MuS10

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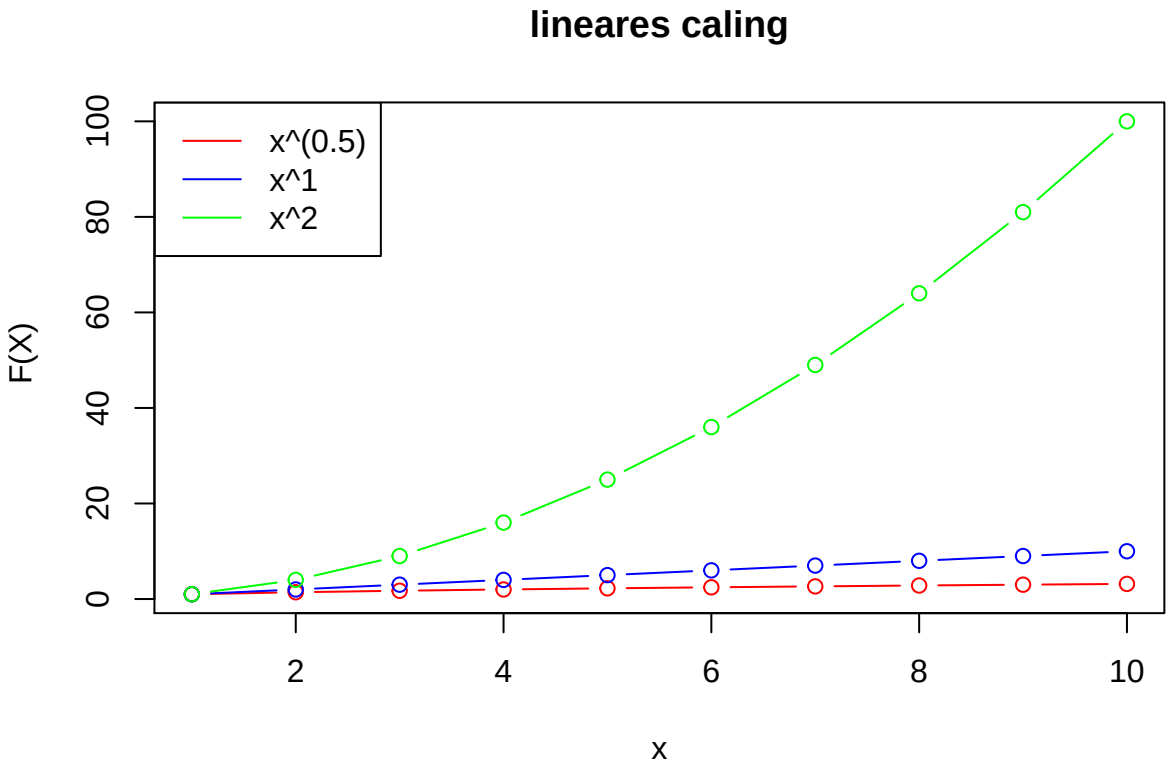
Problem 10.1: Graphical presentation of data sets

1. We define three functions $F_i(x) = x^i$ by choosing $i \in 0.5; 1; 2$. Plot the three functions for $x : 1 <= x <= 10 und x \in Z$ with a linear and a logarithmic scaling for both the x- and the y-axis in two different diagrams! Assign meaningful labels to the axes and the curves and explain the observed effects! [15 Points]

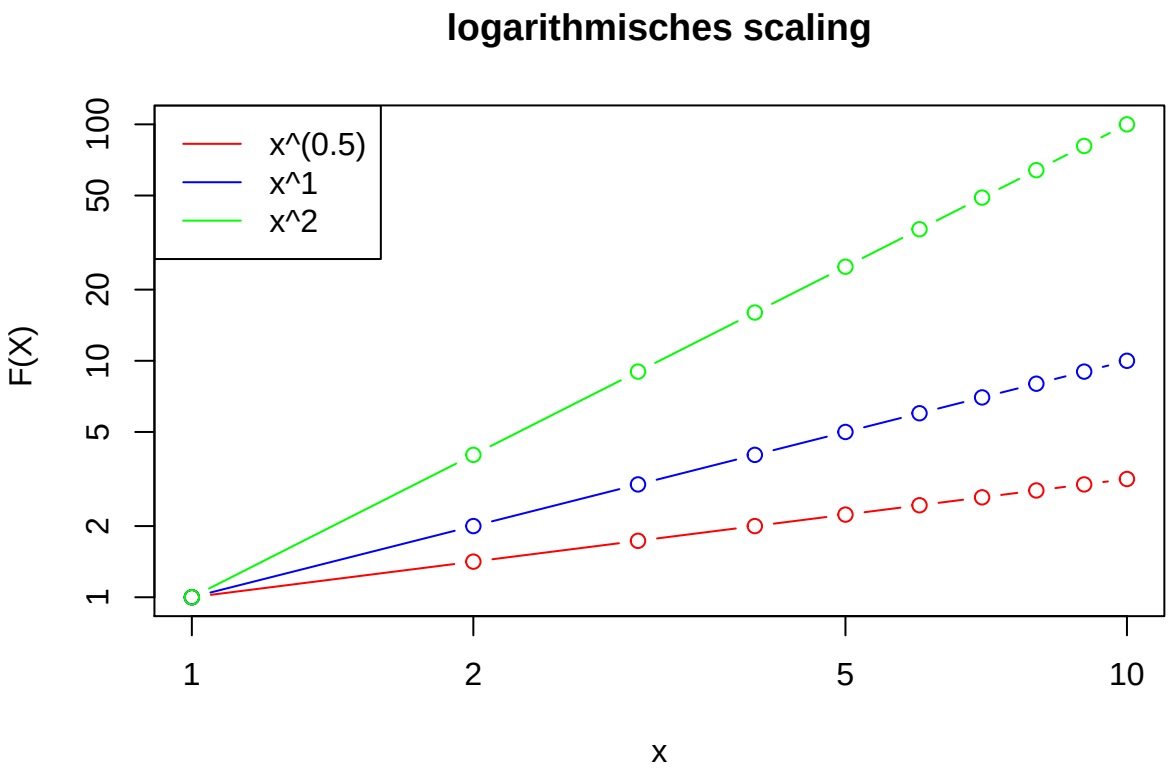
```
#Wertebereich x von 1 bis 10
x<-c(1:10)

#definintion der funtionen
function_1<-x^(0.5)
function_2<-x^1
function_3<-x^2

# plot linear scaling:
plot(range(x), range(floor(min(function_1,function_2,function_3)):
              ceiling(max(function_1,function_2,function_3))),
              type = "n", ylab = " F(X)", xlab = "x",
              main = "lineares caling")
lines(x, function_1, type = "b", col = "red")
lines(x, function_2, type = "b", col = "blue")
lines(x, function_3, type = "b", col = "green")
legend("topleft", legend = c("x^(0.5)", "x^1", "x^2"),
              col = c("red","blue","green"), lty = "solid")
```

