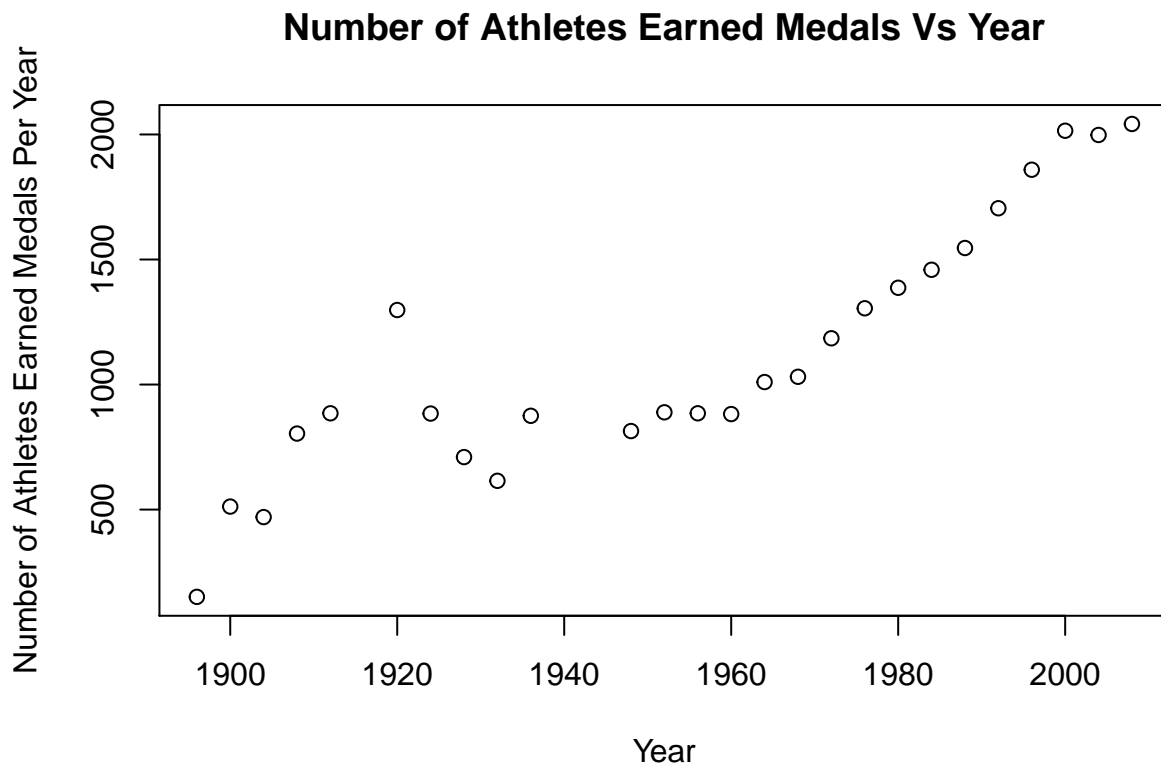# lab5

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April 15, 2019

```
library(RSQLite)
library(DBI)
dbcon = dbConnect(SQLite(), dbname="stat240Week5.sqlite")
dbListTables(dbcon)

## [1] "CA"         "Olymp_meds" "POP2006"    "POP2011"    "Pokem"
## [6] "Vanpoke"    "WinterO"    "tickets"    "zip"
```

Question1

(a)

```
athlete_table=dbGetQuery(dbcon, "SELECT Edition, Count(Athlete) As TotalAthleteNumber
FROM Olymp_meds GROUP BY Edition")
plot(x=athlete_table$Edition, y=athlete_table$TotalAthleteNumber, type="p",
     xlab="Year", ylab="Number of Athletes Earned Medals Per Year",
     main="Number of Athletes Earned Medals Vs Year", col=1 )
```

