# HW03_Sampathirao_A

*Anvita Sampathirao*

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```
#1.1a.
#Let p be the probability (lambda) of winning the game
#p*x_w-x=0
#p=1-(x/x_w)
#1.1b.
#AverageGain=(x_w*p)-x*(1-p)
AverageGain<-(1000*0.05)-10*(1-0.05)
AverageGain
```

```
## [1] 40.5
```

```
#1.1c.
#AverageGain=0
#x_w*p=x*(1-p)
p<-10/(10+1000)
p
```

```
## [1] 0.00990099
```

```
#1.2a.
GradUnemployedp<-0.009/0.046
GradUnemployedp
```

```
## [1] 0.1956522
```

```
NGradUnemployedp<-0.037/0.046
NGradUnemployedp
```

```
## [1] 0.8043478
```

```
#1.2b.
#For Educational achievement and employment status to be independent variables probability of their int
#P(X&Y)=P(X)*P(Y)
```

```
#1.3.
#P(InnerCircle)=2/3*Ar
#P(BullsEye)=5/100*Ar
#P(InnerCircle|BullsEye)=1
#P(BullsEye|InnerCircle)[Variable-Prob]=P(InnerCircle|BullsEye)*P(BullsEye)/P(InnerCircle)
Prob<-1*(5/100)*(3/2)
Prob
```

```
## [1] 0.075
```

```
#1.4
#P(D+)=1/1000=0.001
#P(D-)=1-0.001=0.999
#P(T+|D+)=0.95
#P(T+|D-)=0.05
#1.4a.
#P(D+|T+)=?=P(D+)*P(T+|D+)/P(T+)
#P(T+)=P(T+|D+)*P(D+)+P(T+|D-)*P(D-)
PDiseaseTestPve<-(0.001*0.95)/((0.001*0.95)+(0.05*0.999))
PDiseaseTestPve
```

```
## [1] 0.01866405
```

```
#1.4b.
PDiseaseTestPve1<-(0.0001*0.95)/((0.0001*0.95)+(0.05*0.9999))
PDiseaseTestPve1
```

```
## [1] 0.001896586
```

```
#1.4c.
#This tells us that for rare diseases, the chances of actually having the disease are very minimal or i
```

```
#2a.
dice<-function(n){
probability<-1/n
return(probability)
}
dice(4)
```

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