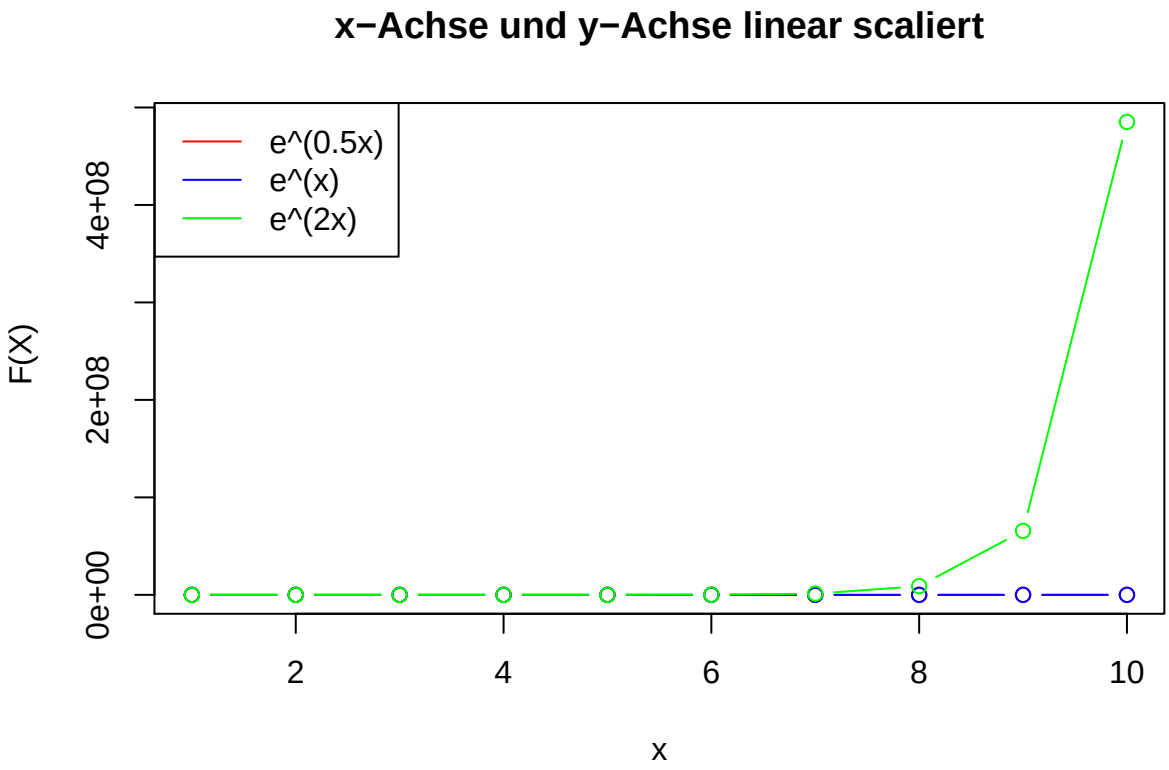


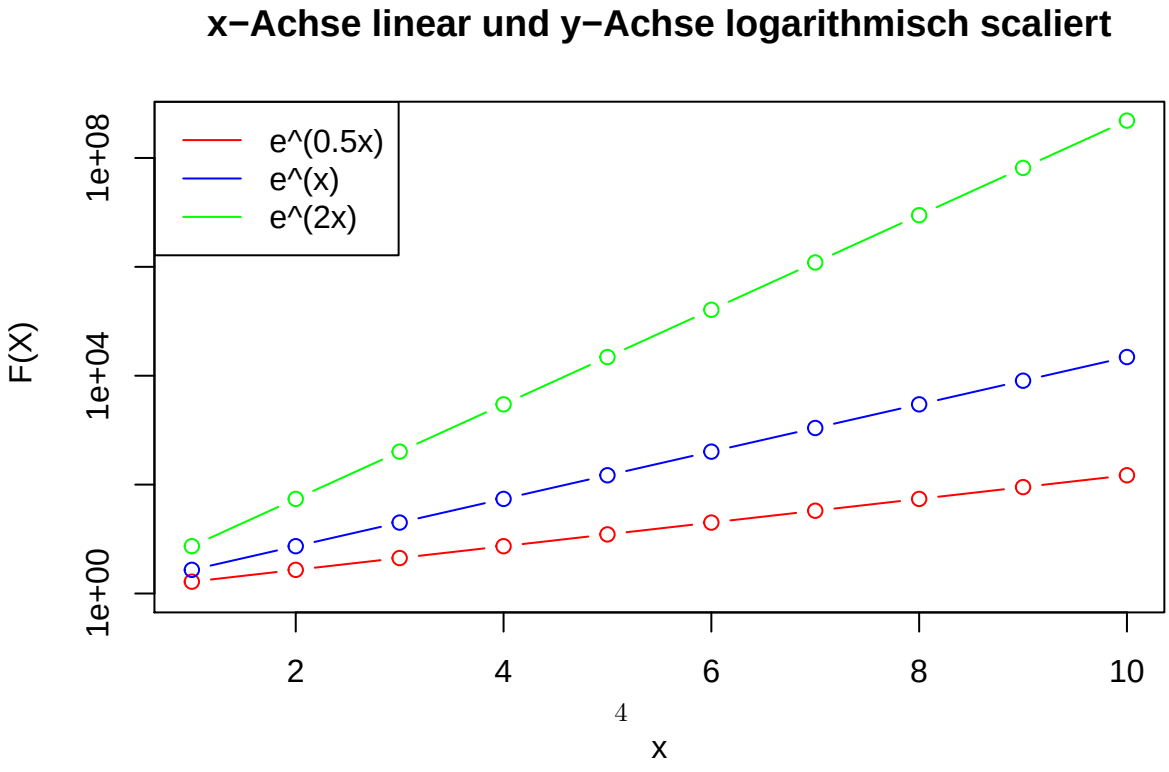

```
#plot logarithmic scaling
plot(range(x), range(floor(min(function_1,function_2,function_3)):
             ceiling(max(function_1,function_2,function_3))),
             type = "n", ylab = " F(X)", xlab = "x",
             main = "logarithmisches scaling", log = "xy")
lines(x, function_1, type = "b", col = "red")
lines(x, function_2, type = "b", col = "blue")
lines(x, function_3, type = "b", col = "green")
legend("topleft", legend = c("x^(0.5)", "x^1", "x^2"),
       col = c("red","blue","green"), lty = "solid")
```



Vergleicht man die lineare mit der Logarithmischen Darstellung, so erkennt man, dass man mit der logarithmische Darstellung eine bessere Aussage über das Verhalten der Funktionen treffen kann. Da die logarithmische Darstellung vor allem dann hilfreich ist, wenn der Wertebereich der dargestellten Daten viele Größenordnungen umfasst. Durch die logarithmische Darstellung werden Zusammenhänge im Bereich der kleinen Werte besser überschaubar. Verschiedene mathematische Zusammenhänge können durch die logarithmische Darstellung somit erkennbar bzw. verdeutlicht werden.

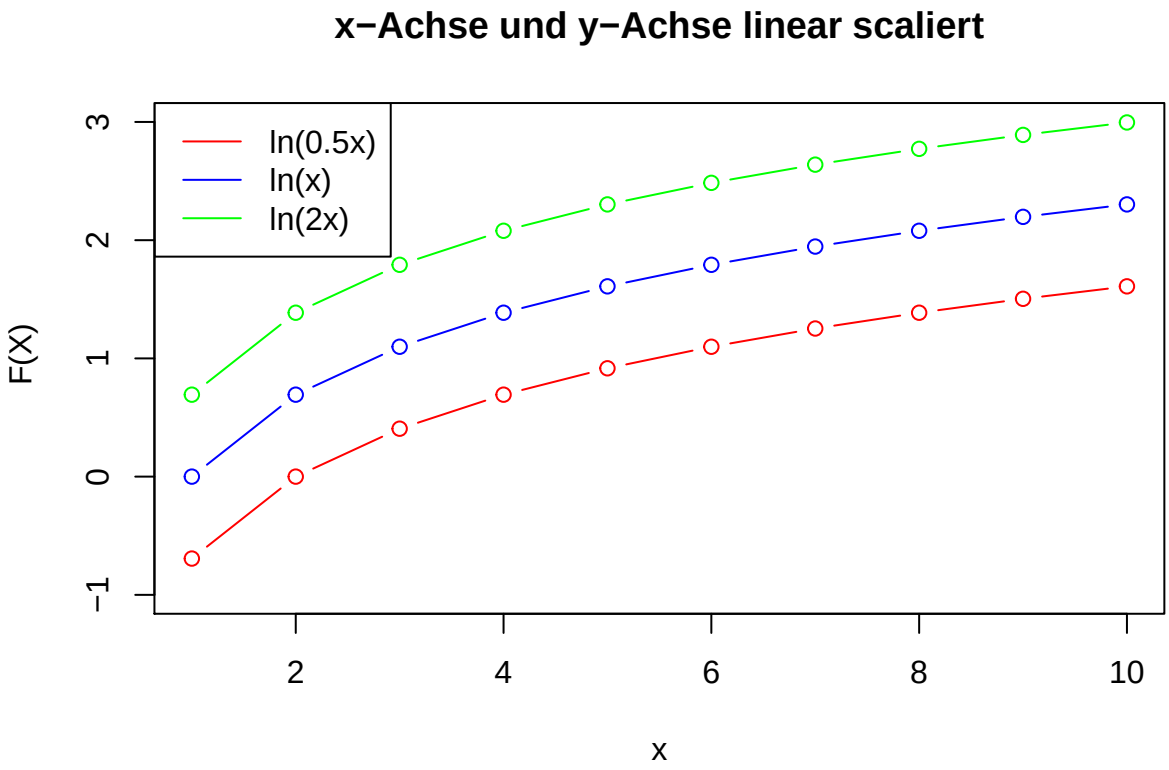
2. We define three functions $F_i(x) = e^{i*x}$ by choosing i $\in$ {0.5; 1; 2}. Plot the three functions for $x : 1 <= x <= 10 und x \in Z$ with a linear,linear and a linear,logarithmic scaling for the x- and the y-axis in two different diagrams! Assign meaningful labels to the axes and the curves and explain the observed effects! [15 Punkte]

