**#ερωτημα1**

set.seed(281200)

game1<-function(k){

matches <- list(c("A1", "A16"), c("A8", "A9"), c("A5", "A12"), c("A4", "A13"), c("A3", "A14"), c("A6", "A11"), c("A7", "A10"), c("A2", "A15"))

team\_means <- c(81.15, 76.30, 77.15, 78.24, 79.20, 76.55, 76.41, 80.87, 76.28, 72.15, 74.86, 73.85, 73.78, 73.59, 69.47, 76.30)

winners1 <- c() #νικητες πρωτης αναμετρησης

winners2 <- c() #νικητες δευτερης αναμετρησης

winners3<- c() #νικητες τριτης αναμετρησης

#πρωτη αναμετρηση

#πρωτοι αγωνες για ολες τις ομαδες

for (i in 1:8) {

team1 <- matches[[i]][1]

team2 <- matches[[i]][2]

mean\_team1 <- team\_means[as.numeric(gsub("A", "", team1))]

mean\_team2 <- team\_means[as.numeric(gsub("A", "", team2))]

score\_team1 <- floor(rnorm(1, mean\_team1, k))

score\_team2 <- floor(rnorm(1, mean\_team2, k))

if (score\_team1 > score\_team2 || (score\_team1 == score\_team2 && runif(1) > 0.5)) {

winners1 <- c(winners1, team1)

} else {

winners1 <- c(winners1, team2)

}

}

#δευτερη αναμετρηση

#αγωνες για τις ομαδες που κερδισαν στον πρωτο γυρο

list\_winners1<-list(c(winners1[1],winners1[2]),c(winners1[3],winners1[4]),c(winners1[5],winners1[6]),c(winners1[7],winners1[8]))

for (i in 1:4){

team1 <- list\_winners1[[i]][1]

team2 <- list\_winners1[[i]][2]

mean\_team1 <- team\_means[as.numeric(gsub("A", "", team1))]

mean\_team2 <- team\_means[as.numeric(gsub("A", "", team2))]

score\_team1 <- floor(rnorm(1, mean\_team1, k))

score\_team2 <- floor(rnorm(1, mean\_team2, k))

if (score\_team1 > score\_team2 || (score\_team1 == score\_team2 && runif(1) > 0.5)) {

winners2 <- c(winners2, team1)

} else {

winners2 <- c(winners2, team2)

}

}

#τριτη αναμετρηση

#αγωνες για τις ομαδες που κερδισαν στον δευτερο γυρο

list\_winners2<-list(c(winners2[1],winners2[2]),c(winners2[3],winners2[4]))

for (i in 1:2){

team1 <- list\_winners2[[i]][1]

team2 <- list\_winners2[[i]][2]

mean\_team1 <- team\_means[as.numeric(gsub("A", "", team1))]

mean\_team2 <- team\_means[as.numeric(gsub("A", "", team2))]

score\_team1 <- floor(rnorm(1, mean\_team1, k))

score\_team2 <- floor(rnorm(1, mean\_team2, k))

if (score\_team1 > score\_team2 || (score\_team1 == score\_team2 && runif(1) > 0.5)) {

winners3 <- c(winners3, team1)

} else {

winners3 <- c(winners3, team2)

}

}

return(winners3)

}

game2<-function(k){

team\_means <- c(81.15, 76.30, 77.15, 78.24, 79.20, 76.55, 76.41, 80.87, 76.28, 72.15, 74.86, 73.85, 73.78, 73.59, 69.47, 76.30)

winners3<-game1(k)

team1 <- winners3[1]

team2 <- winners3[2]

mean\_team1 <- team\_means[as.numeric(gsub("A", "", team1))]

mean\_team2 <- team\_means[as.numeric(gsub("A", "", team2))]

score\_team1 <- floor(rnorm(1, mean\_team1, k))

score\_team2 <- floor(rnorm(1, mean\_team2, k))

if (score\_team1 > score\_team2 || (score\_team1 == score\_team2 && runif(1) > 0.5)) {

return(team1)

} else {

return(team2)

}

}

nikitis<-replicate(10000,game2(13))

win<-table(nikitis) #ποσες φορες η κάθε ομαδα κερδιζει

telikos<-replicate(10000,game1(13))

teliko<-table(telikos) #ποσες φορες η κάθε ομαδα φτανει τελικο

par(mfrow = c(1, 2))

barplot(win, xlab="Team", ylab="Number of Wins", main="Results for k=13")

barplot(teliko, xlab="Team", ylab="Number of Finals", main="Results for k=13")

#πιθανοτητες να φτασει η κάθε ομαδα τελικο και να νικησει

pithanotita\_win<-win/10000

pithanotita\_win #πιθανοτητες για νικη

pithanotita\_telikou<-teliko/10000

pithanotita\_telikou #πιθανοτητες για τελικο

sum(pithanotita\_telikou) #παρατηρουμε ότι οι πιθανοτητες για τον τελικο αθροιζουν στο 2

sum(pithanotita\_win)

**#ερωτημα2**

nikitis2<-replicate(10000,game2(20))

win2<-table(nikitis2) #ποσες φορες η κάθε ομαδα κερδιζει

telikos2<-replicate(10000,game1(20))

teliko2<-table(telikos2) #ποσες φορες η κάθε ομαδα φτανει τελικο

par(mfrow = c(1, 2))

barplot(win2, xlab="Team", ylab="Number of Wins", main="Results for k=20")

barplot(teliko2, xlab="Team", ylab="Number of Finals", main="Results for k=20")

