STT810 ICA3 Tiancheng Liu

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a

```
sim <- 10000
win <- replicate(sim,0)
for(i in 1:sim){
  P <- c(0,0,0)
  while(max(P) < 8){
    for(j in 1:3){
      roll <- sample(1:6,1)
      P[j] = P[j] + roll
      if(P[j] >= 8){
        break
      }
    }
  }
  win[i] <- j
}
sum(win == 1)/sim
```

```
## [1] 0.5687
```

```
sum(win == 2)/sim
```

```
## [1] 0.281
```

```
sum(win == 3)/sim
```

```
## [1] 0.1503
```

b

```
sim <- 10000
win <- replicate(sim,0)
for(i in 1:sim){
  P <- c(0,0,0)
  while(max(P) < 50){
    for(j in 1:3){
      roll <- sample(1:6,1)
      P[j] = P[j] + roll
      if(P[j] >= 50){
        break
      }
    }
  }
  win[i] <- j
}
sum(win == 1)/sim
```

```
## [1] 0.4125
```

```
sum(win == 2)/sim
```

```
## [1] 0.3274
```

```
sum(win == 3)/sim
```

```
## [1] 0.2601
```

The winning percentage for 1 lowers and the winning percentage ofr 2 and 3 increases, since it takes more rolls to stack to 50, 2 and 3 have more chances to roll larger numbers than 1.

c

```
sim <- 10000
win <- replicate(sim,0)
for(i in 1:sim){
  P <- c(0,0,0)
  while(max(P) < 50){
    for(j in 1:3){
      roll <- sample(1:4,1)
      P[j] = P[j] + roll
      if(P[j] >= 50){
        break
      }
    }
  }
  win[i] <- j
}
sum(win == 1)/sim
```

```
## [1] 0.4076
```

```
sum(win == 2)/sim
```

```
## [1] 0.3226
```

```
sum(win == 3)/sim
```

```
## [1] 0.2698
```

The winning percentage is similar to that in b. Because the chances for them to roll a side of the dice are still the same, the earlier the dice the higher of chance they have to win.

d

```
sim <- 10000
win <- replicate(sim,0)
for(i in 1:sim){
  P <- c(0,0,0)
  while(max(P) < 8){
    for(j in 1:3){
      roll <- sample(1:6,1)
      P[j] = P[j] + roll
      if(P[j] == 4){
      roll <- sample(1:6,1)
      P[j] = P[j] + roll
    }
      if(P[j] >= 8){
        break
      }
    }
  }
  win[i] <- j
}
sum(win == 1)/sim
```

```
## [1] 0.5383
```

```
sum(win == 2)/sim
```

```
## [1] 0.2886
```

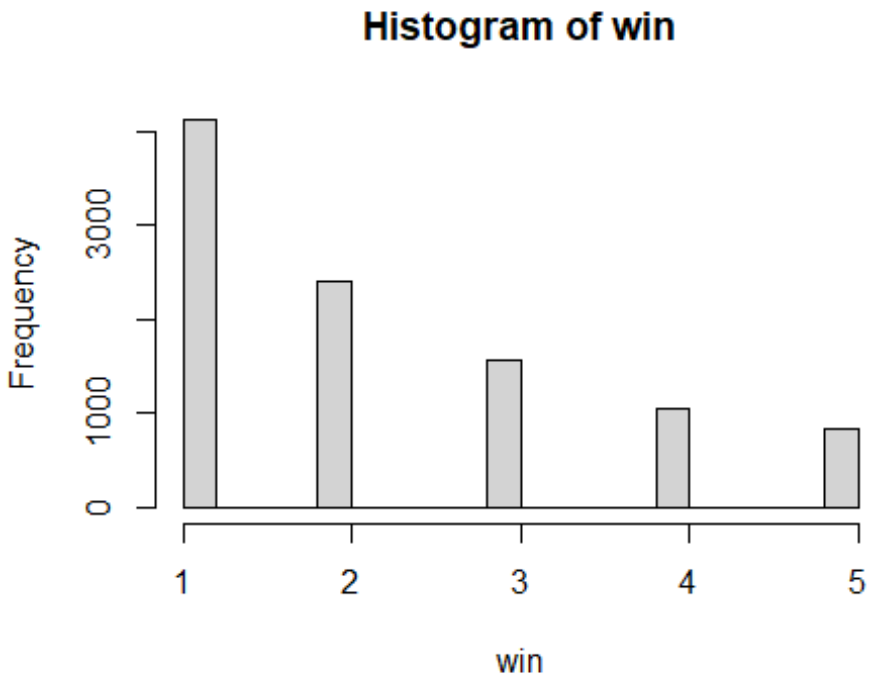
```
sum(win == 3)/sim
```

```
## [1] 0.1731
```

e

```
sim <- 10000
win <- replicate(sim,0)
for(i in 1:sim){
  P <- c(0,0,0,0,0)
  while(max(P) < 8){
    for(j in 1:5){
```

```
      roll <- sample(1:6,1)
      P[j] = P[j] + roll
      if(P[j] == 4){
      roll <- sample(1:6,1)
      P[j] = P[j] + roll
    }
      if(P[j] >= 8){
        break
      }
    }
  }
  win[i] <- j
}
sum(win == 1)/sim

## [1] 0.4127

sum(win == 2)/sim

## [1] 0.2413

sum(win == 3)/sim

## [1] 0.1558

sum(win == 4)/sim

## [1] 0.1058

sum(win == 5)/sim

## [1] 0.0844

hist(win)
```


Histogram of win
Frequency
0
1000
3000
1
2
3
4
5
win