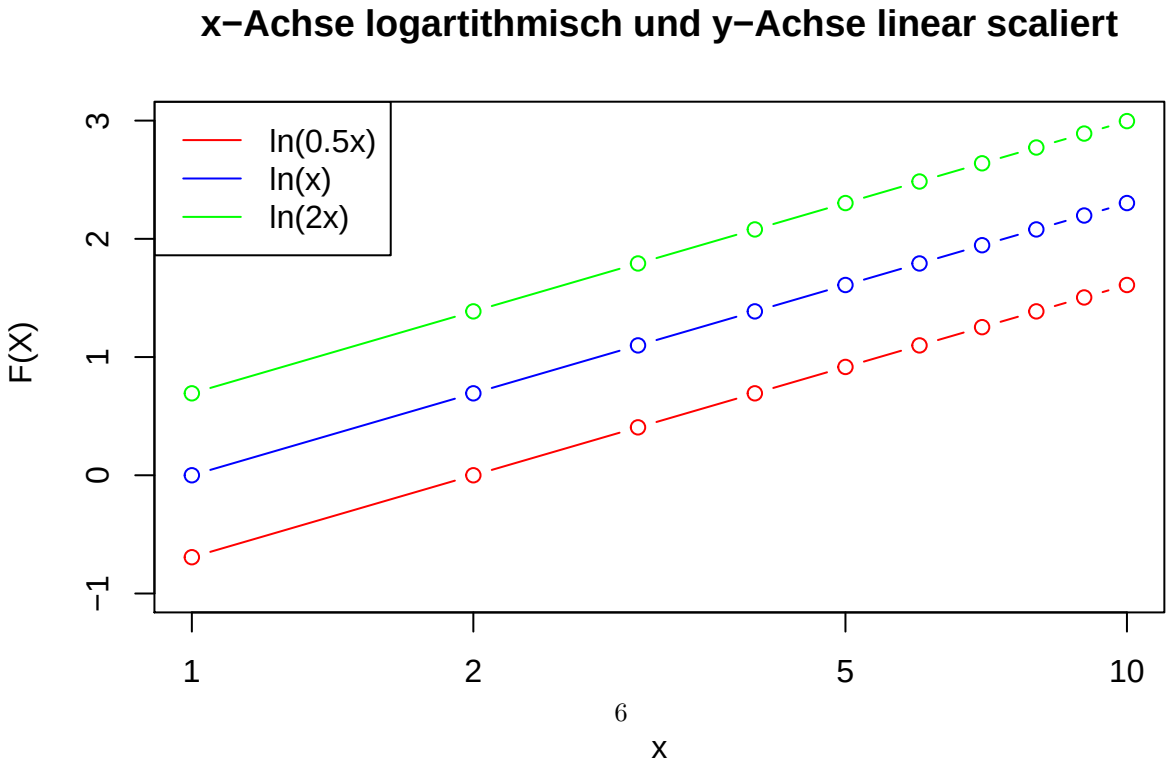




Auch hier ist deutlich zu erkennen, dass sich , wenn sowohl x als auch y-Achse linear skaliert sind, keine direkten Aussagen über das Verhalten der Funktionen machen lässt. Die rote und blaue Kurve überschneiden sich, sodass die ote nicht im Schaubild zu erkennen ist. Auch zu beginn überlagern sich die grüne, blaue und rote Kurve, sodass nur die grüne angezeigt wird. Logarithmiert man jetzt die y Achse, so werden besonders die kleinen Werte besser überschaubar, sodass alle Kurven gesondert betrachtet werden können ohne Überlagerungen, und somit lässt sich über jede Funktion (Kurve) Aussagen treffen.

3. We define three functions F_i (x) = ln(i*x) by choosing i $\in$ {0.5; 1; 2}. Plot the three functions for $x : 1 <= x <= 10 undx \in Z$ with a linear, linear and a logarithmic, linear scaling for the x-and the y-axis in two different diagrams! Assign meaningful labels to the axes and the curves and explain the observed effects! [15 Points]





Da die Funktionen bereits durch das "ln" logaritmiert sind, zeigen beide Plots keine großen Unterschiede bzw Überlagerungen auf.

Problem 10.2: Data Analysis

The provided file US_States_Production.csv contains 816 regional observations describing capital productivity key figures in the Contiguous United States between 1970 and 1986, which were used as statistical base for two scientific publications in the ???eld of econometry. Each observation contains the following variables:

var0 the US state

var1 the year of the observation

var2 private capital

var3 highway and street capital

var4 water utility capital

var5 utility capital (other public buildings and structures)

var6 public capital

var7 gross state product

var8 employment

var9 unemployment rate

Perform a fundamental data analysis by following the steps below:

1. Import the data set! Choose appropriate labels for the columns and apply the changes to the data frame! [5 Points]

```
#import data
us_states_productions <- read.csv("US_States_Production.csv")
names(us_states_productions)[2] <- "state"
names(us_states_productions)[3] <- "year"
names(us_states_productions)[4] <- "privat_capital"
names(us_states_productions)[5] <- "street_capital"
names(us_states_productions)[6] <- "water_capital"
names(us_states_productions)[7] <- "utility_capital"
names(us_states_productions)[8] <- "public_capital"
names(us_states_productions)[9] <- "state_product"
names(us_states_productions)[10] <- "employment"
names(us_states_productions)[11] <- "unemployment_rate"
us_states_productions
```

```
##     obsNr          state year privat_capital street_capital water_capital
## 1       1        ALABAMA 1970       15032.67        7325.80       1655.68
## 2       2        ALABAMA 1971       15501.94        7525.94       1721.02
```

```
## 3        3        ALABAMA 1972       15972.41        7765.42       1764.75
## 4        4        ALABAMA 1973       16406.26        7907.66       1742.41
## 5        5        ALABAMA 1974       16762.67        8025.52       1734.85
## 6        6        ALABAMA 1975       17316.26        8158.23       1752.27
## 7        7        ALABAMA 1976       17732.86        8228.19       1799.74
## 8        8        ALABAMA 1977       18111.93        8365.67       1845.11
## 9        9        ALABAMA 1978       18479.74        8510.64       1960.51
## 10      10        ALABAMA 1979       18881.49        8640.61       2081.91
## 11      11        ALABAMA 1980       19012.34        8663.50       2138.52
## 12      12        ALABAMA 1981       19118.52        8628.83       2218.91
## 13      13        ALABAMA 1982       19118.25        8645.14       2215.84
## 14      14        ALABAMA 1983       19122.00        8612.47       2230.91
## 15      15        ALABAMA 1984       19257.47        8655.94       2235.16
## 16      16        ALABAMA 1985       19433.36        8726.24       2253.03
## 17      17        ALABAMA 1986       19723.37        8813.24       2308.99
## 18      18        ARIZONA 1970       10148.42        4556.81       1627.87
## 19      19        ARIZONA 1971       10560.54        4701.97       1627.34
## 20      20        ARIZONA 1972       10977.53        4847.84       1614.58
## 21      21        ARIZONA 1973       11598.26        4963.46       1647.88
## 22      22        ARIZONA 1974       12129.06        5071.38       1678.00
## 23      23        ARIZONA 1975       12929.06        5163.41       1764.87
## 24      24        ARIZONA 1976       13603.89        5249.82       1910.43
## 25      25        ARIZONA 1977       14175.42        5358.45       1973.48
## 26      26        ARIZONA 1978       14812.04        5470.00       2038.30
## 27      27        ARIZONA 1979       15547.62        5603.12       2132.49
## 28      28        ARIZONA 1980       16344.90        5720.38       2165.64
## 29      29        ARIZONA 1981       17088.30        5816.05       2265.42
## 30      30        ARIZONA 1982       17650.57        5918.50       2377.20
## 31      31        ARIZONA 1983       18108.24        6019.87       2513.38
## 32      32        ARIZONA 1984       18792.09        6101.45       2574.78
## 33      33        ARIZONA 1985       19414.85        6282.51       2737.37
## 34      34        ARIZONA 1986       20212.42        6553.40       2923.15
## 35      35       ARKANSAS 1970        7613.26        3647.73        644.99
## 36      36       ARKANSAS 1971        7982.03        3686.95        651.63
## 37      37       ARKANSAS 1972        8309.01        3780.05        668.50
## 38      38       ARKANSAS 1973        8399.59        3894.77        691.76
## 39      39       ARKANSAS 1974        8512.05        3985.99        726.62
## 40      40       ARKANSAS 1975        8651.26        4051.66        742.50
## 41      41       ARKANSAS 1976        8921.91        4185.40        761.38
## 42      42       ARKANSAS 1977        9234.85        4316.52        793.54
## 43      43       ARKANSAS 1978        9374.54        4405.68        821.01
## 44      44       ARKANSAS 1979        9554.83        4483.21        859.23
## 45      45       ARKANSAS 1980        9705.24        4531.36        890.41
## 46      46       ARKANSAS 1981        9872.87        4608.72        916.68
## 47      47       ARKANSAS 1982        9919.35        4681.50        905.92
## 48      48       ARKANSAS 1983        9861.76        4662.68        934.14
## 49      49       ARKANSAS 1984        9754.55        4654.37        934.60
## 50      50       ARKANSAS 1985        9675.47        4639.30        947.04
## 51      51       ARKANSAS 1986        9787.20        4652.71        960.66
## 52      52     CALIFORNIA 1970      128545.36       42961.31      17837.26
## 53      53     CALIFORNIA 1971      132263.33       44768.37      18448.04
## 54      54     CALIFORNIA 1972      134451.52       46045.52      18813.82
## 55      55     CALIFORNIA 1973      135988.40       47064.46      19084.52
## 56      56     CALIFORNIA 1974      136827.29       47572.52      19092.78
```

```
## 57     57     CALIFORNIA 1975      138487.39       47699.42       19654.53
## 58     58     CALIFORNIA 1976      139514.18       47568.65       20346.64
## 59     59     CALIFORNIA 1977      139910.22       47137.99       21014.45
## 60     60     CALIFORNIA 1978      139408.84       46472.40       21556.85
## 61     61     CALIFORNIA 1979      140217.32       46132.47       22297.31
## 62     62     CALIFORNIA 1980      139776.97       45597.88       22925.93
## 63     63     CALIFORNIA 1981      139662.44       45042.91       23291.36
## 64     64     CALIFORNIA 1982      139232.39       44490.48       23502.43
## 65     65     CALIFORNIA 1983      138535.66       44027.17       23828.67
## 66     66     CALIFORNIA 1984      138101.55       43826.52       23841.32
## 67     67     CALIFORNIA 1985      138170.93       43566.26       24121.33
## 68     68     CALIFORNIA 1986      139042.68       43350.54       24592.33
## 69     69       COLORADO 1970       11402.52        4403.21        2165.03
## 70     70       COLORADO 1971       11682.06        4535.52        2166.21
## 71     71       COLORADO 1972       12010.91        4757.59        2133.49
## 72     72       COLORADO 1973       12473.28        4982.21        2206.43
## 73     73       COLORADO 1974       12964.14        5143.73        2312.49
## 74     74       COLORADO 1975       13483.92        5223.11        2464.28
## 75     75       COLORADO 1976       14090.24        5318.10        2617.61
## 76     76       COLORADO 1977       14736.89        5463.79        2747.31
## 77     77       COLORADO 1978       15240.49        5598.49        2887.92
## 78     78       COLORADO 1979       15711.11        5705.99        3078.37
## 79     79       COLORADO 1980       16272.57        5766.89        3274.49
## 80     80       COLORADO 1981       16692.71        5820.52        3564.34
## 81     81       COLORADO 1982       17027.51        5846.02        3719.04
## 82     82       COLORADO 1983       17388.99        5877.85        3898.86
## 83     83       COLORADO 1984       17785.25        5942.80        4000.29
## 84     84       COLORADO 1985       18327.11        6057.50        4153.07
## 85     85       COLORADO 1986       18889.54        6148.80        4340.24
## 86     86    CONNECTICUT 1970       15865.66        7237.14        2208.10
## 87     87    CONNECTICUT 1971       16559.99        7312.24        2406.84
## 88     88    CONNECTICUT 1972       17346.79        7407.46        2642.54
## 89     89    CONNECTICUT 1973       17803.12        7492.12        2741.16
## 90     90    CONNECTICUT 1974       18225.20        7550.75        2881.00
## 91     91    CONNECTICUT 1975       18686.78        7585.56        3027.33
## 92     92    CONNECTICUT 1976       18871.06        7587.34        3104.13
## 93     93    CONNECTICUT 1977       18798.54        7501.72        3166.91
## 94     94    CONNECTICUT 1978       18566.24        7352.08        3194.03
## 95     95    CONNECTICUT 1979       18487.06        7274.07        3294.94
## 96     96    CONNECTICUT 1980       18385.98        7192.00        3387.26
## 97     97    CONNECTICUT 1981       18271.34        7103.85        3396.82
## 98     98    CONNECTICUT 1982       18030.08        7017.05        3371.93
## 99     99    CONNECTICUT 1983       17739.88        6959.31        3332.92
## 100   100    CONNECTICUT 1984       17494.36        6890.73        3300.44
## 101   101    CONNECTICUT 1985       17317.13        6861.64        3313.05
## 102   102    CONNECTICUT 1986       17290.61        6878.14        3314.55
## 103   103       DELAWARE 1970        4250.95        2078.95         234.23
## 104   104       DELAWARE 1971        4405.91        2076.73         230.51
## 105   105       DELAWARE 1972        4560.71        2105.30         233.59
## 106   106       DELAWARE 1973        4725.12        2125.88         283.84
## 107   107       DELAWARE 1974        4927.52        2195.49         324.32
## 108   108       DELAWARE 1975        4988.37        2197.46         349.68
## 109   109       DELAWARE 1976        4959.87        2161.42         358.60
## 110   110       DELAWARE 1977        4958.47        2158.95         400.11
```