(b)

```
mov_avg2 = "CREATE VIEW tot_meds AS SELECT Edition, Count(Edition) AS
TotalNumber FROM Olymp_meds GROUP BY Edition"
dbSendQuery(dbcon, mov_avg2)
```

```
## <SQLiteResult>
##   SQL  CREATE VIEW tot_meds AS SELECT Edition, Count(Edition) AS
## TotalNumber FROM Olymp_meds GROUP BY Edition
##   ROWS Fetched: 0 [complete]
##       Changed: 0
```
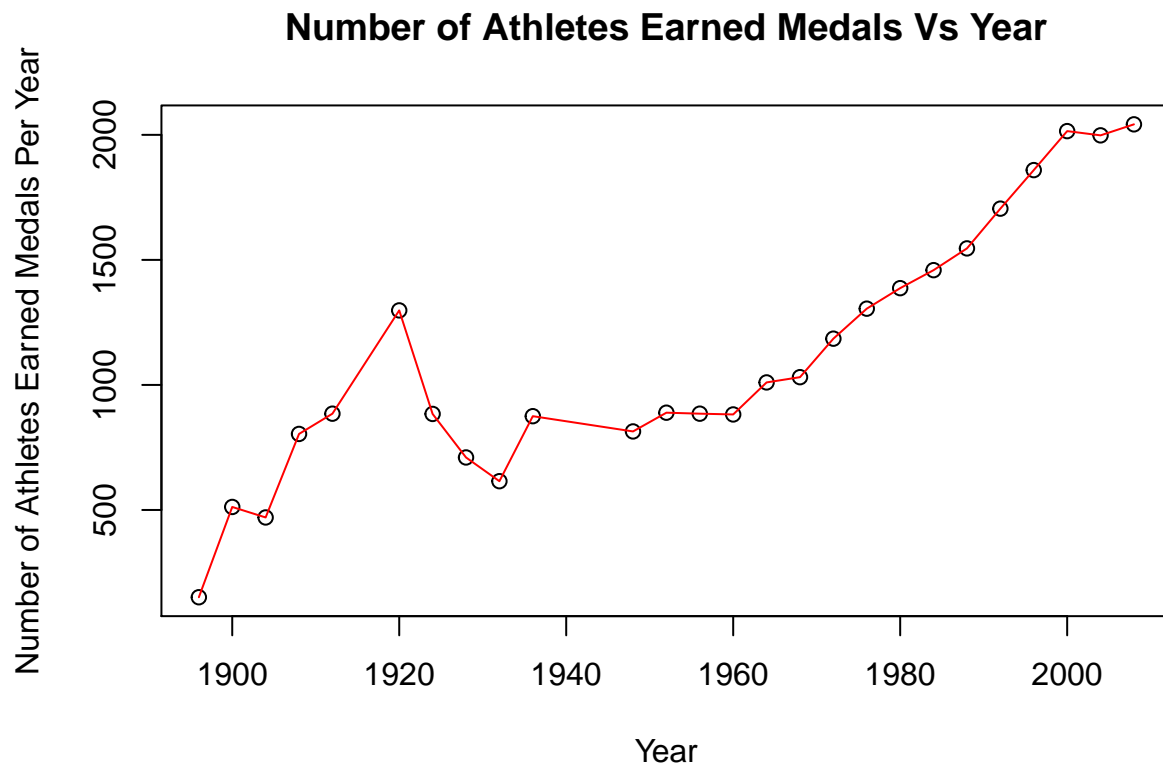
```
dbListTables(dbcon)
```

```
## Warning: Closing open result set, pending rows
```

```
## [1] "CA"         "Olymp_meds" "POP2006"    "POP2011"    "Pokem"
## [6] "Vanpoke"    "WinterO"    "tickets"    "tot_meds"   "zip"
```

```
# dbSendQuery(dbcon, "drop view tot_meds")
```

(c)

```
plot(x=athlete_table$Edition, y=athlete_table$TotalAthleteNumber, type="p",
     xlab="Year", ylab="Number of Athletes Earned Medals Per Year",
     main="Number of Athletes Earned Medals Vs Year", col=1 )
lines(athlete_table$Edition, athlete_table$TotalAthleteNumber, col=2, lty=1)
```

