

The results below are generated from an R script.

```
# Question 1
#a.
chickwts[14,]

##      weight      feed
## 14      141 linseed

#b.
chickwts$weight[c(7,14,37)]

## [1] 108 141 423

#c.
chickwtsCasein <- chickwts[chickwts$feed == "casein", ]
chickwtsCasein

##      weight      feed
## 60      368 casein
## 61      390 casein
## 62      379 casein
## 63      260 casein
## 64      404 casein
## 65      318 casein
## 66      352 casein
## 67      359 casein
## 68      216 casein
## 69      222 casein
## 70      283 casein
## 71      332 casein

#d.
mean(chickwtsCasein$weight)

## [1] 323.5833

#e.
Feed = levels(chickwts$feed)
Feed

## [1] "casein"      "horsebean" "linseed"    "meatmeal"   "soybean"    "sunflower"

#f.
chick240 = subset(chickwts, chickwts$weight<240)
chick240

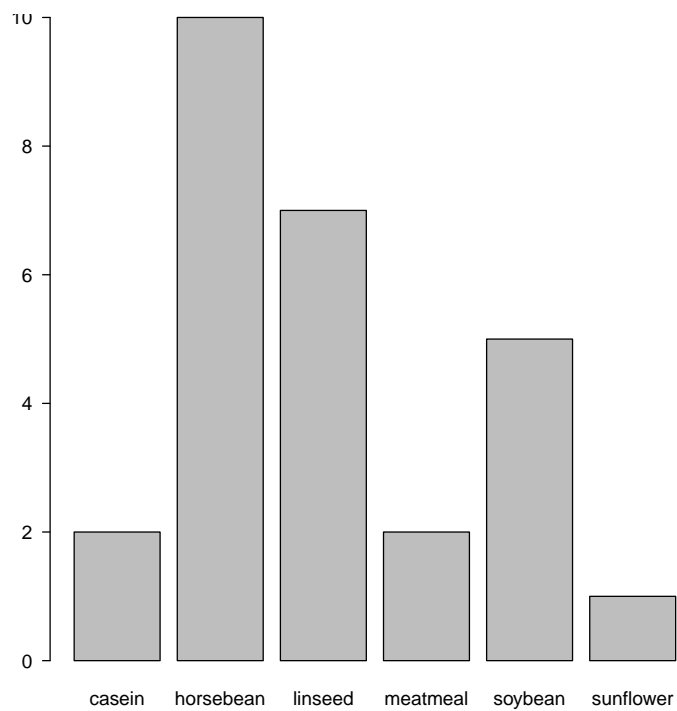
##      weight      feed
## 1      179 horsebean
## 2      160 horsebean
## 3      136 horsebean
## 4      227 horsebean
## 5      217 horsebean
## 6      168 horsebean
## 7      108 horsebean
## 8      124 horsebean
## 9      143 horsebean
```

```
## 10    140 horsebean
## 12    229  linseed
## 13    181  linseed
## 14    141  linseed
## 16    203  linseed
## 17    148  linseed
## 18    169  linseed
## 19    213  linseed
## 24    230  soybean
## 29    193  soybean
## 33    199  soybean
## 34    171  soybean
## 35    158  soybean
## 42    226 sunflower
## 54    153  meatmeal
## 57    206  meatmeal
## 68    216   casein
## 69    222   casein

#g.
chick240Table = table(chick240$feed)
chick240Table

##
##      casein horsebean  linseed  meatmeal  soybean sunflower
##           2         10         7         2         5         1

barplot(chick240Table)
```



```

#Question 2
#a.
nrow(cuckoos)

## Error in nrow(cuckoos): object 'cuckoos' not found

#b.
cuckoos$length[27]

## Error in eval(expr, envir, enclos): object 'cuckoos' not found

#c.
cuckoos[40,]

## Error in eval(expr, envir, enclos): object 'cuckoos' not found

#d.
cuckoos$species = levels(cuckoos$species)

## Error in levels(cuckoos$species): object 'cuckoos' not found

cuckoos$species

## Error in eval(expr, envir, enclos): object 'cuckoos$species' not found

#e.
cuckoos$m.pipitFactor = cuckoos$species

## Error in eval(expr, envir, enclos): object 'cuckoos' not found

levels(cuckoos$m.pipitFactor) = c("other", "meadow.pipit", rep("other", 4))

## Error in levels(cuckoos$m.pipitFactor) = c("other", "meadow.pipit", rep("other", : object
'cuckoos' not found

levels(cuckoos$m.pipitFactor)

## Error in levels(cuckoos$m.pipitFactor): object 'cuckoos' not found

cuckoos$m.pipitFactor=="meadow.pipit"

## Error in eval(expr, envir, enclos): object 'cuckoos' not found

#g.
cuckoosMPipit = subset(cuckoos, m.pipitFactor=="meadow.pipit")

## Error in subset(cuckoos, m.pipitFactor == "meadow.pipit"): object 'cuckoos' not found

cuckoosMPipit

## Error in eval(expr, envir, enclos): object 'cuckoosMPipit' not found

cuckoosOther <- subset(cuckoos, m.pipitFactor=="other")

## Error in subset(cuckoos, m.pipitFactor == "other"): object 'cuckoos' not found

cuckoosOther

## Error in eval(expr, envir, enclos): object 'cuckoosOther' not found

#h.
cuckoosLongLength = subset(cuckoos, length>23)

## Error in subset(cuckoos, length > 23): object 'cuckoos' not found