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## 111   111       DELAWARE 1978        4954.21        2134.89        440.95
## 112   112       DELAWARE 1979        4936.91        2103.91        482.11
## 113   113       DELAWARE 1980        4868.74        2071.23        488.36
## 114   114       DELAWARE 1981        4825.97        2050.14        491.43
## 115   115       DELAWARE 1982        4786.37        2038.78        487.77
## 116   116       DELAWARE 1983        4768.17        2029.77        482.47
## 117   117       DELAWARE 1984        4743.86        2037.26        483.30
## 118   118       DELAWARE 1985        4731.49        2043.62        490.68
## 119   119       DELAWARE 1986        4716.73        2052.16        492.03
## 120   120        FLORIDA 1970       29696.86       12622.30       4174.89
## 121   121        FLORIDA 1971       30683.09       12873.62       4282.97
## 122   122        FLORIDA 1972       32089.12       13424.21       4318.05
## 123   123        FLORIDA 1973       33480.99       13999.70       4268.38
## 124   124        FLORIDA 1974       34650.29       14586.91       4281.73
## 125   125        FLORIDA 1975       36103.75       15075.13       4446.11
## 126   126        FLORIDA 1976       37942.61       15538.54       4726.01
## 127   127        FLORIDA 1977       39393.89       15790.70       5404.47
## 128   128        FLORIDA 1978       40859.40       15985.09       6123.84
## 129   129        FLORIDA 1979       42107.13       16220.82       6625.71
## 130   130        FLORIDA 1980       43192.98       16457.76       6998.35
## 131   131        FLORIDA 1981       44311.68       16724.87       7430.67
## 132   132        FLORIDA 1982       45492.00       16952.95       7814.59
## 133   133        FLORIDA 1983       47116.82       17282.36       8183.58
## 134   134        FLORIDA 1984       48538.98       17597.76       8483.89
## 135   135        FLORIDA 1985       50336.63       17888.08       8767.52
## 136   136        FLORIDA 1986       52309.37       18290.06       9172.05
## 137   137        GEORGIA 1970       18270.44        7999.19       2092.77
## 138   138        GEORGIA 1971       19275.62        8213.17       2148.43
## 139   139        GEORGIA 1972       20167.45        8433.38       2165.53
## 140   140        GEORGIA 1973       21015.05        8676.01       2267.56
## 141   141        GEORGIA 1974       21882.27        9004.13       2519.94
## 142   142        GEORGIA 1975       22713.54        9192.85       2797.47
## 143   143        GEORGIA 1976       23556.37        9445.52       3029.37
## 144   144        GEORGIA 1977       24124.15        9623.51       3177.03
## 145   145        GEORGIA 1978       24622.13        9745.86       3240.48
## 146   146        GEORGIA 1979       25631.20       10054.77       3347.57
## 147   147        GEORGIA 1980       26685.37       10289.71       3461.48
## 148   148        GEORGIA 1981       27546.85       10501.58       3574.39
## 149   149        GEORGIA 1982       28209.03       10620.04       3669.58
## 150   150        GEORGIA 1983       28996.86       10985.78       3808.70
## 151   151        GEORGIA 1984       29702.75       11236.24       3896.84
## 152   152        GEORGIA 1985       30068.26       11292.92       3926.96
## 153   153        GEORGIA 1986       30991.33       11563.64       4024.23
## 154   154          IDAHO 1970        3410.22        2193.99        267.56
## 155   155          IDAHO 1971        3579.67        2276.68        256.47
## 156   156          IDAHO 1972        3676.22        2353.72        247.87
## 157   157          IDAHO 1973        3737.66        2399.18        236.98
## 158   158          IDAHO 1974        3813.94        2467.04        228.46
## 159   159          IDAHO 1975        3942.37        2531.40        229.86
## 160   160          IDAHO 1976        4105.58        2563.07        249.94
## 161   161          IDAHO 1977        4255.84        2606.65        271.88
## 162   162          IDAHO 1978        4398.05        2674.18        289.18
## 163   163          IDAHO 1979        4522.19        2724.98        298.74
## 164   164          IDAHO 1980        4605.70        2740.64        324.21
```