Number of Athletes Earned Medals Vs Year

(d)

```
check = "SELECT * FROM tot_meds AS t, (SELECT t1.Edition, AVG(t2.TotalNumber)
AS mavg FROM tot_meds AS t1, tot_meds AS t2 WHERE t2.Edition
BETWEEN (t1.Edition-4) AND (t1.Edition+4) GROUP BY t1.Edition) sq
WHERE (t.Edition = sq.Edition)"
movingAvg = dbGetQuery(dbcon, check)
# dbReadTable(dbcon, "tot_meds")
plot(x=athlete_table$Edition, y=athlete_table$TotalAthleteNumber, type="p",
     xlab="Year", ylab="Number of Athletes Earned Medals Per Year",
     main="Number of Athletes Earned Medals Vs Year", col=1 )
lines(athlete_table$Edition, athlete_table$TotalAthleteNumber, col=2, lty=1)
lines(athlete_table$Edition, movingAvg$mavg, col=3, lty=6)
legend("topleft", c("Medals Earned","Medals Earned","MovingAvg"),
       col=1:3, lty=c(NA,1,6), pch=c(1,NA,NA) )
```
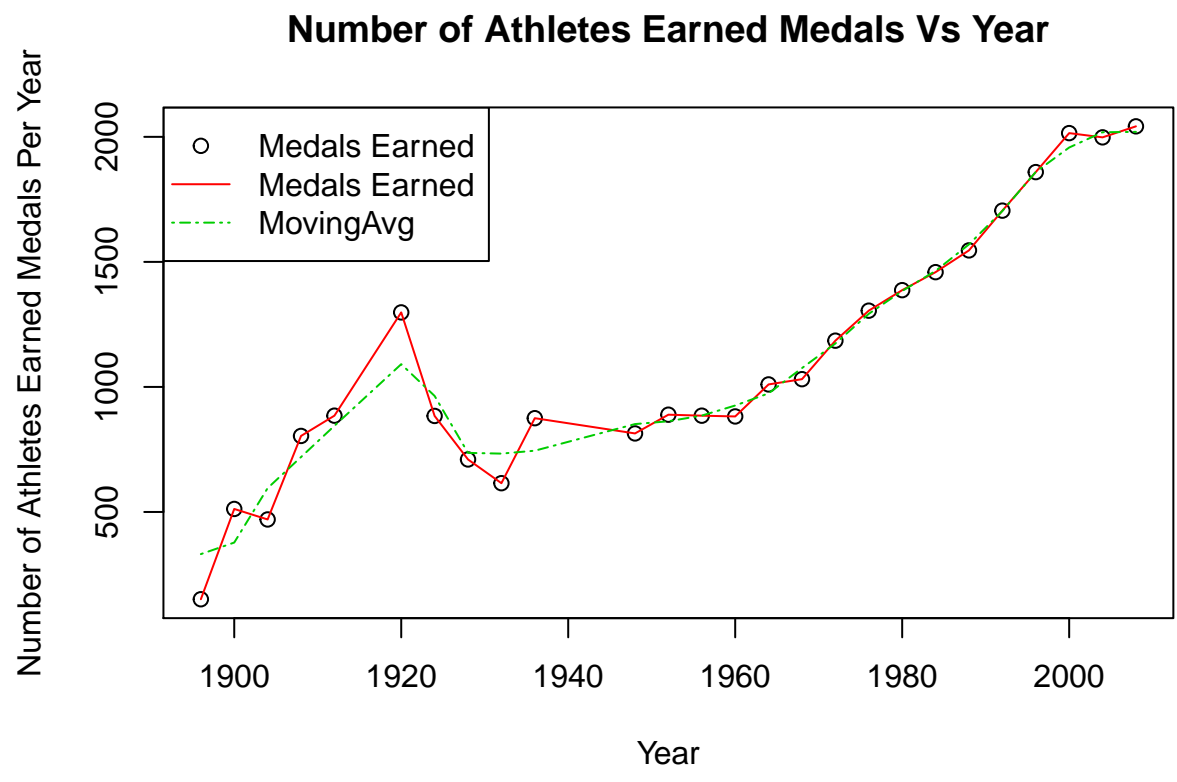
Number of Athletes Earned Medals Vs Year