```

```
cuckoosLongLength
```

```
## Error in eval(expr, envir, enclos): object 'cuckoosLongLength' not found
```

```
mean(cuckoosLongLength$breadth)
```

```
## Error in mean(cuckoosLongLength$breadth): object 'cuckoosLongLength' not found
```

```
#Question 3
```

```
#a.
```

```
rain.df = read.table("rain.txt",header=FALSE,sep="")
```

```
rain.df
```

```
##      V1 V2 V3 V4 V5 V6 V7 V8 V9 V10 V11 V12 V13 V14 V15 V16 V17 V18 V19 V20 V21 V22 V23 V24
## 1  60  4  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 2  60  4  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 3  60  4  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 4  60  4  4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 5  60  4  5  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 6  60  4  6  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 7  60  4  7  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 8  60  4  8  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 9  60  4  9  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 10 60  4 10  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 11 60  4 11  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 12 60  4 12  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 13 60  4 13  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 14 60  4 14  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 15 60  4 15  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 16 60  4 16  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 17 60  4 17  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 18 60  4 18  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 19 60  4 19  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 20 60  4 20  0  0  0  0  8  0  13  8  3  0  0  0  0  0  0  0  0  0  0  0  0  0
## 21 60  4 21  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 22 60  4 22  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 23 60  4 23  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 24 60  4 24  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 25 60  4 25  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 26 60  4 26  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 27 60  4 27  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 28 60  4 28  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 29 60  4 29  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 30 60  4 30  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 31 60  5  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 32 60  5  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 33 60  5  3  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 34 60  5  4  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 35 60  5  5  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 36 60  5  6  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
## 37 60  5  7  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
##      V25 V26 V27
## 1      0  0  0
## 2      0  0  0
## 3      0  0  0
## 4      0  0  0
```

```

## 5      0      0      0
## 6      0      0      0
## 7      0      0      0
## 8      0      0      0
## 9      0      0      0
## 10     0      0      0
## 11     0      0      0
## 12     0      0      0
## 13     0      0      0
## 14     0      0      0
## 15     0      0      0
## 16     0      0      0
## 17     0      0      0
## 18     0      0      0
## 19     0      0      0
## 20     0      0      0
## 21     0      0      0
## 22     0      0      0
## 23     0      0      0
## 24     0      0      0
## 25     0      0      0
## 26     0      0      0
## 27     0      0      0
## 28     0      0      0
## 29     0      0      0
## 30     0      0      0
## 31     0      0      0
## 32     0      0      0
## 33     0      0      0
## 34     0      0      0
## 35     0      0      0
## 36     0      0      0
## 37     0      0      0
## [ reached 'max' / getOption("max.print") -- omitted 5033 rows ]

#b.
rain.df[2,4]

## [1] 0

#c.
rainColumn = levels(rain.df)
rainColumn

## NULL

#d.
rain.df[2,]

##   V1 V2 V3 V4 V5 V6 V7 V8 V9 V10 V11 V12 V13 V14 V15 V16 V17 V18 V19 V20 V21 V22 V23 V24
## 2 60  4  2  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
##   V25 V26 V27
## 2    0    0    0

#e.