```
## 165   165          IDAHO 1981        4667.31        2753.25         337.06
## 166   166          IDAHO 1982        4699.95        2749.25         347.34
## 167   167          IDAHO 1983        4710.03        2756.72         359.68
## 168   168          IDAHO 1984        4769.76        2794.78         376.04
## 169   169          IDAHO 1985        4819.32        2838.03         382.94
## 170   170          IDAHO 1986        4890.92        2886.07         406.41
## 171   171       ILLINOIS 1970       52197.49       23582.87        6361.94
## 172   172       ILLINOIS 1971       53805.62       23841.66        6579.10
## 173   173       ILLINOIS 1972       55540.36       24602.76        6675.74
## 174   174       ILLINOIS 1973       57288.30       25448.17        6807.99
## 175   175       ILLINOIS 1974       58984.18       25806.09        7107.00
## 176   176       ILLINOIS 1975       60139.25       26068.87        7342.22
## 177   177       ILLINOIS 1976       61104.40       26325.26        7522.85
## 178   178       ILLINOIS 1977       62200.83       26835.52        7669.60
## 179   179       ILLINOIS 1978       63096.48       27300.22        8004.98
## 180   180       ILLINOIS 1979       63642.81       27247.22        8491.35
## 181   181       ILLINOIS 1980       64003.03       27237.54        9047.41
## 182   182       ILLINOIS 1981       64549.30       27406.33        9523.64
## 183   183       ILLINOIS 1982       65064.20       27568.50       10218.00
## 184   184       ILLINOIS 1983       64751.99       27483.00       10436.04
## 185   185       ILLINOIS 1984       64460.25       27590.53       10485.73
## 186   186       ILLINOIS 1985       64487.38       27811.57       10532.95
## 187   187       ILLINOIS 1986       64726.05       28101.57       10577.77
## 188   188        INDIANA 1970       20813.65        8904.96        2814.86
## 189   189        INDIANA 1971       21665.60        9140.25        2919.60
## 190   190        INDIANA 1972       22368.04        9391.29        2929.94
## 191   191        INDIANA 1973       23230.94        9696.29        2947.49
## 192   192        INDIANA 1974       23652.30        9913.98        2918.14
## 193   193        INDIANA 1975       23945.55       10038.12        2932.54
## 194   194        INDIANA 1976       24259.12       10178.36        3017.66
## 195   195        INDIANA 1977       24506.31       10409.08        3014.11
## 196   196        INDIANA 1978       24639.62       10518.94        3026.38
## 197   197        INDIANA 1979       24744.99       10536.00        3082.76
## 198   198        INDIANA 1980       24799.68       10574.03        3142.24
## 199   199        INDIANA 1981       24976.64       10619.58        3210.15
## 200   200        INDIANA 1982       25108.79       10618.71        3297.40
## 201   201        INDIANA 1983       24983.98       10558.11        3284.13
## 202   202        INDIANA 1984       24835.60       10481.99        3311.04
## 203   203        INDIANA 1985       24905.94       10532.65        3376.20
## 204   204        INDIANA 1986       24924.85       10567.20        3377.17
## 205   205           IOWA 1970       14728.51        8684.87        1377.50
## 206   206           IOWA 1971       15311.03        8926.99        1451.36
## 207   207           IOWA 1972       15657.48        9144.08        1508.06
## 208   208           IOWA 1973       16006.47        9424.40        1508.45
## 209   209           IOWA 1974       16159.20        9571.66        1518.00
## 210   210           IOWA 1975       16414.32        9677.48        1567.76
## 211   211           IOWA 1976       16766.52        9770.03        1682.16
## 212   212           IOWA 1977       17166.76        9948.06        1822.71
## 213   213           IOWA 1978       17407.43       10038.99        1972.05
## 214   214           IOWA 1979       17722.68       10112.22        2114.49
## 215   215           IOWA 1980       17928.92       10183.36        2148.16
## 216   216           IOWA 1981       18050.52       10188.72        2154.55
## 217   217           IOWA 1982       18141.76       10187.89        2132.80
## 218   218           IOWA 1983       18240.50       10187.06        2184.02
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## 219   219          IOWA 1984       18203.48       10197.84       2252.53
## 220   220          IOWA 1985       18288.61       10286.39       2319.88
## 221   221          IOWA 1986       18436.18       10397.50       2393.84
## 222   222        KANSAS 1970       11115.57        5988.83       1449.42
## 223   223        KANSAS 1971       11595.03        6098.10       1515.59
## 224   224        KANSAS 1972       11854.06        6226.46       1527.80
## 225   225        KANSAS 1973       12137.40        6368.52       1513.71
## 226   226        KANSAS 1974       12412.46        6488.52       1542.50
## 227   227        KANSAS 1975       12792.34        6542.80       1599.35
## 228   228        KANSAS 1976       13023.89        6628.42       1632.99
## 229   229        KANSAS 1977       13386.60        6753.55       1691.70
## 230   230        KANSAS 1978       13726.24        6830.98       1757.29
## 231   231        KANSAS 1979       14157.68        6863.58       1838.20
## 232   232        KANSAS 1980       14479.94        6919.83       1889.43
## 233   233        KANSAS 1981       14855.02        7018.71       1953.03
## 234   234        KANSAS 1982       15082.15        7104.16       2018.15
## 235   235        KANSAS 1983       15062.88        7150.68       2053.86
## 236   236        KANSAS 1984       15116.06        7177.68       2121.44
## 237   237        KANSAS 1985       15145.49        7222.85       2181.94
## 238   238        KANSAS 1986       15216.66        7310.79       2232.58
## 239   239      KENTUCKY 1970       16035.09        9021.31       1706.76
## 240   240      KENTUCKY 1971       16706.92        9280.45       1711.30
## 241   241      KENTUCKY 1972       17169.23        9606.59       1708.68
## 242   242      KENTUCKY 1973       17697.13       10008.41       1723.18
## 243   243      KENTUCKY 1974       18263.75       10372.71       1773.45
## 244   244      KENTUCKY 1975       18624.45       10505.77       1906.71
## 245   245      KENTUCKY 1976       18945.26       10588.00       2019.97
## 246   246      KENTUCKY 1977       19294.60       10701.70       2124.99
## 247   247      KENTUCKY 1978       19572.86       10809.85       2169.76
## 248   248      KENTUCKY 1979       19948.68       11017.87       2246.22
## 249   249      KENTUCKY 1980       20585.01       11367.36       2363.19
## 250   250      KENTUCKY 1981       21116.39       11721.16       2400.49
## 251   251      KENTUCKY 1982       21308.34       11933.89       2390.23
## 252   252      KENTUCKY 1983       21162.34       12008.09       2365.05
## 253   253      KENTUCKY 1984       21032.34       12056.30       2350.25
## 254   254      KENTUCKY 1985       21052.49       12171.63       2355.38
## 255   255      KENTUCKY 1986       20959.34       12139.07       2338.37
## 256   256     LOUISIANA 1970       19638.31        9891.38       2660.82
## 257   257     LOUISIANA 1971       20066.64       10162.65       2734.98
## 258   258     LOUISIANA 1972       20887.68       10392.20       2770.17
## 259   259     LOUISIANA 1973       21408.20       10606.21       2733.22
## 260   260     LOUISIANA 1974       21787.15       10805.89       2713.92
## 261   261     LOUISIANA 1975       22175.86       10983.60       2721.50
## 262   262     LOUISIANA 1976       22682.17       11273.56       2819.43
## 263   263     LOUISIANA 1977       23389.41       11634.15       2937.22
## 264   264     LOUISIANA 1978       24102.46       11981.51       3051.01
## 265   265     LOUISIANA 1979       24446.12       12128.07       3108.48
## 266   266     LOUISIANA 1980       24568.45       12107.67       3093.48
## 267   267     LOUISIANA 1981       24789.76       12157.90       3067.08
## 268   268     LOUISIANA 1982       25087.00       12262.86       3102.91
## 269   269     LOUISIANA 1983       25422.96       12448.15       3123.98
## 270   270     LOUISIANA 1984       25932.73       12825.32       3144.81
## 271   271     LOUISIANA 1985       26477.79       13131.09       3213.47
## 272   272     LOUISIANA 1986       26617.47       13271.71       3275.03
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## 273   273          MAINE 1970        3868.87        2206.79         482.69