Number of Athletes Earned Medals Per Year

- o Medals Earned
- — Medals Earned
- -·- MovingAvg

Year

Question2

(a)

```
meds = "SELECT Year, Count(Year) AS TotalNumber FROM WinterO
GROUP BY Country, Year HAVING Country =='Canada' AND Year == 2010"
out = dbGetQuery(dbcon, meds)
out
```

```
##   year TotalNumber
## 1 2010         102
```

```
#However, the actual number is 26
winter_table=dbReadTable(dbcon, "WinterO")
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
filter(winter_table, Country == "Canada" & year=="2010")
```

```
##          place year Country  Medal               Event
## 1    Vancouver 2010  Canada Silver        moguls women
## 2    Vancouver 2010  Canada Bronze        four-man men
## 3    Vancouver 2010  Canada Bronze        four-man men
## 4    Vancouver 2010  Canada Bronze        four-man men
## 5    Vancouver 2010  Canada Bronze        four-man men
## 6    Vancouver 2010  Canada Bronze        four-man men
## 7    Vancouver 2010  Canada   Gold       two-man women
## 8    Vancouver 2010  Canada   Gold       two-man women
## 9    Vancouver 2010  Canada   Gold       two-man women
## 10   Vancouver 2010  Canada Silver       two-man women
## 11   Vancouver 2010  Canada Silver       two-man women
## 12   Vancouver 2010  Canada Silver       two-man women
## 13   Vancouver 2010  Canada   Gold         curling men
## 14   Vancouver 2010  Canada   Gold         curling men
## 15   Vancouver 2010  Canada   Gold         curling men
## 16   Vancouver 2010  Canada   Gold         curling men
## 17   Vancouver 2010  Canada   Gold         curling men
## 18   Vancouver 2010  Canada   Gold         curling men
## 19   Vancouver 2010  Canada Silver       curling women
## 20   Vancouver 2010  Canada Silver       curling women
## 21   Vancouver 2010  Canada Silver       curling women
## 22   Vancouver 2010  Canada Silver       curling women
## 23   Vancouver 2010  Canada Silver       curling women
## 24   Vancouver 2010  Canada Silver       curling women
## 25   Vancouver 2010  Canada   Gold         moguls men
## 26   Vancouver 2010  Canada   Gold     Ski Cross women
```

```
## 27   Vancouver 2010   Canada Bronze        individual women
## 28   Vancouver 2010   Canada   Gold       ice dancing mixed
## 29   Vancouver 2010   Canada   Gold       ice dancing mixed
## 30   Vancouver 2010   Canada   Gold       ice dancing mixed
## 31   Vancouver 2010   Canada   Gold          ice hockey men
## 32   Vancouver 2010   Canada   Gold          ice hockey men
## 33   Vancouver 2010   Canada   Gold          ice hockey men
## 34   Vancouver 2010   Canada   Gold          ice hockey men
## 35   Vancouver 2010   Canada   Gold          ice hockey men
## 36   Vancouver 2010   Canada   Gold          ice hockey men
## 37   Vancouver 2010   Canada   Gold          ice hockey men
## 38   Vancouver 2010   Canada   Gold          ice hockey men
## 39   Vancouver 2010   Canada   Gold          ice hockey men
## 40   Vancouver 2010   Canada   Gold          ice hockey men
## 41   Vancouver 2010   Canada   Gold          ice hockey men
## 42   Vancouver 2010   Canada   Gold          ice hockey men
## 43   Vancouver 2010   Canada   Gold          ice hockey men
## 44   Vancouver 2010   Canada   Gold          ice hockey men
## 45   Vancouver 2010   Canada   Gold          ice hockey men
## 46   Vancouver 2010   Canada   Gold          ice hockey men
## 47   Vancouver 2010   Canada   Gold          ice hockey men
## 48   Vancouver 2010   Canada   Gold          ice hockey men
## 49   Vancouver 2010   Canada   Gold          ice hockey men
## 50   Vancouver 2010   Canada   Gold          ice hockey men
## 51   Vancouver 2010   Canada   Gold          ice hockey men
## 52   Vancouver 2010   Canada   Gold          ice hockey men
## 53   Vancouver 2010   Canada   Gold          ice hockey men
## 54   Vancouver 2010   Canada   Gold          ice hockey men
## 55   Vancouver 2010   Canada   Gold        ice hockey women
## 56   Vancouver 2010   Canada   Gold        ice hockey women
## 57   Vancouver 2010   Canada   Gold        ice hockey women
## 58   Vancouver 2010   Canada   Gold        ice hockey women
## 59   Vancouver 2010   Canada   Gold        ice hockey women
## 60   Vancouver 2010   Canada   Gold        ice hockey women
## 61   Vancouver 2010   Canada   Gold        ice hockey women
## 62   Vancouver 2010   Canada   Gold        ice hockey women
## 63   Vancouver 2010   Canada   Gold        ice hockey women
## 64   Vancouver 2010   Canada   Gold        ice hockey women
## 65   Vancouver 2010   Canada   Gold        ice hockey women
## 66   Vancouver 2010   Canada   Gold        ice hockey women
## 67   Vancouver 2010   Canada   Gold        ice hockey women
## 68   Vancouver 2010   Canada   Gold        ice hockey women
## 69   Vancouver 2010   Canada   Gold        ice hockey women
## 70   Vancouver 2010   Canada   Gold        ice hockey women
## 71   Vancouver 2010   Canada   Gold        ice hockey women
## 72   Vancouver 2010   Canada   Gold        ice hockey women
## 73   Vancouver 2010   Canada   Gold        ice hockey women
## 74   Vancouver 2010   Canada   Gold        ice hockey women
## 75   Vancouver 2010   Canada   Gold        ice hockey women
## 76   Vancouver 2010   Canada   Gold        ice hockey women
## 77   Vancouver 2010   Canada   Gold Giant parallel slalom men
## 78   Vancouver 2010   Canada Silver      Snowboard Cross men
## 79   Vancouver 2010   Canada   Gold    Snowboard Cross women
## 80   Vancouver 2010   Canada   Gold          individual men
```

