a2q2

(a)

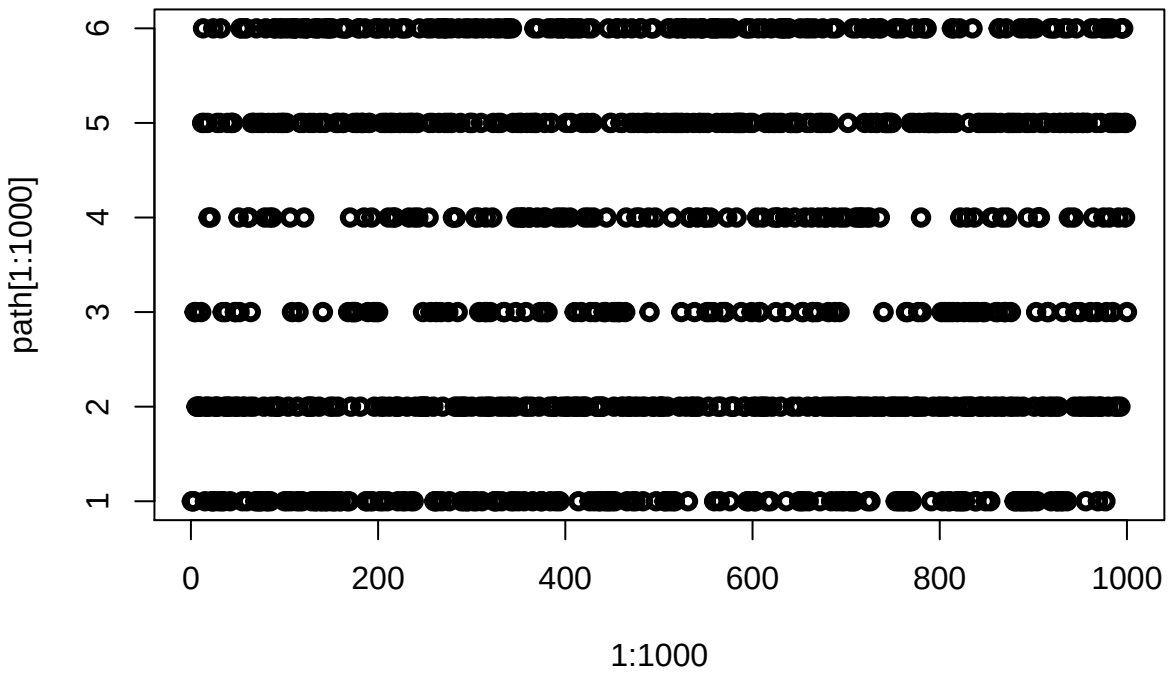
```
P=diag(c(0.5,0.5,0.25,0.25,0.5,0.5))
P[1,2]=P[6,5]=0.5
P[2,1]=P[2,3]=P[5,4]=P[5,6]= 0.25
P[3,1]=P[3,2]=P[3,4]=P[4,6]=P[4,5]=P[4,3]=0.25
P
```

```
##      [,1] [,2] [,3] [,4] [,5] [,6]
## [1,] 0.50 0.50 0.00 0.00 0.00 0.00
## [2,] 0.25 0.50 0.25 0.00 0.00 0.00
## [3,] 0.25 0.25 0.25 0.25 0.00 0.00
## [4,] 0.00 0.00 0.25 0.25 0.25 0.25
## [5,] 0.00 0.00 0.00 0.25 0.50 0.25
## [6,] 0.00 0.00 0.00 0.00 0.50 0.50
```

```
getrand.state=function(x){
  ret=-1
  r=runif(1)
  temp=0
  for(sta in 1:length(x)){
    temp=temp+x[sta]
    if (r <= temp){
      ret = sta
      break
    }
  }
  ret
}

x=c(1,rep(0,5))
path=rep(0,1000)
for (i in 1:1000){
  path[i]=getrand.state(x)
  x= t(P) %*% x
}

plot(1:1000, path[1:1000] ,lwd=3)
```




```
#relative frequency
table(path)/1000
```

```
## path
##     1     2     3     4     5     6
## 0.165 0.225 0.105 0.099 0.232 0.174
```

```
# we guess stationary distribution is c(1/6,2/9,1/9,1/9,2/9,1/6)

t(P)%*%c(1/6,2/9,1/9,1/9,2/9,1/6)
```

```
##           [,1]
## [1,] 0.1666667
## [2,] 0.2222222
## [3,] 0.1111111
## [4,] 0.1111111
## [5,] 0.2222222
## [6,] 0.1666667
```