## 274   274          MAINE 1971        3999.86        2256.43         494.98
## 275   275          MAINE 1972        4167.61        2335.08         505.60
## 276   276          MAINE 1973        4272.26        2427.57         515.68
## 277   277          MAINE 1974        4394.33        2485.16         549.75
## 278   278          MAINE 1975        4529.86        2515.26         579.48
## 279   279          MAINE 1976        4593.66        2518.41         610.57
## 280   280          MAINE 1977        4662.84        2521.78         673.27
## 281   281          MAINE 1978        4813.68        2531.39         862.79
## 282   282          MAINE 1979        4931.13        2541.84         983.92
## 283   283          MAINE 1980        4991.87        2553.75        1023.49
## 284   284          MAINE 1981        5009.05        2559.10        1040.72
## 285   285          MAINE 1982        4976.60        2536.96        1032.93
## 286   286          MAINE 1983        4952.99        2540.19        1023.46
## 287   287          MAINE 1984        4941.74        2536.66        1017.56
## 288   288          MAINE 1985        4942.55        2526.87        1037.07
## 289   289          MAINE 1986        4939.70        2535.26        1044.48
## 290   290       MARYLAND 1970       19145.01        7466.91        4107.45
## 291   291       MARYLAND 1971       20023.61        7761.21        4151.61
## 292   292       MARYLAND 1972       21126.69        8191.56        4165.89
## 293   293       MARYLAND 1973       22060.79        8386.45        4296.63
## 294   294       MARYLAND 1974       23017.84        8733.95        4422.23
## 295   295       MARYLAND 1975       24189.50        9088.64        4637.77
## 296   296       MARYLAND 1976       25322.85        9328.20        4974.62
## 297   297       MARYLAND 1977       26238.15        9610.83        5189.16
## 298   298       MARYLAND 1978       26910.22        9813.67        5266.61
## 299   299       MARYLAND 1979       27644.44        9951.82        5454.99
## 300   300       MARYLAND 1980       28081.96       10018.00        5557.20
## 301   301       MARYLAND 1981       28715.84       10118.32        5713.03
## 302   302       MARYLAND 1982       28850.43       10160.71        5787.90
## 303   303       MARYLAND 1983       29101.83       10461.03        5776.88
## 304   304       MARYLAND 1984       29214.12       10668.97        5683.73
## 305   305       MARYLAND 1985       29451.52       10845.28        5946.06
## 306   306       MARYLAND 1986       29577.46       10983.19        5892.33
## 307   307  MASSACHUSETTS 1970       21923.28        8541.89        2240.20
## 308   308  MASSACHUSETTS 1971       23177.83        8871.26        2363.06
## 309   309  MASSACHUSETTS 1972       24385.09        9022.56        2540.81
## 310   310  MASSACHUSETTS 1973       25765.21        9033.16        2755.10
## 311   311  MASSACHUSETTS 1974       27100.33        9074.66        2863.37
## 312   312  MASSACHUSETTS 1975       28204.28        9114.56        2980.54
## 313   313  MASSACHUSETTS 1976       28752.82        9101.40        3198.66
## 314   314  MASSACHUSETTS 1977       29171.97        9098.10        3366.41
## 315   315  MASSACHUSETTS 1978       29202.12        9123.64        3466.10
## 316   316  MASSACHUSETTS 1979       29455.50        9169.85        3718.09
## 317   317  MASSACHUSETTS 1980       29999.21        9146.15        4015.43
## 318   318  MASSACHUSETTS 1981       30166.12        9094.17        4216.05
## 319   319  MASSACHUSETTS 1982       30190.87        9076.55        4277.85
## 320   320  MASSACHUSETTS 1983       30221.77        9034.17        4320.64
## 321   321  MASSACHUSETTS 1984       30352.69        9031.48        4381.02
## 322   322  MASSACHUSETTS 1985       30497.51        9004.18        4451.55
## 323   323  MASSACHUSETTS 1986       30795.56        8984.76        4558.94
## 324   324       MICHIGAN 1970       44684.82       17924.92        8380.48
## 325   325       MICHIGAN 1971       45993.77       18238.74        8564.69
## 326   326       MICHIGAN 1972       46772.91       18423.57        8947.32
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## 327   327       MICHIGAN 1973       47923.55       18834.46       9556.35
## 328   328       MICHIGAN 1974       48793.43       19160.95       9887.32
## 329   329       MICHIGAN 1975       49789.59       19397.17      10081.01
## 330   330       MICHIGAN 1976       50687.49       19591.79      10233.82
## 331   331       MICHIGAN 1977       51302.34       19800.72      10369.21
## 332   332       MICHIGAN 1978       51494.34       19980.26      10350.29
## 333   333       MICHIGAN 1979       51707.36       20002.83      10486.26
## 334   334       MICHIGAN 1980       51922.35       19996.38      10644.23
## 335   335       MICHIGAN 1981       52276.40       20024.11      10900.24
## 336   336       MICHIGAN 1982       51955.88       19881.31      10758.53
## 337   337       MICHIGAN 1983       51305.62       19714.51      10578.52
## 338   338       MICHIGAN 1984       50724.55       19505.44      10584.32
## 339   339       MICHIGAN 1985       50392.79       19397.92      10390.41
## 340   340       MICHIGAN 1986       49879.29       19184.17      10178.05
## 341   341      MINNESOTA 1970       21948.43       10284.33       3682.74
## 342   342      MINNESOTA 1971       23056.36       10735.90       3740.41
## 343   343      MINNESOTA 1972       24023.53       11014.64       3790.75
## 344   344      MINNESOTA 1973       24731.18       11172.43       3809.76
## 345   345      MINNESOTA 1974       25333.93       11367.22       3945.05
## 346   346      MINNESOTA 1975       25910.97       11555.19       3999.70
## 347   347      MINNESOTA 1976       26485.99       11620.28       4141.07
## 348   348      MINNESOTA 1977       27080.21       11748.50       4290.67
## 349   349      MINNESOTA 1978       27464.67       11880.62       4455.08
## 350   350      MINNESOTA 1979       27832.95       11985.82       4611.99
## 351   351      MINNESOTA 1980       28055.27       12074.92       4721.44
## 352   352      MINNESOTA 1981       28460.94       12164.09       4787.78
## 353   353      MINNESOTA 1982       28590.72       12212.26       4834.17
## 354   354      MINNESOTA 1983       28694.10       12279.25       4914.92
## 355   355      MINNESOTA 1984       28718.02       12413.96       4898.92
## 356   356      MINNESOTA 1985       28959.43       12569.74       4852.34
## 357   357      MINNESOTA 1986       29241.00       12752.43       4809.57
## 358   358    MISSISSIPPI 1970       10016.07        4936.56        824.65
## 359   359    MISSISSIPPI 1971       10497.82        5114.50        861.51
## 360   360    MISSISSIPPI 1972       10844.14        5323.04        887.66
## 361   361    MISSISSIPPI 1973       11076.23        5491.42        923.12
## 362   362    MISSISSIPPI 1974       11239.45        5639.29        951.12
## 363   363    MISSISSIPPI 1975       11515.56        5738.05       1011.40
## 364   364    MISSISSIPPI 1976       11799.74        5844.97       1072.13
## 365   365    MISSISSIPPI 1977       12061.45        6029.90       1100.06
## 366   366    MISSISSIPPI 1978       12274.39        6182.76       1101.60
## 367   367    MISSISSIPPI 1979       12384.91        6224.01       1135.35
## 368   368    MISSISSIPPI 1980       12454.04        6267.28       1122.82
## 369   369    MISSISSIPPI 1981       12547.36        6352.24       1111.96
## 370   370    MISSISSIPPI 1982       12603.35        6422.29       1117.05
## 371   371    MISSISSIPPI 1983       12613.88        6517.93       1129.55
## 372   372    MISSISSIPPI 1984       12509.37        6583.29       1117.48
## 373   373    MISSISSIPPI 1985       12430.11        6621.01       1108.22
## 374   374    MISSISSIPPI 1986       12411.36        6654.31       1138.91
## 375   375       MISSOURI 1970       19464.98        9512.80       2571.06
## 376   376       MISSOURI 1971       20393.17        9928.55       2701.12
## 377   377       MISSOURI 1972       21288.19       10282.11       2803.23
## 378   378       MISSOURI 1973       22079.10       10518.19       2798.25
## 379   379       MISSOURI 1974       22475.35       10658.22       2787.58
## 380   380       MISSOURI 1975       22839.32       10880.54       2774.79
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## 381   381       MISSOURI 1976       23032.56       10949.45       2804.81