```
dice(20)
```

```
## [1] 0.05
```

```
dice(100)
```

```
## [1] 0.01
```

```
#2b.
die1 = c(1:20)
die1
```

```
##  [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20
```

```
library(ggplot2)
```

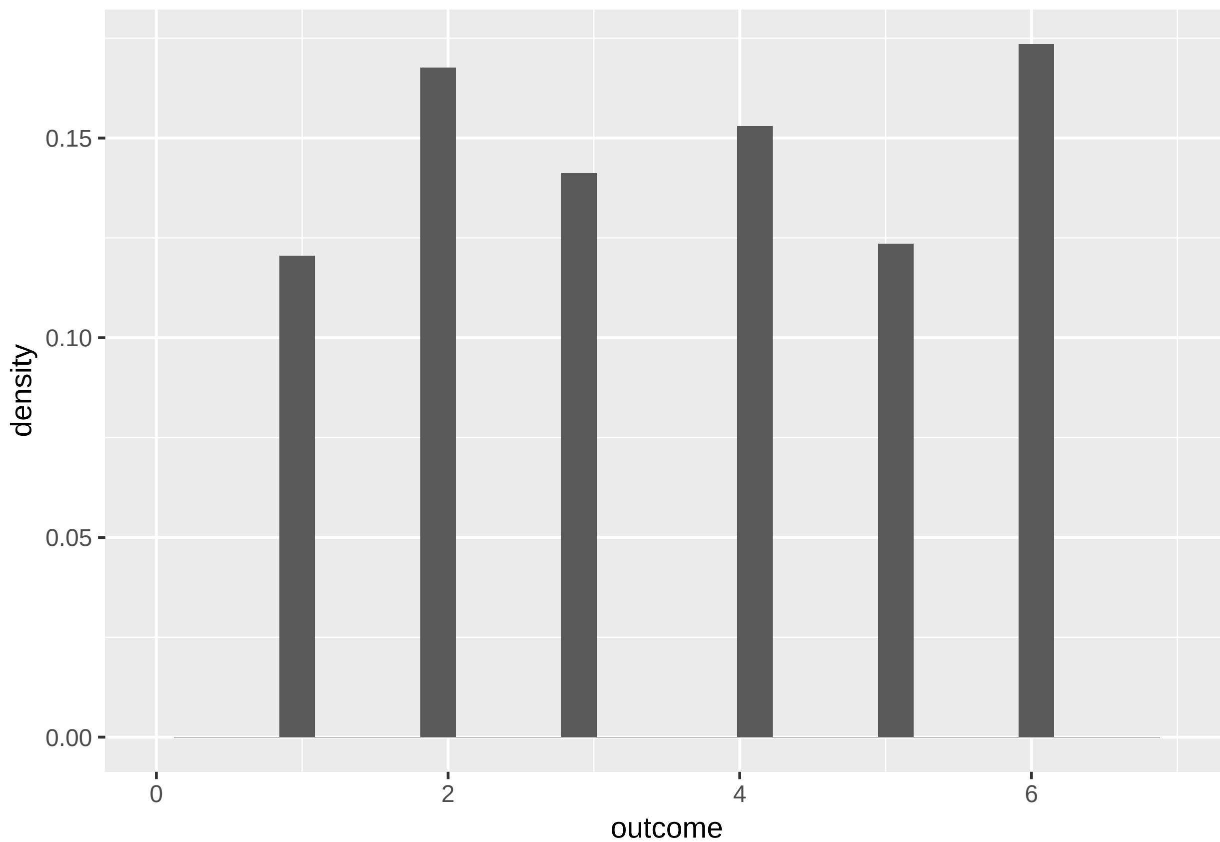
```
## Registered S3 methods overwritten by 'ggplot2':
##   method         from
##   [.quosures     rlang
##   c.quosures     rlang
##   print.quosures rlang
```

```r
sout <- sample(die1, 1000, replace=TRUE)
ggplot(data=data.frame(sout),aes(x=sout)) +
  geom_histogram(aes(y=..count../sum(..count..))) +
  xlim(0, 7) + ylab("density") + xlab("outcome")
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.

