STT810 ICA3 Tiancheng Liu

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2022-09-13

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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)