```

```
colnames(rain.df) = c("year","month","day1","day2","day3","day4","day5","day6","day7","day8","day9",
"day10","day11","day12","day13","day14","day15","day16","day17","day18","day19",
"day20","day21","day22","day23","day24","day25")
```

```
rain.df
```

##	year	month	day1	day2	day3	day4	day5	day6	day7	day8	day9	day10	day11	day12	day13	day14
## 1	60	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0
## 2	60	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
## 3	60	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0
## 4	60	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0
## 5	60	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0
## 6	60	4	6	0	0	0	0	0	0	0	0	0	0	0	0	0
## 7	60	4	7	0	0	0	0	0	0	0	0	0	0	0	0	0
## 8	60	4	8	0	0	0	0	0	0	0	0	0	0	0	0	0
## 9	60	4	9	0	0	0	0	0	0	0	0	0	0	0	0	0
## 10	60	4	10	0	0	0	0	0	0	0	0	0	0	0	0	0
## 11	60	4	11	0	0	0	0	0	0	0	0	0	0	0	0	0
## 12	60	4	12	0	0	0	0	0	0	0	0	0	0	0	0	0
## 13	60	4	13	0	0	0	0	0	0	0	0	0	0	0	0	0
## 14	60	4	14	0	0	0	0	0	0	0	0	0	0	0	0	0
## 15	60	4	15	0	0	0	0	0	0	0	0	0	0	0	0	0
## 16	60	4	16	0	0	0	0	0	0	0	0	0	0	0	0	0
## 17	60	4	17	0	0	0	0	0	0	0	0	0	0	0	0	0
## 18	60	4	18	0	0	0	0	0	0	0	0	0	0	0	0	0
## 19	60	4	19	0	0	0	0	0	0	0	0	0	0	0	0	0
## 20	60	4	20	0	0	0	0	8	0	13	8	3	0	0	0	0
## 21	60	4	21	0	0	0	0	0	0	0	0	0	0	0	0	0
## 22	60	4	22	0	0	0	0	0	0	0	0	0	0	0	0	0
## 23	60	4	23	0	0	0	0	0	0	0	0	0	0	0	0	0
## 24	60	4	24	0	0	0	0	0	0	0	0	0	0	0	0	0
## 25	60	4	25	0	0	0	0	0	0	0	0	0	0	0	0	0
## 26	60	4	26	0	0	0	0	0	0	0	0	0	0	0	0	0
## 27	60	4	27	0	0	0	0	0	0	0	0	0	0	0	0	0
## 28	60	4	28	0	0	0	0	0	0	0	0	0	0	0	0	0
## 29	60	4	29	0	0	0	0	0	0	0	0	0	0	0	0	0
## 30	60	4	30	0	0	0	0	0	0	0	0	0	0	0	0	0
## 31	60	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0
## 32	60	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0
## 33	60	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0
## 34	60	5	4	0	0	0	0	0	0	0	0	0	0	0	0	0
## 35	60	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0
## 36	60	5	6	0	0	0	0	0	0	0	0	0	0	0	0	0
## 37	60	5	7	0	0	0	0	0	0	0	0	0	0	0	0	0
##	day15	day16	day17	day18	day19	day20	day21	day22	day23	day24	day25					
## 1	0	0	0	0	0	0	0	0	0	0	0					
## 2	0	0	0	0	0	0	0	0	0	0	0					
## 3	0	0	0	0	0	0	0	0	0	0	0					
## 4	0	0	0	0	0	0	0	0	0	0	0					
## 5	0	0	0	0	0	0	0	0	0	0	0					
## 6	0	0	0	0	0	0	0	0	0	0	0					
## 7	0	0	0	0	0	0	0	0	0	0	0					
## 8	0	0	0	0	0	0	0	0	0	0	0					
## 9	0	0	0	0	0	0	0	0	0	0	0					
## 10	0	0	0	0	0	0	0	0	0	0	0					

```
## 11      0      0      0      0      0      0      0      0      0      0      0
## 12      0      0      0      0      0      0      0      0      0      0      0
## 13      0      0      0      0      0      0      0      0      0      0      0
## 14      0      0      0      0      0      0      0      0      0      0      0
## 15      0      0      0      0      0      0      0      0      0      0      0
## 16      0      0      0      0      0      0      0      0      0      0      0
## 17      0      0      0      0      0      0      0      0      0      0      0
## 18      0      0      0      0      0      0      0      0      0      0      0
## 19      0      0      0      0      0      0      0      0      0      0      0
## 20      0      0      0      0      0      0      0      0      0      0      0
## 21      0      0      0      0      0      0      0      0      0      0      0
## 22      0      0      0      0      0      0      0      0      0      0      0
## 23      0      0      0      0      0      0      0      0      0      0      0
## 24      0      0      0      0      0      0      0      0      0      0      0
## 25      0      0      0      0      0      0      0      0      0      0      0
## 26      0      0      0      0      0      0      0      0      0      0      0
## 27      0      0      0      0      0      0      0      0      0      0      0
## 28      0      0      0      0      0      0      0      0      0      0      0
## 29      0      0      0      0      0      0      0      0      0      0      0
## 30      0      0      0      0      0      0      0      0      0      0      0
## 31      0      0      0      0      0      0      0      0      0      0      0
## 32      0      0      0      0      0      0      0      0      0      0      0
## 33      0      0      0      0      0      0      0      0      0      0      0
## 34      0      0      0      0      0      0      0      0      0      0      0
## 35      0      0      0      0      0      0      0      0      0      0      0
## 36      0      0      0      0      0      0      0      0      0      0      0
## 37      0      0      0      0      0      0      0      0      0      0      0
## [ reached 'max' / getOption("max.print") -- omitted 5033 rows ]
```