## Warning: Removed 660 rows containing non-finite values (stat_bin).

## Warning: Removed 2 rows containing missing values (geom_bar).
```



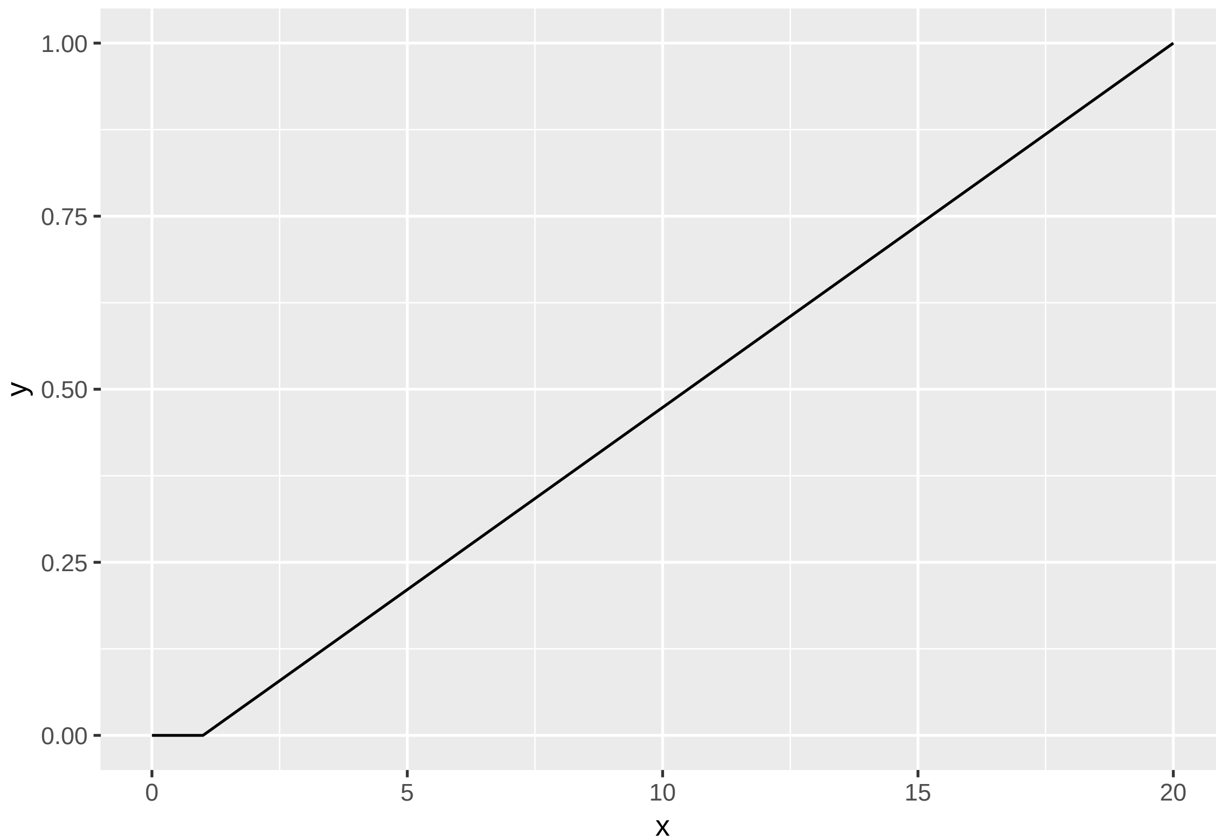

```r
#It is a Uniform distribution, all outcomes are equally probable  and have a constant probability
#2c.
uniformfun<-function(x)
{
ifelse(x>=1&x<=20,dice(20),0)
}
uniformfun(3)
```

```
## [1] 0.05
```

```r
uniformfun(89)
```

```
## [1] 0
```

```
#2d.
uniformcdf<-function(x)
{
ifelse(x>=1&x<=20,(x-1)/(20-1),0)
}
ggplot(data=data.frame(x=c(0:20)),aes(x)) + stat_function(fun=uniformcdf)
```