#πιθανοτητες να φτασει η κάθε ομαδα τελικο και να νικησει

pithanotita\_win2<-win2/10000

pithanotita\_win2 #πιθανοτητες για νικη

pithanotita\_telikou2<-teliko2/10000

pithanotita\_telikou2 #πιθανοτητες για τελικο

**#ερωτημα3**

game3<-function(){

matches <- list(c("A1", "A16"), c("A8", "A9"), c("A5", "A12"), c("A4", "A13"), c("A3", "A14"), c("A6", "A11"), c("A7", "A10"), c("A2", "A15"))

team\_means <- c(81.15, 76.30, 77.15, 78.24, 79.20, 76.55, 76.41, 80.87, 76.28, 72.15, 74.86, 73.85, 73.78, 73.59, 69.47, 76.30)

winners1 <- c() #νικητες πρωτης αναμετρησης

winners2 <- c() #νικητες δευτερης αναμετρησης

winners3<- c() #νικητες τριτης αναμετρησης

#πρωτη αναμετρηση

#πρωτοι αγωνες για ολες τις ομαδες

for (i in 1:8) {

team1 <- matches[[i]][1]

team2 <- matches[[i]][2]

mean\_team1 <- team\_means[as.numeric(gsub("A", "", team1))]

mean\_team2 <- team\_means[as.numeric(gsub("A", "", team2))]

if (team1 %in% c("A1", "A2")) {

score\_team1 <- floor(rnorm(1, mean\_team1-5 , 13))

} else {

score\_team1 <- floor(rnorm(1, mean\_team1, 13))

}

score\_team2 <- floor(rnorm(1, mean\_team2, 13))

if (score\_team1 > score\_team2 || (score\_team1 == score\_team2 && runif(1) > 0.5)) {

winners1 <- c(winners1, team1)

} else {

winners1 <- c(winners1, team2)

}

}

#δευτερη αναμετρηση

#αγωνες για τις ομαδες που κερδισαν στον πρωτο γυρο

list\_winners1<-list(c(winners1[1],winners1[2]),c(winners1[3],winners1[4]),c(winners1[5],winners1[6]),c(winners1[7],winners1[8]))

for (i in 1:4){

team1 <- list\_winners1[[i]][1]

team2 <- list\_winners1[[i]][2]

mean\_team1 <- team\_means[as.numeric(gsub("A", "", team1))]

mean\_team2 <- team\_means[as.numeric(gsub("A", "", team2))]

if (team1 %in% c("A1", "A2")) {

score\_team1 <- floor(rnorm(1, mean\_team1-5 , 13))

} else {

score\_team1 <- floor(rnorm(1, mean\_team1, 13))

}

score\_team2 <- floor(rnorm(1, mean\_team2, 13))

if (score\_team1 > score\_team2 || (score\_team1 == score\_team2 && runif(1) > 0.5)) {

winners2 <- c(winners2, team1)

} else {

winners2 <- c(winners2, team2)

}

}

#τριτη αναμετρηση

#αγωνες για τις ομαδες που κερδισαν στον δευτερο γυρο

list\_winners2<-list(c(winners2[1],winners2[2]),c(winners2[3],winners2[4]))

for (i in 1:2){

team1 <- list\_winners2[[i]][1]

team2 <- list\_winners2[[i]][2]

mean\_team1 <- team\_means[as.numeric(gsub("A", "", team1))]

mean\_team2 <- team\_means[as.numeric(gsub("A", "", team2))]

score\_team1 <- floor(rnorm(1, mean\_team1, 13))

score\_team2 <- floor(rnorm(1, mean\_team2, 13))

if (score\_team1 > score\_team2 || (score\_team1 == score\_team2 && runif(1) > 0.5)) {

winners3 <- c(winners3, team1)

} else {

winners3 <- c(winners3, team2)

}

}

return(winners3)

}

game4<-function(){

team\_means <- c(81.15, 76.30, 77.15, 78.24, 79.20, 76.55, 76.41, 80.87, 76.28, 72.15, 74.86, 73.85, 73.78, 73.59, 69.47, 76.30)

winners3<-game3()

team1 <- winners3[1]

team2 <- winners3[2]

mean\_team1 <- team\_means[as.numeric(gsub("A", "", team1))]

mean\_team2 <- team\_means[as.numeric(gsub("A", "", team2))]

score\_team1 <- floor(rnorm(1, mean\_team1, 13))

score\_team2 <- floor(rnorm(1, mean\_team2, 13))

if (score\_team1 > score\_team2 || (score\_team1 == score\_team2 && runif(1) > 0.5)) {

return(team1)

} else {

return(team2)

}

}

nikitis3<-replicate(10000,game4())

win3<-table(nikitis3) #ποσες φορες η κάθε ομαδα κερδιζει

telikos3<-replicate(10000,game3())

teliko3<-table(telikos3) #ποσες φορες η κάθε ομαδα φτανει τελικο

par(mfrow = c(1, 2))

barplot(win3, xlab="Team", ylab="Number of Wins", main="Results for 3th case")

barplot(teliko3, xlab="Team", ylab="Number of Finals", main="Results for 3th case")

#πιθανοτητες να φτασει η κάθε ομαδα τελικο και να νικησει

pithanotita\_win3<-win3/10000

pithanotita\_win3 #πιθανοτητες για νικη

pithanotita\_telikou3<-teliko3/10000

pithanotita\_telikou3 #πιθανοτητες για τελικο