```
## 81  Vancouver 2010   Canada    Gold          Team pursuit men
## 82  Vancouver 2010   Canada    Gold          Team pursuit men
## 83  Vancouver 2010   Canada    Gold          Team pursuit men
## 84  Vancouver 2010   Canada    Gold          Team pursuit men
## 85  Vancouver 2010   Canada    Gold              1000m women
## 86  Vancouver 2010   Canada  Silver             1500m women
## 87  Vancouver 2010   Canada  Bronze             3000m women
## 88  Vancouver 2010   Canada  Bronze             5000m women
## 89  Vancouver 2010   Canada    Gold                500m men
## 90  Vancouver 2010   Canada  Bronze                500m men
## 91  Vancouver 2010   Canada    Gold          5000m relay men
## 92  Vancouver 2010   Canada    Gold          5000m relay men
## 93  Vancouver 2010   Canada    Gold          5000m relay men
## 94  Vancouver 2010   Canada    Gold          5000m relay men
## 95  Vancouver 2010   Canada    Gold          5000m relay men
## 96  Vancouver 2010   Canada    Gold          5000m relay men
## 97  Vancouver 2010   Canada  Silver              500m women
## 98  Vancouver 2010   Canada  Silver       3000m relay women
## 99  Vancouver 2010   Canada  Silver       3000m relay women
## 100 Vancouver 2010   Canada  Silver       3000m relay women
## 101 Vancouver 2010   Canada  Silver       3000m relay women
## 102 Vancouver 2010   Canada  Silver       3000m relay women
##                          Athlete Record
## 1              Jennifer HEIL
## 2
## 3                Lyndon RUSH
## 4              Chris LE BIHAN
## 5               David BISSETT
## 6             Lascelles BROWN
## 7
## 8             Kaillie HUMPHRIES
## 9               Heather MOYSE
## 10
## 11             Helen UPPERTON
## 12          Shelley-Ann BROWN
## 13
## 14               Kevin MARTIN
## 15                John MORRIS
## 16              Marc KENNEDY
## 17                Ben HEBERT
## 18              Adam ENRIGHT
## 19
## 20             Cheryl BERNARD
## 21             Susan O CONNOR
## 22          Carolyn DARBYSHIRE
## 23                Cori BARTEL
## 24              Kristie MOORE
## 25          Alexandre BILODEAU
## 26             Ashleigh McIVOR
## 27            Joannie ROCHETTE
## 28
## 29              Tessa VIRTUE
## 30                Scott MOIR
## 31
```

```
## 32            Roberto LUONGO
## 33            Brenden MORROW
## 34           Patrick MARLEAU
## 35            Jarome IGINLA
## 36             Dany HEATLEY
## 37           Jonathan TOEWS
## 38            Mike RICHARDS
## 39             Joe THORNTON
## 40             Duncan KEITH
## 41            Chris PRONGER
## 42               Eric STAAL
## 43                Dan BOYLE
## 44              Corey PERRY
## 45         Scott NIEDERMAYER
## 46         Marc-Andre FLEURY
## 47            Martin BRODEUR
## 48          Patrice BERGERON
## 49             Ryan GETZLAF
## 50               Shea WEBER
## 51                Rick NASH
## 52            Brent SEABROOK
## 53             Drew DOUGHTY
## 54            Sidney CROSBY
## 55
## 56          Shannon SZABADOS
## 57             Gillian APPS
## 58         Meaghan MIKKELSON
## 59         Caroline OUELLETTE
## 60             Jayna HEFFORD
## 61         Jennifer BOTTERILL
## 62            Catherine WARD
## 63             Meghan AGOSTA
## 64              Haley IRWIN
## 65        Hayley WICKENHEISER
## 66            Tessa BONHOMME
## 67         Sarah VAILLANCOURT
## 68             Gina KINGSBURY
## 69        Marie-Philip POULIN
## 70             Carla MACLEOD
## 71          Charline LABONTE
## 72             Kim ST-PIERRE
## 73              Becky KELLAR
## 74          Colleen SOSTORICS
## 75          Rebecca JOHNSTON
## 76              Cherie PIPER
## 77         Jasey Jay ANDERSON
## 78            Mike ROBERTSON
## 79             Maelle RICKER
## 80            Jon MONTGOMERY
## 81
## 82            Mathieu GIROUX
## 83            Lucas MAKOWSKY
## 84            Denny MORRISON
## 85          Christine NESBITT
```

```
## 86          Kristina GROVES
## 87          Kristina GROVES
## 88            Clara HUGHES
## 89          Charles HAMELIN
## 90  Francois-Louis TREMBLAY
## 91
## 92       Guillaume BASTILLE
## 93          Charles HAMELIN
## 94         Francois HAMELIN
## 95             Olivier JEAN
## 96  Francois-Louis TREMBLAY
## 97       Marianne ST-GELAIS
## 98
## 99            Jessica GREGG
## 100         Kalyna ROBERGE
## 101      Marianne ST-GELAIS
## 102            Tania VICENT
#The 'meds' SQL query does not handle the case where the medal counts for a team sport is only 1.
```