```
Prob1<-uniformcdf(20)-uniformcdf(14)
Prob1
```

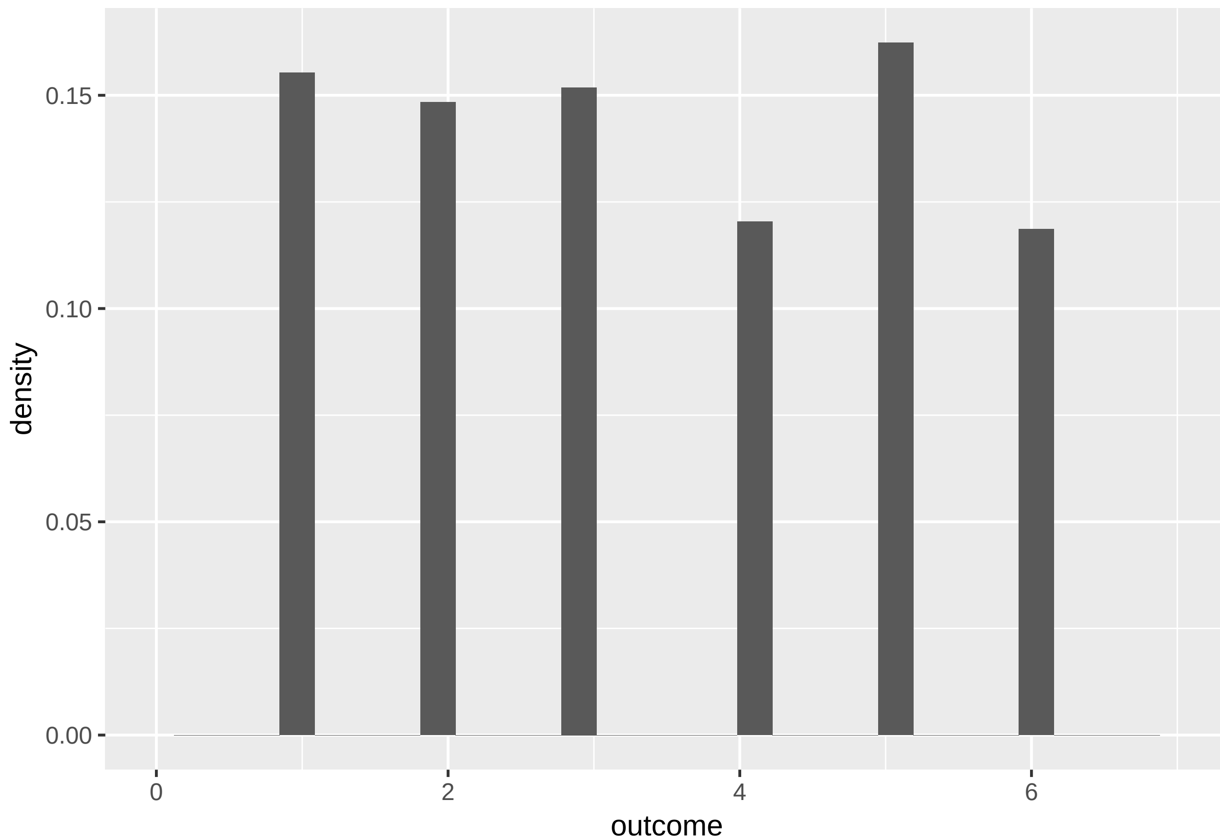
```
## [1] 0.3157895
```

```
#2e.
rolldice<-function(){
die2=c(1:6)
sout1<-sample(die2,4,replace=TRUE)
b<-sum(sout1)-min(sout1)
return(b)
}
sout2<-sample(rolldice(),1000,replace=TRUE)
ggplot(data=data.frame(sout2),aes(x=sout2)) +
  geom_histogram(aes(y=..count../sum(..count..))) +
  xlim(0, 7) + ylab("density") + xlab("outcome")
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.

## Warning: Removed 427 rows containing non-finite values (stat_bin).

## Warning: Removed 2 rows containing missing values (geom_bar).
```




```
#3a.
pbinom(500,size=10000,prob=(1/20),lower.tail=TRUE)
```

```
## [1] 0.511895
```

```
SMPL1<-sample(die1,10000,replace=TRUE)
Proportion<-sum((SMPL1==20))/10000
Proportion
```

```
## [1] 0.0516
```

```
#3b.
a<-rbinom(1,1000,1/100)
a
```

```
## [1] 15
```

```r
sum(a==1)
```

```
## [1] 0
```

```r
#3c.
ppois(1,5,lower.tail=FALSE)
```

```
## [1] 0.9595723
```

```r
#3d.
pnorm(85,mean=70,sd=10,lower.tail=FALSE)
```

```
## [1] 0.0668072
```

```r
pnorm(85,mean=70,sd=10,lower.tail=TRUE)-pnorm(55,mean=70,sd=10,lower.tail=TRUE)
```

```
## [1] 0.8663856
```

```r
1-pnorm(40,mean=70,sd=10,lower.tail=FALSE)
```

```
## [1] 0.001349898
```

```r
#3e.
#Normal distribution is an appropriate distribution to simulate grades for a large class strength (say
```