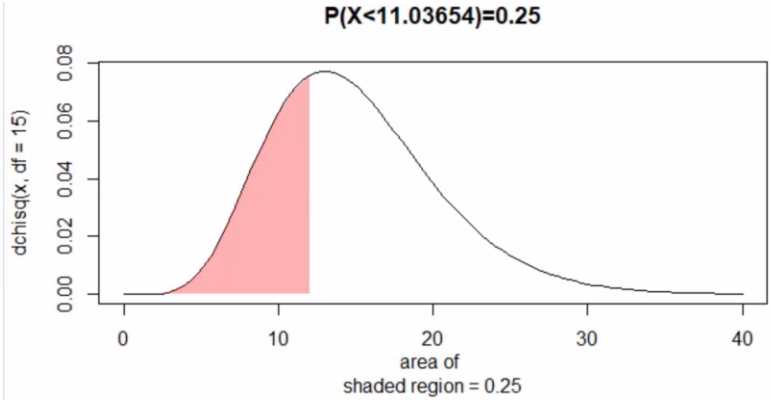
3. P(10 < X < 18)

```
> #Calculate P(10<X<18)
> pchisq(18, df=15)-pchisq(10, df=15)
[1] 0.5570744
> #Illustrate with shaded density curve
> curve(dchisq(x,df=15),from=0,to=40,main='P(10<X<18) = 0.5570',xlab='area of
+ shaded region = 0.5570')
> x2_vector<-seq(10,18)
> p2_vector<-dchisq(x2_vector,df=15)
> polygon(c(x2_vector,rev(x2_vector)),c(p2_vector,rep(0,length(p2_vector))),
col=adjustcolor('red',alpha=0.3),border=NA)
```



4. Find x so that P(X < x) = .25

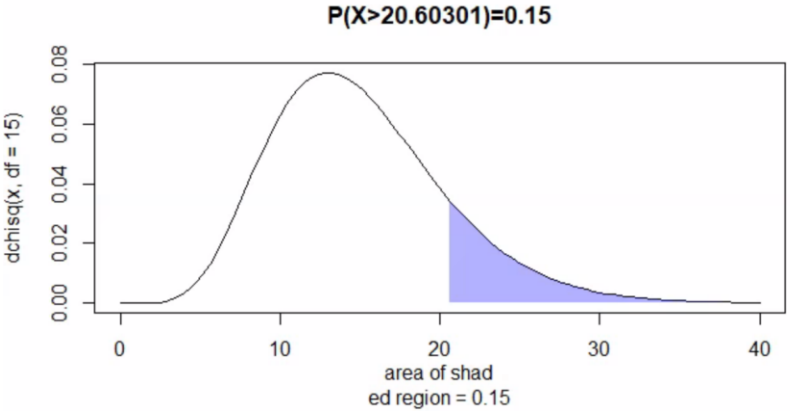
```
> #Find x so that P(X<x)=0.25
> qchisq(0.25, df=15)
[1] 11.03654
> #Illustrate with shaded density curve
> curve(dchisq(x,df=15),from=0,to=40,main='P(X<11.03654)=0.25',xlab='area of
+ shaded region = 0.25')
>
polygon(c(x_vector,rev(x_vector)),c(p_vector,rep(0,length(p_vector))),col=adjustcolor('red',alph
a=0.3),border=NA)
```



5. Find x so that P(X > x) = .15

```
> #Find x so that P(X>x = 0.15)
> qchisq(0.15, df=15, lower.tail=FALSE)
[1] 20.60301
> #Illustrate w/ shaded density curve
> curve(dchisq(x,df=15),from=0,to=40,main='P(X>20.60301)=0.15',xlab='area of shad
+ ed region = 0.15')
> x3_vector<-seq(20.6,40)
> p3_vector<-dchisq(x3_vector,df=15)
```

```
>polygon(c(x3_vector,rev(x3_vector)),c(p3_vector,rep(0,length(p3_vector))),col=adjustcolor('blue',alpha=0.3),border=NA)
>polygon(c(x3_vector,rev(x3_vector)),c(p3_vector,rep(0,length(p3_vector))),col=adjustcolor('blue',alpha=0.3),border=NA)
```



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6. Find constants a and b so that P(X<a) = .05 and P(a<X<b) = .9.

```
> qchisq(0.05, df=15)
[1] 7.260944
> qchisq(0.05, df=15, lower.tail=FALSE)
[1] 24.99579
>#Illustrate with a shaded density curve
> curve(dchisq(x,df=14),from=0,to=40,main='P(7.26<X<24.99)=0.9',xlab='area of shaded region = 0.9')
> x4_vector<-seq(7,25)
> p4_vector<-dchisq(x4_vector,df=15)
>polygon(c(x4_vector,rev(x4_vector)),c(p4_vector,rep(0,length(p4_vector))),
col=adjustcolor('orange',alpha=0.3),border=NA)
```