#Question 4

#a.

temps <-

```
c(-0.64, -0.56, -0.54, -0.65, -0.72, -0.76, -0.75, -0.77, -0.64,
  -0.56, -0.81, -0.68, -0.71, -0.74, -0.75, -0.65, -0.59, -0.55,
  -0.72, -0.6, -0.53, -0.59, -0.71, -0.79, -0.88, -0.72, -0.67,
  -0.84, -0.87, -0.91, -0.86, -0.88, -0.79, -0.78, -0.6, -0.55,
  -0.78, -0.84, -0.7, -0.66, -0.71, -0.65, -0.72, -0.68, -0.72,
  -0.65, -0.54, -0.65, -0.65, -0.8, -0.59, -0.53, -0.61, -0.73,
  -0.58, -0.64, -0.59, -0.47, -0.47, -0.47, -0.36, -0.32, -0.35,
  -0.31, -0.19, -0.32, -0.48, -0.49, -0.53, -0.53, -0.62, -0.51,
  -0.43, -0.36, -0.57, -0.59, -0.64, -0.4, -0.37, -0.41, -0.46,
  -0.39, -0.41, -0.38, -0.64, -0.54, -0.49, -0.46, -0.51, -0.37,
  -0.42, -0.53, -0.43, -0.29, -0.51, -0.46, -0.55, -0.26, -0.37,
  -0.27, -0.17, -0.11, -0.31, -0.14, -0.29, -0.32, -0.25, -0.11,
  -0.03, -0.15, 0, -0.01, -0.21, -0.2, -0.12, 0.02, -0.09, 0.04,
  0.2, -0.02, -0.02, 0.11, 0.19, 0.18, 0.11, 0.25, 0.19, 0.22,
  0.1, 0.2, 0.27, 0.16, 0.19, 0.21, 0.3, 0.43, 0.55)
```

#b.

```
temp.df = data.frame(TempDiff=temps,Year= c(1880:2016))
temp.df
```

```
##      TempDiff Year
## 1      -0.64 1880
```

## 2	-0.56	1881
## 3	-0.54	1882
## 4	-0.65	1883
## 5	-0.72	1884
## 6	-0.76	1885
## 7	-0.75	1886
## 8	-0.77	1887
## 9	-0.64	1888
## 10	-0.56	1889
## 11	-0.81	1890
## 12	-0.68	1891
## 13	-0.71	1892
## 14	-0.74	1893
## 15	-0.75	1894
## 16	-0.65	1895
## 17	-0.59	1896
## 18	-0.55	1897
## 19	-0.72	1898
## 20	-0.60	1899
## 21	-0.53	1900
## 22	-0.59	1901
## 23	-0.71	1902
## 24	-0.79	1903
## 25	-0.88	1904
## 26	-0.72	1905
## 27	-0.67	1906
## 28	-0.84	1907
## 29	-0.87	1908
## 30	-0.91	1909
## 31	-0.86	1910
## 32	-0.88	1911
## 33	-0.79	1912
## 34	-0.78	1913
## 35	-0.60	1914
## 36	-0.55	1915
## 37	-0.78	1916
## 38	-0.84	1917
## 39	-0.70	1918
## 40	-0.66	1919
## 41	-0.71	1920
## 42	-0.65	1921
## 43	-0.72	1922
## 44	-0.68	1923
## 45	-0.72	1924
## 46	-0.65	1925
## 47	-0.54	1926
## 48	-0.65	1927
## 49	-0.65	1928
## 50	-0.80	1929
## 51	-0.59	1930
## 52	-0.53	1931
## 53	-0.61	1932
## 54	-0.73	1933
## 55	-0.58	1934