(b)

```
#actual number is 14 gold, 7 silver, and 5 bronze
meds = "SELECT DISTINCT Event,Medal FROM WinterO WHERE year == 2010 AND Country =='Canada' ORDER BY Even
table(dbGetQuery(dbcon, meds)$Medal)
```

```
##
## Bronze    Gold Silver
##      5      14      7
```

Question3

```
UKmeds_temp="CREATE VIEW summerTot_meds AS SELECT DISTINCT Edition,
Sport, Event, Medal, NOC FROM Olymp_meds WHERE NOC=='GBR'"
dbSendQuery(dbcon, UKmeds_temp)
```

```
## <SQLiteResult>
##   SQL  CREATE VIEW summerTot_meds AS SELECT DISTINCT Edition,
## Sport, Event, Medal, NOC FROM Olymp_meds WHERE NOC=='GBR'
##   ROWS Fetched: 0 [complete]
##        Changed: 0
```

```
# dbListTables(dbcon)

# at least 1 medal per summer Olympics
meds_peryear="SELECT DISTINCT Edition, NOC, COUNT(Edition) AS TotalMeds
FROM summerTot_meds GROUP BY Edition"
(UK_meds = dbGetQuery(dbcon, meds_peryear))
```

```
## Warning: Closing open result set, pending rows

##     Edition NOC TotalMeds
## 1      1896 GBR         7
## 2      1900 GBR        28
## 3      1904 GBR         2
## 4      1908 GBR       137
## 5      1912 GBR        41
## 6      1920 GBR        42
## 7      1924 GBR        34
## 8      1928 GBR        20
## 9      1932 GBR        16
## 10     1936 GBR        14
## 11     1948 GBR        23
## 12     1952 GBR        11
## 13     1956 GBR        24
## 14     1960 GBR        20
## 15     1964 GBR        17
## 16     1968 GBR        12
## 17     1972 GBR        18
## 18     1976 GBR        13
## 19     1980 GBR        21
## 20     1984 GBR        36
## 21     1988 GBR        24
## 22     1992 GBR        19
## 23     1996 GBR        15
## 24     2000 GBR        28
## 25     2004 GBR        30
## 26     2008 GBR        45
```

```
# temp UK view
UK_temp="CREATE VIEW UK AS SELECT Edition, NOC, COUNT(Edition) AS TotalMeds
FROM summerTot_meds GROUP BY Edition"
dbSendQuery(dbcon, UK_temp)
```

```
## <SQLiteResult>
##   SQL  CREATE VIEW UK AS SELECT Edition, NOC, COUNT(Edition) AS TotalMeds
```

```
## FROM summerTot_meds GROUP BY Edition
##    ROWS Fetched: 0 [complete]
##        Changed: 0
# dbListTables(dbcon)


# the MA of the current and past 12 years
MA_past="SELECT * FROM UK AS t,
        (SELECT t1.Edition, AVG(t2.TotalMeds) AS MA FROM UK AS t1,
UK AS t2 WHERE t2.Edition BETWEEN (t1.Edition-12) AND (t1.Edition)
GROUP BY t1.Edition) sq WHERE (t.Edition = sq.Edition)"
MA_1=dbGetQuery(dbcon, MA_past)

## Warning: Closing open result set, pending rows
# the MA of with a window containing the past and next 4 years
MA_with4="SELECT * FROM UK AS t,
        (SELECT t1.Edition, AVG(t2.TotalMeds) AS MA FROM UK AS t1,
UK AS t2 WHERE t2.Edition BETWEEN (t1.Edition-4) AND (t1.Edition+4)
GROUP BY t1.Edition) sq WHERE (t.Edition = sq.Edition)"
MA_2=dbGetQuery(dbcon, MA_with4)

plot(UK_meds$Edition, UK_meds$TotalMeds,
     main="Total Medals per Summer Olympics for Great Britain Since 1896",
     xlab="Year",ylab="Medal Counts", type="p", col=1)
lines(MA_1$Edition, MA_1$MA, col=2, lwd=1)
lines(MA_2$Edition, MA_2$MA, col=3, lwd=2)
abline(h=mean(UK_meds$TotalMeds), col=4, lwd=2)

legend("topright", col=1:4, lwd=c(NA,1,2,2), pch=c(1,NA,NA,NA),
       c("UK Medals per Summer Olympics", "MA for Past 12 Years",
         "MA with a Window 4 Years", "Average Medals for All Years"),
       cex=0.75)
```
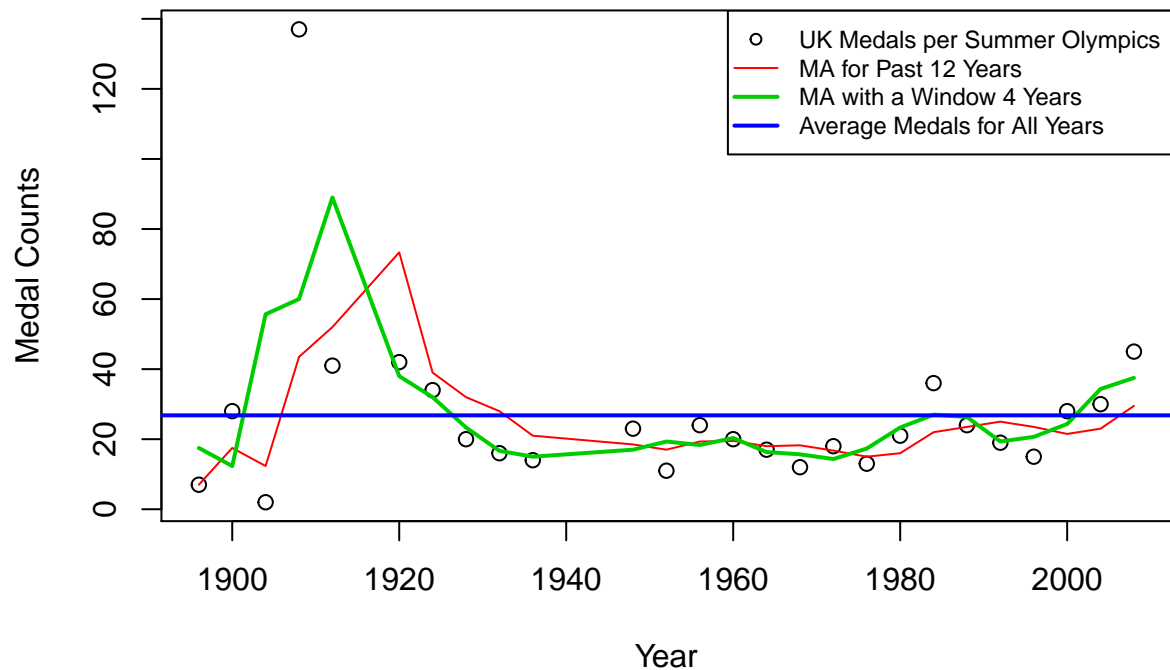
Total Medals per Summer Olympics for Great Britain Since 1896


```r
dbSendQuery(dbcon, "drop view UK")
```

```
## <SQLiteResult>
##   SQL  drop view UK
##   ROWS Fetched: 0 [complete]
##        Changed: 0
```

```r
dbSendQuery(dbcon, "drop view SummerTot_meds")
```

```
## Warning: Closing open result set, pending rows
```

```
## <SQLiteResult>
##   SQL  drop view SummerTot_meds
##   ROWS Fetched: 0 [complete]
##        Changed: 0
```