## 382   382       MISSOURI 1977       23236.14       11026.81       2899.28
## 383   383       MISSOURI 1978       23393.53       11140.36       3006.60
## 384   384       MISSOURI 1979       23545.20       11165.62       3174.40
## 385   385       MISSOURI 1980       23670.64       11257.64       3244.45
## 386   386       MISSOURI 1981       23947.15       11287.89       3375.57
## 387   387       MISSOURI 1982       24084.48       11257.30       3526.02
## 388   388       MISSOURI 1983       23957.04       11186.57       3560.48
## 389   389       MISSOURI 1984       23782.61       11168.62       3544.61
## 390   390       MISSOURI 1985       23761.70       11134.25       3572.77
## 391   391       MISSOURI 1986       23855.97       11224.66       3593.45
## 392   392         MONTANA 1970        4782.64        3372.27        366.92
## 393   393         MONTANA 1971        4956.96        3517.01        371.39
## 394   394         MONTANA 1972        5095.70        3657.76        368.85
## 395   395         MONTANA 1973        5241.43        3786.46        360.64
## 396   396         MONTANA 1974        5420.38        3881.28        406.51
## 397   397         MONTANA 1975        5487.68        3885.38        428.87
## 398   398         MONTANA 1976        5536.46        3863.19        459.07
## 399   399         MONTANA 1977        5628.09        3886.33        497.77
## 400   400         MONTANA 1978        5756.96        3964.73        519.63
## 401   401         MONTANA 1979        5871.16        3999.93        530.18
## 402   402         MONTANA 1980        5945.22        3997.37        533.84
## 403   403         MONTANA 1981        6004.93        4003.21        534.09
## 404   404         MONTANA 1982        6027.25        4030.51        531.54
## 405   405         MONTANA 1983        5967.63        4007.25        530.62
## 406   406         MONTANA 1984        5957.83        4013.08        533.75
## 407   407         MONTANA 1985        6024.85        4046.68        553.46
## 408   408         MONTANA 1986        6117.91        4085.04        575.89
## 409   409        NEBRASKA 1970        9235.03        4134.55       1065.95
## 410   410        NEBRASKA 1971        9759.43        4227.15       1071.08
## 411   411        NEBRASKA 1972       10291.33        4373.59       1042.10
## 412   412        NEBRASKA 1973       10785.36        4469.52       1042.23
## 413   413        NEBRASKA 1974       11293.48        4574.39       1082.39
## 414   414        NEBRASKA 1975       11814.03        4667.10       1136.50
## 415   415        NEBRASKA 1976       12436.57        4740.46       1263.78
## 416   416        NEBRASKA 1977       12902.62        4831.06       1277.91
## 417   417        NEBRASKA 1978       13482.42        4911.27       1301.78
## 418   418        NEBRASKA 1979       14181.26        4985.51       1374.67
## 419   419        NEBRASKA 1980       14619.96        5048.29       1407.61
## 420   420        NEBRASKA 1981       14897.42        5106.40       1449.25
## 421   421        NEBRASKA 1982       15039.75        5138.40       1440.27
## 422   422        NEBRASKA 1983       15088.99        5188.05       1442.72
## 423   423        NEBRASKA 1984       15027.98        5215.73       1422.43
## 424   424        NEBRASKA 1985       14981.50        5281.80       1408.58
## 425   425        NEBRASKA 1986       14974.69        5344.81       1399.20
## 426   426          NEVADA 1970        3768.60        1993.17        464.21
## 427   427          NEVADA 1971        3877.35        2042.40        481.20
## 428   428          NEVADA 1972        4033.14        2094.25        508.15
## 429   429          NEVADA 1973        4160.79        2116.82        508.31
## 430   430          NEVADA 1974        4296.97        2155.53        513.74
## 431   431          NEVADA 1975        4402.10        2158.46        514.36
## 432   432          NEVADA 1976        4500.21        2165.37        538.63
## 433   433          NEVADA 1977        4574.27        2174.66        572.23
## 434   434          NEVADA 1978        4646.28        2195.82        606.32
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## 435   435         NEVADA 1979        4766.05        2243.79         616.74
## 436   436         NEVADA 1980        4935.36        2276.73         711.72
## 437   437         NEVADA 1981        5188.56        2321.80         839.08
## 438   438         NEVADA 1982        5381.96        2368.03         886.05
## 439   439         NEVADA 1983        5500.17        2389.52         918.29
## 440   440         NEVADA 1984        5695.00        2455.39         997.68
## 441   441         NEVADA 1985        5856.90        2508.07        1049.48
## 442   442         NEVADA 1986        6003.00        2574.74        1082.71
## 443   443  NEW_HAMPSHIRE 1970        3085.49        1889.29         254.57
## 444   444  NEW_HAMPSHIRE 1971        3247.53        1943.53         275.04
## 445   445  NEW_HAMPSHIRE 1972        3419.24        2008.20         302.67
## 446   446  NEW_HAMPSHIRE 1973        3559.45        2057.30         322.28
## 447   447  NEW_HAMPSHIRE 1974        3688.39        2124.83         372.70
## 448   448  NEW_HAMPSHIRE 1975        3783.91        2167.52         397.66
## 449   449  NEW_HAMPSHIRE 1976        3915.38        2214.32         428.63
## 450   450  NEW_HAMPSHIRE 1977        4084.04        2257.39         476.30
## 451   451  NEW_HAMPSHIRE 1978        4223.59        2301.79         511.67
## 452   452  NEW_HAMPSHIRE 1979        4329.97        2333.25         567.87
## 453   453  NEW_HAMPSHIRE 1980        4348.94        2342.18         560.20
## 454   454  NEW_HAMPSHIRE 1981        4369.35        2344.09         578.84
## 455   455  NEW_HAMPSHIRE 1982        4353.02        2330.25         607.17
## 456   456  NEW_HAMPSHIRE 1983        4333.41        2314.90         622.69
## 457   457  NEW_HAMPSHIRE 1984        4324.98        2327.25         624.39
## 458   458  NEW_HAMPSHIRE 1985        4316.63        2337.76         633.79
## 459   459  NEW_HAMPSHIRE 1986        4331.54        2350.11         637.52
## 460   460     NEW_JERSEY 1970       24857.74       10385.59        3963.35
## 461   461     NEW_JERSEY 1971       26627.68       11262.24        4101.37
## 462   462     NEW_JERSEY 1972       28256.83       12060.09        4189.13
## 463   463     NEW_JERSEY 1973       29544.99       12813.13        4386.79
## 464   464     NEW_JERSEY 1974       30629.69       13495.55        4408.03
## 465   465     NEW_JERSEY 1975       31830.65       13945.50        4522.40
## 466   466     NEW_JERSEY 1976       32396.14       14014.03        4615.85
## 467   467     NEW_JERSEY 1977       32775.77       13955.12        4803.28
## 468   468     NEW_JERSEY 1978       33066.76       13788.65        5095.30
## 469   469     NEW_JERSEY 1979       33268.60       13644.05        5404.27
## 470   470     NEW_JERSEY 1980       33625.27       13558.33        5776.42
## 471   471     NEW_JERSEY 1981       33794.24       13439.86        6029.86
## 472   472     NEW_JERSEY 1982       34144.85       13293.91        6255.30
## 473   473     NEW_JERSEY 1983       34320.27       13343.43        6279.97
## 474   474     NEW_JERSEY 1984       34385.92       13415.00        6284.28
## 475   475     NEW_JERSEY 1985       34528.53       13486.99        6391.51
## 476   476     NEW_JERSEY 1986       34675.69       13719.05        6368.17
## 477   477     NEW_MEXICO 1970        6082.20        3256.77         802.99
## 478   478     NEW_MEXICO 1971        6195.50        3341.90         824.19
## 479   479     NEW_MEXICO 1972        6238.49        3385.03         800.31
## 480   480     NEW_MEXICO 1973        6326.03        3442.98         779.31
## 481   481     NEW_MEXICO 1974        6367.27        3446.34         784.57
## 482   482     NEW_MEXICO 1975        6447.38        3460.85         808.88
## 483   483     NEW_MEXICO 1976        6606.97        3474.94         883.33
## 484   484     NEW_MEXICO 1977        6724.71        3501.57         890.22
## 485   485     NEW_MEXICO 1978        6786.25        3494.83         896.99
## 486   486     NEW_MEXICO 1979        6902.83        3515.79         923.86
## 487   487     NEW_MEXICO 1980        7104.70        3579.76         972.35
## 488   488     NEW_MEXICO 1981        7296.53        3615.48        1017.38
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## 489   489     NEW_MEXICO 1982        7402.21        3631.09        1039.88
## 490   490     NEW_MEXICO 1983        7634.64        3739.57        1071.49
## 491   491     NEW_MEXICO 1984        7904.32        3877.09        1117.34
## 492   492     NEW_MEXICO 1985        8228.31        4028.10        1150.52
## 493   493     NEW_MEXICO 1986        8483.37        4096.28        1198.64
## 494   494       NEW_YORK 1970      106893.49       34674.49       10536.87
## 495   495       NEW_YORK 1971      110931.96       35397.65       11005.89
## 496   496       NEW_YORK 1972      115957.66       36040.10       11844.87
## 497   497       NEW_YORK 1973      121450.05       36678.41       12806.81
## 498   498       NEW_YORK 1974      126498.16       36709.33       14026.58
## 499   499       NEW_YORK 1975      131097.03       36931.52       15461.48
## 500   500       NEW_YORK 1976      134166.03       36848.64       16674.44
## 501   501       NEW_YORK 1977      134701.89       36486.69       17487.05
## 502   502       NEW_YORK 1978      134632.83       36064.57       18001.42
## 503   503       NEW_YORK 1979      134765.25       35899.56       18904.65
## 504   504       NEW_YORK 1980      134166.71       35837.95       19440.64
## 505   505       NEW_YORK 1981      133207.70       35638.22       20032.22
## 506   506       NEW_YORK 1982      132189.18       35797.68       20063.48
## 507   507       NEW_YORK 1983      131808.83       35777.56       20119.85
## 508   508       NEW_YORK 1984      131365.12       35970.24       20223.34
## 509   509       NEW_YORK 1985      131529.92       36063.88       20459.67
## 510   510       NEW_YORK 1986      132203.02       36270.34       20695.61
## 511   511 NORTH_CAROLINA 1970       16840.00        7670.09        2354.23
## 512   512 NORTH_CAROLINA 1971       17688.47        8035.21        2409.62
## 513   513 NORTH_CAROLINA 1972       18419.02        8433.57        2437.58
## 514   514 NORTH_CAROLINA 1973       19081.72        8810.08        2458.58