## 56	-0.64	1935
## 57	-0.59	1936
## 58	-0.47	1937
## 59	-0.47	1938
## 60	-0.47	1939
## 61	-0.36	1940
## 62	-0.32	1941
## 63	-0.35	1942
## 64	-0.31	1943
## 65	-0.19	1944
## 66	-0.32	1945
## 67	-0.48	1946
## 68	-0.49	1947
## 69	-0.53	1948
## 70	-0.53	1949
## 71	-0.62	1950
## 72	-0.51	1951
## 73	-0.43	1952
## 74	-0.36	1953
## 75	-0.57	1954
## 76	-0.59	1955
## 77	-0.64	1956
## 78	-0.40	1957
## 79	-0.37	1958
## 80	-0.41	1959
## 81	-0.46	1960
## 82	-0.39	1961
## 83	-0.41	1962
## 84	-0.38	1963
## 85	-0.64	1964
## 86	-0.54	1965
## 87	-0.49	1966
## 88	-0.46	1967
## 89	-0.51	1968
## 90	-0.37	1969
## 91	-0.42	1970
## 92	-0.53	1971
## 93	-0.43	1972
## 94	-0.29	1973
## 95	-0.51	1974
## 96	-0.46	1975
## 97	-0.55	1976
## 98	-0.26	1977
## 99	-0.37	1978
## 100	-0.27	1979
## 101	-0.17	1980
## 102	-0.11	1981
## 103	-0.31	1982
## 104	-0.14	1983
## 105	-0.29	1984
## 106	-0.32	1985
## 107	-0.25	1986
## 108	-0.11	1987
## 109	-0.03	1988

```

## 110      -0.15 1989
## 111       0.00 1990
## 112     -0.01 1991
## 113     -0.21 1992
## 114     -0.20 1993
## 115     -0.12 1994
## 116       0.02 1995
## 117     -0.09 1996
## 118       0.04 1997
## 119       0.20 1998
## 120     -0.02 1999
## 121     -0.02 2000
## 122       0.11 2001
## 123       0.19 2002
## 124       0.18 2003
## 125       0.11 2004
## 126       0.25 2005
## 127       0.19 2006
## 128       0.22 2007
## 129       0.10 2008
## 130       0.20 2009
## 131       0.27 2010
## 132       0.16 2011
## 133       0.19 2012
## 134       0.21 2013
## 135       0.30 2014
## 136       0.43 2015
## 137       0.55 2016

#c.
temp.df$Period = ifelse(temp.df$Year<1939, "EARLY",ifelse(temp.df$Year>1980,"CURRENT","MIDDLE"))
temp.df

##      TempDiff Year  Period
## 1      -0.64 1880   EARLY
## 2      -0.56 1881   EARLY
## 3      -0.54 1882   EARLY
## 4      -0.65 1883   EARLY
## 5      -0.72 1884   EARLY
## 6      -0.76 1885   EARLY
## 7      -0.75 1886   EARLY
## 8      -0.77 1887   EARLY
## 9      -0.64 1888   EARLY
## 10     -0.56 1889   EARLY
## 11     -0.81 1890   EARLY
## 12     -0.68 1891   EARLY
## 13     -0.71 1892   EARLY
## 14     -0.74 1893   EARLY
## 15     -0.75 1894   EARLY
## 16     -0.65 1895   EARLY
## 17     -0.59 1896   EARLY
## 18     -0.55 1897   EARLY
## 19     -0.72 1898   EARLY
## 20     -0.60 1899   EARLY

```

## 21	-0.53	1900	EARLY
## 22	-0.59	1901	EARLY
## 23	-0.71	1902	EARLY
## 24	-0.79	1903	EARLY
## 25	-0.88	1904	EARLY
## 26	-0.72	1905	EARLY
## 27	-0.67	1906	EARLY
## 28	-0.84	1907	EARLY
## 29	-0.87	1908	EARLY
## 30	-0.91	1909	EARLY
## 31	-0.86	1910	EARLY
## 32	-0.88	1911	EARLY
## 33	-0.79	1912	EARLY
## 34	-0.78	1913	EARLY
## 35	-0.60	1914	EARLY
## 36	-0.55	1915	EARLY
## 37	-0.78	1916	EARLY
## 38	-0.84	1917	EARLY
## 39	-0.70	1918	EARLY
## 40	-0.66	1919	EARLY
## 41	-0.71	1920	EARLY
## 42	-0.65	1921	EARLY
## 43	-0.72	1922	EARLY
## 44	-0.68	1923	EARLY
## 45	-0.72	1924	EARLY
## 46	-0.65	1925	EARLY
## 47	-0.54	1926	EARLY
## 48	-0.65	1927	EARLY
## 49	-0.65	1928	EARLY
## 50	-0.80	1929	EARLY
## 51	-0.59	1930	EARLY
## 52	-0.53	1931	EARLY
## 53	-0.61	1932	EARLY
## 54	-0.73	1933	EARLY
## 55	-0.58	1934	EARLY
## 56	-0.64	1935	EARLY
## 57	-0.59	1936	EARLY
## 58	-0.47	1937	EARLY
## 59	-0.47	1938	EARLY
## 60	-0.47	1939	MIDDLE
## 61	-0.36	1940	MIDDLE
## 62	-0.32	1941	MIDDLE
## 63	-0.35	1942	MIDDLE
## 64	-0.31	1943	MIDDLE
## 65	-0.19	1944	MIDDLE
## 66	-0.32	1945	MIDDLE
## 67	-0.48	1946	MIDDLE
## 68	-0.49	1947	MIDDLE
## 69	-0.53	1948	MIDDLE
## 70	-0.53	1949	MIDDLE
## 71	-0.62	1950	MIDDLE
## 72	-0.51	1951	MIDDLE
## 73	-0.43	1952	MIDDLE
## 74	-0.36	1953	MIDDLE