Question4

```
Canadian = "CREATE VIEW Can_tot_meds AS SELECT Edition AS Year, Count(Edition) AS
TotalNumber FROM Olymp_meds GROUP BY NOC, Edition HAVING NOC =='CAN'"
dbSendQuery(dbcon, Canadian)
```

```
## Warning: Closing open result set, pending rows
```

```
## <SQLiteResult>
##   SQL  CREATE VIEW Can_tot_meds AS SELECT Edition AS Year, Count(Edition) AS
## TotalNumber FROM Olymp_meds GROUP BY NOC, Edition HAVING NOC =='CAN'
##   ROWS Fetched: 0 [complete]
##        Changed: 0
```

```
summaries = "SELECT COUNT(Year) AS YearsInOlympics, AVG(TotalNumber) AS AVGmedalcount ,
MIN(TotalNumber) AS MINmedalcount , MAX(TotalNumber) AS MAXmedalcount FROM Can_tot_meds"
(out = dbGetQuery(dbcon, summaries))
```

```
## Warning: Closing open result set, pending rows
```

```
##   YearsInOlympics AVGmedalcount MINmedalcount MAXmedalcount
## 1              24      24.66667             2            86
```

```
getmedian = "SELECT TotalNumber AS Median FROM Can_tot_meds ORDER BY TotalNumber
LIMIT 1 OFFSET (SELECT COUNT(TotalNumber) FROM Can_tot_meds) /2"
(out = dbGetQuery(dbcon, getmedian))
```

```
##   Median
## 1     20
```

```
dbSendQuery(dbcon, "CREATE VIEW MTL AS SELECT Count(country) AS TotalNumber, country
          FROM Olymp_meds GROUP BY country, place HAVING place == 'Lake PLacid'")
```

```
## <SQLiteResult>
##   SQL  CREATE VIEW MTL AS SELECT Count(country) AS TotalNumber, country
##            FROM Olymp_meds GROUP BY country, place HAVING place == 'Lake PLacid'
##   ROWS Fetched: 0 [complete]
##        Changed: 0
```

```
get10 = "SELECT TotalNumber AS percentile10 FROM Can_tot_meds ORDER BY
TotalNumber LIMIT 1 OFFSET (SELECT COUNT(TotalNumber)*1/10 FROM Can_tot_meds)"
p10 = dbGetQuery(dbcon, get10)
```

```
## Warning: Closing open result set, pending rows
```

```
get30 = "SELECT TotalNumber AS percentile30 FROM Can_tot_meds ORDER BY
TotalNumber LIMIT 1 OFFSET (SELECT COUNT(TotalNumber)*3/10 FROM Can_tot_meds)"
p30 = dbGetQuery(dbcon, get30)
get50 = "SELECT TotalNumber AS percentile50 FROM Can_tot_meds ORDER BY
TotalNumber LIMIT 1 OFFSET (SELECT COUNT(TotalNumber)*5/10 FROM Can_tot_meds)"
p50 = dbGetQuery(dbcon, get50)
get70 = "SELECT TotalNumber AS percentile70 FROM Can_tot_meds ORDER BY
TotalNumber LIMIT 1 OFFSET (SELECT COUNT(TotalNumber)*7/10 FROM Can_tot_meds)"
p70 = dbGetQuery(dbcon, get70)
get90 = "SELECT TotalNumber AS percentile90 FROM Can_tot_meds ORDER BY
TotalNumber LIMIT 1 OFFSET (SELECT COUNT(TotalNumber)*9/10 FROM Can_tot_meds)"
p90 = dbGetQuery(dbcon, get90)
c(p10, p30, p50, p70, p90)
```

```
## $percentile10
## [1] 5
##
## $percentile30
## [1] 10
##
## $percentile50
## [1] 20
##
## $percentile70
## [1] 33
##
## $percentile90
## [1] 51
```

```r
dbSendQuery(dbcon, 'drop view MTL')
```

```
## <SQLiteResult>
##   SQL  drop view MTL
##   ROWS Fetched: 0 [complete]
##        Changed: 0
```

```r
dbSendQuery(dbcon, 'drop view Can_tot_meds')
```

```
## Warning: Closing open result set, pending rows
```

```
## <SQLiteResult>
##   SQL  drop view Can_tot_meds
##   ROWS Fetched: 0 [complete]
##        Changed: 0
```
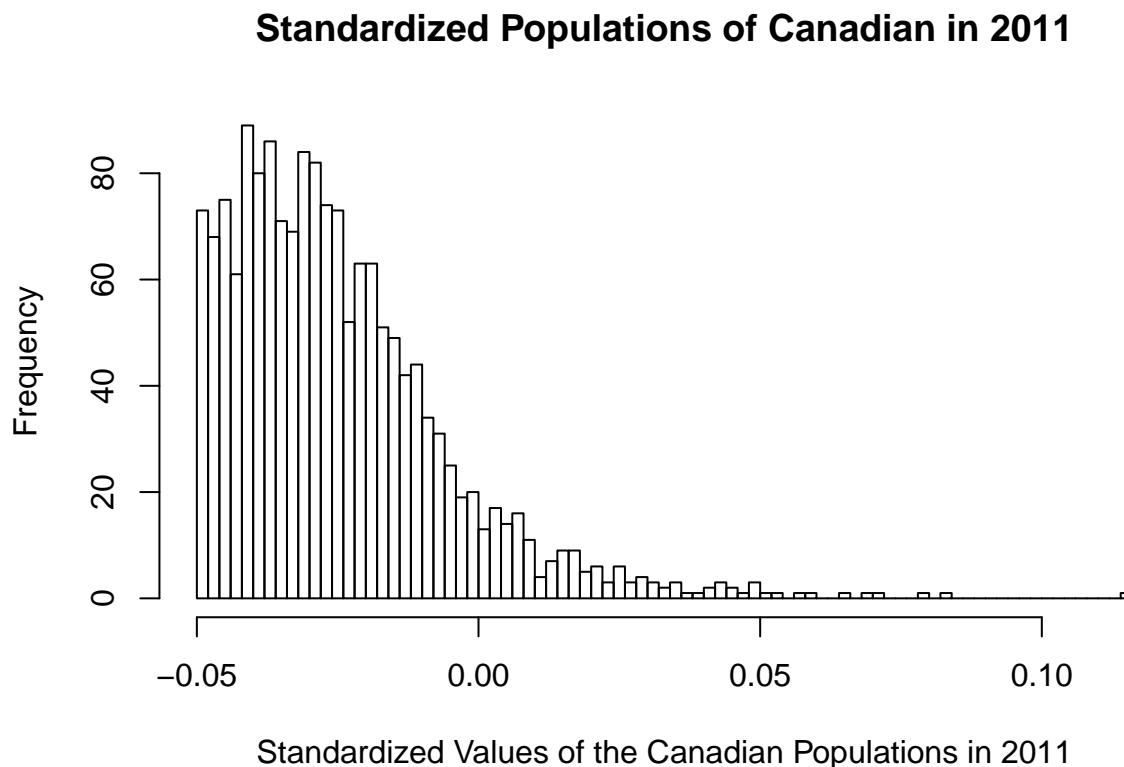
Question5