## 75	-0.57	1954	MIDDLE
## 76	-0.59	1955	MIDDLE
## 77	-0.64	1956	MIDDLE
## 78	-0.40	1957	MIDDLE
## 79	-0.37	1958	MIDDLE
## 80	-0.41	1959	MIDDLE
## 81	-0.46	1960	MIDDLE
## 82	-0.39	1961	MIDDLE
## 83	-0.41	1962	MIDDLE
## 84	-0.38	1963	MIDDLE
## 85	-0.64	1964	MIDDLE
## 86	-0.54	1965	MIDDLE
## 87	-0.49	1966	MIDDLE
## 88	-0.46	1967	MIDDLE
## 89	-0.51	1968	MIDDLE
## 90	-0.37	1969	MIDDLE
## 91	-0.42	1970	MIDDLE
## 92	-0.53	1971	MIDDLE
## 93	-0.43	1972	MIDDLE
## 94	-0.29	1973	MIDDLE
## 95	-0.51	1974	MIDDLE
## 96	-0.46	1975	MIDDLE
## 97	-0.55	1976	MIDDLE
## 98	-0.26	1977	MIDDLE
## 99	-0.37	1978	MIDDLE
## 100	-0.27	1979	MIDDLE
## 101	-0.17	1980	MIDDLE
## 102	-0.11	1981	CURRENT
## 103	-0.31	1982	CURRENT
## 104	-0.14	1983	CURRENT
## 105	-0.29	1984	CURRENT
## 106	-0.32	1985	CURRENT
## 107	-0.25	1986	CURRENT
## 108	-0.11	1987	CURRENT
## 109	-0.03	1988	CURRENT
## 110	-0.15	1989	CURRENT
## 111	0.00	1990	CURRENT
## 112	-0.01	1991	CURRENT
## 113	-0.21	1992	CURRENT
## 114	-0.20	1993	CURRENT
## 115	-0.12	1994	CURRENT
## 116	0.02	1995	CURRENT
## 117	-0.09	1996	CURRENT
## 118	0.04	1997	CURRENT
## 119	0.20	1998	CURRENT
## 120	-0.02	1999	CURRENT
## 121	-0.02	2000	CURRENT
## 122	0.11	2001	CURRENT
## 123	0.19	2002	CURRENT
## 124	0.18	2003	CURRENT
## 125	0.11	2004	CURRENT
## 126	0.25	2005	CURRENT
## 127	0.19	2006	CURRENT
## 128	0.22	2007	CURRENT

```

## 129      0.10 2008 CURRENT
## 130      0.20 2009 CURRENT
## 131      0.27 2010 CURRENT
## 132      0.16 2011 CURRENT
## 133      0.19 2012 CURRENT
## 134      0.21 2013 CURRENT
## 135      0.30 2014 CURRENT
## 136      0.43 2015 CURRENT
## 137      0.55 2016 CURRENT

#d.
summary(temp.df)

##      TempDiff      Year      Period
##  Min.   :-0.9100  Min.   :1880  Length:137
##  1st Qu.: -0.6500  1st Qu.:1914  Class  :character
##  Median : -0.5100  Median :1948  Mode   :character
##  Mean   : -0.4156  Mean   :1948
##  3rd Qu.: -0.2500  3rd Qu.:1982
##  Max.    :  0.5500  Max.    :2016

#e.
tempPeriod = factor(temp.df$Period)
summary(tempPeriod)

## CURRENT  EARLY  MIDDLE
##      36      59      42

#f.
temp.df[["TempAct"]] = (temp.df$TempDiff + 6)
temp.df

##      TempDiff Year  Period TempAct
## 1      -0.64 1880  EARLY    5.36
## 2      -0.56 1881  EARLY    5.44
## 3      -0.54 1882  EARLY    5.46
## 4      -0.65 1883  EARLY    5.35
## 5      -0.72 1884  EARLY    5.28
## 6      -0.76 1885  EARLY    5.24
## 7      -0.75 1886  EARLY    5.25
## 8      -0.77 1887  EARLY    5.23
## 9      -0.64 1888  EARLY    5.36
## 10     -0.56 1889  EARLY    5.44
## 11     -0.81 1890  EARLY    5.19
## 12     -0.68 1891  EARLY    5.32
## 13     -0.71 1892  EARLY    5.29
## 14     -0.74 1893  EARLY    5.26
## 15     -0.75 1894  EARLY    5.25
## 16     -0.65 1895  EARLY    5.35
## 17     -0.59 1896  EARLY    5.41
## 18     -0.55 1897  EARLY    5.45
## 19     -0.72 1898  EARLY    5.28
## 20     -0.60 1899  EARLY    5.40
## 21     -0.53 1900  EARLY    5.47
## 22     -0.59 1901  EARLY    5.41