(a)

```
initExtension(dbcon)
```

```
## Warning: Closing open result set, pending rows
```

```
sql_z = "WITH pop_cnt AS (SELECT avg(Population__2011) AS mean,
stdev(Population__2011) AS sd FROM POP2011) SELECT Geographic_name,
POP2011.Population__2011, pop_cnt.mean, pop_cnt.sd,
(POP2011.Population__2011 - pop_cnt.mean) / pop_cnt.sd AS z_score_pop
FROM pop_cnt, POP2011 LIMIT -1 OFFSET 1"
out = dbGetQuery(dbcon, sql_z)
hist(out$z_score_pop, breaks=100,
     xlab="Standardized Values of the Canadian Populations in 2011",
     main="Standardized Populations of Canadian in 2011")
```


(b)

```
library(MASS)
```

```
##
## Attaching package: 'MASS'
```

```
## The following object is masked from 'package:dplyr':
```

15

```
##
##     select
```

```r
library(sp)
library(rworldmap)
```

```
## ### Welcome to rworldmap ###
```

```
## For a short introduction type :   vignette('rworldmap')
```

```r
library(rworldxtra)
poke = dbGetQuery(dbcon, "SELECT latitude, longitude, Type_1, Type_2, vanpoke.name
                   FROM vanpoke INNER JOIN Pokem on vanpoke.name = POkem.Name WHERE Type_1=='Ground' OR
                   Type_2=='Ground'")
worldmap = getMap(resolution = "high")
NrthAm = worldmap[which(worldmap$REGION == "North America"), ]
plot(NrthAm, xlim = c(-123.35, -122.65), ylim = c(49, 49.35), main = "Ground Type Pokemon in Vancouver")
points(poke$longitude, poke$latitude, pch = ".")
est2 = kde2d(poke$longitude, poke$latitude, n = c(121, 150))
contour(est2, add = TRUE, col = 2, lwd = 3)
```

Ground Type Pokemon in Vancouver