```

## 23	-0.71	1902	EARLY	5.29
## 24	-0.79	1903	EARLY	5.21
## 25	-0.88	1904	EARLY	5.12
## 26	-0.72	1905	EARLY	5.28
## 27	-0.67	1906	EARLY	5.33
## 28	-0.84	1907	EARLY	5.16
## 29	-0.87	1908	EARLY	5.13
## 30	-0.91	1909	EARLY	5.09
## 31	-0.86	1910	EARLY	5.14
## 32	-0.88	1911	EARLY	5.12
## 33	-0.79	1912	EARLY	5.21
## 34	-0.78	1913	EARLY	5.22
## 35	-0.60	1914	EARLY	5.40
## 36	-0.55	1915	EARLY	5.45
## 37	-0.78	1916	EARLY	5.22
## 38	-0.84	1917	EARLY	5.16
## 39	-0.70	1918	EARLY	5.30
## 40	-0.66	1919	EARLY	5.34
## 41	-0.71	1920	EARLY	5.29
## 42	-0.65	1921	EARLY	5.35
## 43	-0.72	1922	EARLY	5.28
## 44	-0.68	1923	EARLY	5.32
## 45	-0.72	1924	EARLY	5.28
## 46	-0.65	1925	EARLY	5.35
## 47	-0.54	1926	EARLY	5.46
## 48	-0.65	1927	EARLY	5.35
## 49	-0.65	1928	EARLY	5.35
## 50	-0.80	1929	EARLY	5.20
## 51	-0.59	1930	EARLY	5.41
## 52	-0.53	1931	EARLY	5.47
## 53	-0.61	1932	EARLY	5.39
## 54	-0.73	1933	EARLY	5.27
## 55	-0.58	1934	EARLY	5.42
## 56	-0.64	1935	EARLY	5.36
## 57	-0.59	1936	EARLY	5.41
## 58	-0.47	1937	EARLY	5.53
## 59	-0.47	1938	EARLY	5.53
## 60	-0.47	1939	MIDDLE	5.53
## 61	-0.36	1940	MIDDLE	5.64
## 62	-0.32	1941	MIDDLE	5.68
## 63	-0.35	1942	MIDDLE	5.65
## 64	-0.31	1943	MIDDLE	5.69
## 65	-0.19	1944	MIDDLE	5.81
## 66	-0.32	1945	MIDDLE	5.68
## 67	-0.48	1946	MIDDLE	5.52
## 68	-0.49	1947	MIDDLE	5.51
## 69	-0.53	1948	MIDDLE	5.47
## 70	-0.53	1949	MIDDLE	5.47
## 71	-0.62	1950	MIDDLE	5.38
## 72	-0.51	1951	MIDDLE	5.49
## 73	-0.43	1952	MIDDLE	5.57
## 74	-0.36	1953	MIDDLE	5.64
## 75	-0.57	1954	MIDDLE	5.43
## 76	-0.59	1955	MIDDLE	5.41

## 77	-0.64	1956	MIDDLE	5.36
## 78	-0.40	1957	MIDDLE	5.60
## 79	-0.37	1958	MIDDLE	5.63
## 80	-0.41	1959	MIDDLE	5.59
## 81	-0.46	1960	MIDDLE	5.54
## 82	-0.39	1961	MIDDLE	5.61
## 83	-0.41	1962	MIDDLE	5.59
## 84	-0.38	1963	MIDDLE	5.62
## 85	-0.64	1964	MIDDLE	5.36
## 86	-0.54	1965	MIDDLE	5.46
## 87	-0.49	1966	MIDDLE	5.51
## 88	-0.46	1967	MIDDLE	5.54
## 89	-0.51	1968	MIDDLE	5.49
## 90	-0.37	1969	MIDDLE	5.63
## 91	-0.42	1970	MIDDLE	5.58
## 92	-0.53	1971	MIDDLE	5.47
## 93	-0.43	1972	MIDDLE	5.57
## 94	-0.29	1973	MIDDLE	5.71
## 95	-0.51	1974	MIDDLE	5.49
## 96	-0.46	1975	MIDDLE	5.54
## 97	-0.55	1976	MIDDLE	5.45
## 98	-0.26	1977	MIDDLE	5.74
## 99	-0.37	1978	MIDDLE	5.63
## 100	-0.27	1979	MIDDLE	5.73
## 101	-0.17	1980	MIDDLE	5.83
## 102	-0.11	1981	CURRENT	5.89
## 103	-0.31	1982	CURRENT	5.69
## 104	-0.14	1983	CURRENT	5.86
## 105	-0.29	1984	CURRENT	5.71
## 106	-0.32	1985	CURRENT	5.68
## 107	-0.25	1986	CURRENT	5.75
## 108	-0.11	1987	CURRENT	5.89
## 109	-0.03	1988	CURRENT	5.97
## 110	-0.15	1989	CURRENT	5.85
## 111	0.00	1990	CURRENT	6.00
## 112	-0.01	1991	CURRENT	5.99
## 113	-0.21	1992	CURRENT	5.79
## 114	-0.20	1993	CURRENT	5.80
## 115	-0.12	1994	CURRENT	5.88
## 116	0.02	1995	CURRENT	6.02
## 117	-0.09	1996	CURRENT	5.91
## 118	0.04	1997	CURRENT	6.04
## 119	0.20	1998	CURRENT	6.20
## 120	-0.02	1999	CURRENT	5.98
## 121	-0.02	2000	CURRENT	5.98
## 122	0.11	2001	CURRENT	6.11
## 123	0.19	2002	CURRENT	6.19
## 124	0.18	2003	CURRENT	6.18
## 125	0.11	2004	CURRENT	6.11
## 126	0.25	2005	CURRENT	6.25
## 127	0.19	2006	CURRENT	6.19
## 128	0.22	2007	CURRENT	6.22
## 129	0.10	2008	CURRENT	6.10
## 130	0.20	2009	CURRENT	6.20

```
## 131      0.27 2010 CURRENT      6.27
## 132      0.16 2011 CURRENT      6.16
## 133      0.19 2012 CURRENT      6.19
## 134      0.21 2013 CURRENT      6.21
## 135      0.30 2014 CURRENT      6.30
## 136      0.43 2015 CURRENT      6.43
## 137      0.55 2016 CURRENT      6.55

#g.
summary(temp.df)

##      TempDiff      Year      Period      TempAct
## Min.      :-0.9100 Min.      :1880 Length:137 Min.      :5.090
## 1st Qu.: -0.6500 1st Qu.:1914 Class :character 1st Qu.:5.350
## Median : -0.5100 Median :1948 Mode  :character Median :5.490
## Mean    : -0.4156 Mean    :1948              Mean    :5.584
## 3rd Qu.: -0.2500 3rd Qu.:1982              3rd Qu.:5.750
## Max.    :  0.5500 Max.    :2016              Max.    :6.550

#h.
var1 = with(temp.df, sample(temp.df$Year,6))
var1

## [1] 1926 1915 1928 1966 1954 1956
```

The R session information (including the OS info, R version and all packages used):

```
sessionInfo()

## R version 4.2.2 (2022-10-31)
## Platform: x86_64-apple-darwin17.0 (64-bit)
## Running under: macOS Ventura 13.1
##
## Matrix products: default
## LAPACK: /Library/Frameworks/R.framework/Versions/4.2/Resources/lib/libRlapack.dylib
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  methods    base
##
## loaded via a namespace (and not attached):
## [1] compiler_4.2.2 tools_4.2.2      highr_0.10      knitr_1.42      xfun_0.37
## [6] evaluate_0.20

Sys.time()

## [1] "2023-02-13 13:04:39 PST"
```