## 515   515 NORTH_CAROLINA 1974       19701.02        9185.20        2511.72
## 516   516 NORTH_CAROLINA 1975       20334.13        9347.54        2626.44
## 517   517 NORTH_CAROLINA 1976       21062.44        9478.41        2794.70
## 518   518 NORTH_CAROLINA 1977       22029.51        9749.47        3027.51
## 519   519 NORTH_CAROLINA 1978       22652.00        9915.07        3236.38
## 520   520 NORTH_CAROLINA 1979       23305.83       10151.65        3386.90
## 521   521 NORTH_CAROLINA 1980       24164.71       10342.92        3529.30
## 522   522 NORTH_CAROLINA 1981       24576.10       10401.46        3674.75
## 523   523 NORTH_CAROLINA 1982       24698.58       10322.00        3776.84
## 524   524 NORTH_CAROLINA 1983       24700.31       10211.41        3848.75
## 525   525 NORTH_CAROLINA 1984       24674.17       10160.18        3881.92
## 526   526 NORTH_CAROLINA 1985       24744.19       10119.46        3934.05
## 527   527 NORTH_CAROLINA 1986       25179.37       10143.70        4011.37
## 528   528   NORTH_DAKOTA 1970        4173.07        2716.99         307.77
## 529   529   NORTH_DAKOTA 1971        4226.31        2740.92         312.24
## 530   530   NORTH_DAKOTA 1972        4302.57        2816.25         312.10
## 531   531   NORTH_DAKOTA 1973        4330.52        2834.21         309.31
## 532   532   NORTH_DAKOTA 1974        4404.40        2888.67         324.15
## 533   533   NORTH_DAKOTA 1975        4458.28        2903.68         331.88
## 534   534   NORTH_DAKOTA 1976        4492.23        2903.34         348.23
## 535   535   NORTH_DAKOTA 1977        4573.94        2943.62         369.74
## 536   536   NORTH_DAKOTA 1978        4628.15        2985.13         393.92
## 537   537   NORTH_DAKOTA 1979        4704.64        3011.56         431.75
## 538   538   NORTH_DAKOTA 1980        4798.61        3050.67         465.06
## 539   539   NORTH_DAKOTA 1981        4888.20        3070.19         499.31
## 540   540   NORTH_DAKOTA 1982        4893.00        3065.00         509.81
## 541   541   NORTH_DAKOTA 1983        4929.21        3061.18         523.49
## 542   542   NORTH_DAKOTA 1984        4929.23        3054.36         531.07
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## 543   543   NORTH_DAKOTA 1985        4968.32        3087.35        540.84
## 544   544   NORTH_DAKOTA 1986        5014.77        3125.82        545.24
## 545   545          OHIO 1970       48317.68       23653.22       8042.87
## 546   546          OHIO 1971       50241.05       24331.77       8185.73
## 547   547          OHIO 1972       51395.75       24733.59       8222.16
## 548   548          OHIO 1973       52356.39       24882.94       8181.22
## 549   549          OHIO 1974       52834.75       24967.19       8073.31
## 550   550          OHIO 1975       53464.68       25063.58       8154.51
## 551   551          OHIO 1976       54188.05       24980.44       8182.63
## 552   552          OHIO 1977       54969.48       24924.30       8163.67
## 553   553          OHIO 1978       55391.11       24781.45       8188.06
## 554   554          OHIO 1979       56115.22       24696.32       8735.81
## 555   555          OHIO 1980       56513.62       24562.73       9220.96
## 556   556          OHIO 1981       56980.17       24343.52       9746.70
## 557   557          OHIO 1982       57101.01       24029.59      10083.59
## 558   558          OHIO 1983       56929.04       23773.55      10340.46
## 559   559          OHIO 1984       56648.46       23606.36      10301.22
## 560   560          OHIO 1985       56463.31       23826.13      10347.15
## 561   561          OHIO 1986       56283.12       23755.80      10438.18
## 562   562      OKLAHOMA 1970       11168.19        5732.80       1486.50
## 563   563      OKLAHOMA 1971       11478.15        5929.05       1490.06
## 564   564      OKLAHOMA 1972       11680.58        5994.30       1490.32
## 565   565      OKLAHOMA 1973       11832.90        5697.07       1502.23
## 566   566      OKLAHOMA 1974       12026.61        5821.31       1504.27
## 567   567      OKLAHOMA 1975       12396.49        5890.24       1563.42
## 568   568      OKLAHOMA 1976       12730.82        5926.67       1582.08
## 569   569      OKLAHOMA 1977       12979.01        5936.34       1660.13
## 570   570      OKLAHOMA 1978       13229.51        5972.49       1772.14
## 571   571      OKLAHOMA 1979       13492.11        6001.28       1874.55
## 572   572      OKLAHOMA 1980       13835.66        6039.31       1978.89
## 573   573      OKLAHOMA 1981       14248.02        6072.15       2074.79
## 574   574      OKLAHOMA 1982       14564.32        6131.31       2093.83
## 575   575      OKLAHOMA 1983       14766.51        6159.51       2107.75
## 576   576      OKLAHOMA 1984       15088.88        6263.83       2163.79
## 577   577      OKLAHOMA 1985       15480.80        6331.49       2296.72
## 578   578      OKLAHOMA 1986       15891.09        6405.81       2469.94
## 579   579        OREGON 1970       11143.64        5522.14       1700.12
## 580   580        OREGON 1971       11481.58        5641.79       1727.20
## 581   581        OREGON 1972       11830.75        5868.40       1804.21
## 582   582        OREGON 1973       12150.51        6085.11       1824.76
## 583   583        OREGON 1974       12912.83        6313.44       1862.00
## 584   584        OREGON 1975       13214.80        6322.44       1964.90
## 585   585        OREGON 1976       13671.14        6354.98       2114.32
## 586   586        OREGON 1977       13976.13        6408.58       2228.32
## 587   587        OREGON 1978       14350.99        6376.73       2333.49
## 588   588        OREGON 1979       14724.22        6372.79       2486.81
## 589   589        OREGON 1980       15020.05        6373.70       2595.82
## 590   590        OREGON 1981       15420.55        6437.47       2735.99
## 591   591        OREGON 1982       15666.86        6498.98       2809.85
## 592   592        OREGON 1983       15743.83        6563.95       2871.30
## 593   593        OREGON 1984       15759.04        6589.36       2876.97
## 594   594        OREGON 1985       15844.49        6639.98       2914.08
## 595   595        OREGON 1986       15947.63        6716.47       2930.22
## 596   596  PENNSYLVANIA 1970       50428.35       21507.10       6873.42
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## 597   597   PENNSYLVANIA 1971       53374.91       22873.38       7025.09
## 598   598   PENNSYLVANIA 1972       56250.56       24070.94       7202.57
## 599   599   PENNSYLVANIA 1973       58090.06       24636.92       7318.54
## 600   600   PENNSYLVANIA 1974       59430.51       25171.81       7373.42
## 601   601   PENNSYLVANIA 1975       60860.60       25623.54       7590.82
## 602   602   PENNSYLVANIA 1976       61871.02       26024.77       7755.33
## 603   603   PENNSYLVANIA 1977       62830.91       26341.98       7927.55
## 604   604   PENNSYLVANIA 1978       62861.36       26307.55       8126.83
## 605   605   PENNSYLVANIA 1979       62652.44       26037.41       8359.35
## 606   606   PENNSYLVANIA 1980       62617.53       25614.52       8656.53
## 607   607   PENNSYLVANIA 1981       62440.58       25108.39       8987.35
## 608   608   PENNSYLVANIA 1982       62061.65       24753.64       9231.40
## 609   609   PENNSYLVANIA 1983       61479.97       24476.17       9208.68
## 610   610   PENNSYLVANIA 1984       61158.43       24200.25       9085.60
## 611   611   PENNSYLVANIA 1985       60661.77       23961.42       8915.94
## 612   612   PENNSYLVANIA 1986       60244.69       23854.84       8826.75
## 613   613   RHODE_ISLAND 1970        4310.22        2264.59        572.26
## 614   614   RHODE_ISLAND 1971        4451.24        2278.20        591.72
## 615   615   RHODE_ISLAND 1972        4493.55        2224.36        571.84
## 616   616   RHODE_ISLAND 1973        4498.12        2179.26        563.72
## 617   617   RHODE_ISLAND 1974        4490.52        2164.89        555.89
## 618   618   RHODE_ISLAND 1975        4463.83        2139.15        554.58
## 619   619   RHODE_ISLAND 1976        4437.89        2095.73        561.10
## 620   620   RHODE_ISLAND 1977        4443.85        2052.80        589.14
## 621   621   RHODE_ISLAND 1978        4442.70        2016.80        656.02
## 622   622   RHODE_ISLAND 1979        4430.52        1988.83        693.61
## 623   623   RHODE_ISLAND 1980        4411.81        1959.41        727.15
## 624   624   RHODE_ISLAND 1981        4396.28        1928.90        754.45
## 625   625   RHODE_ISLAND 1982        4342.85        1906.68        765.37
## 626   626   RHODE_ISLAND 1983        4302.36        1878.80        769.74
## 627   627   RHODE_ISLAND 1984        4251.45        1860.02        761.93
## 628   628   RHODE_ISLAND 1985        4230.74        1860.07        779.73
## 629   629   RHODE_ISLAND 1986        4254.36        1884.02        800.83
## 630   630 SOUTH_CAROLINA 1970        8250.43        4003.53       1094.79
## 631   631 SOUTH_CAROLINA 1971        8694.41        4102.90       1188.11
## 632   632 SOUTH_CAROLINA 1972        9115.22        4235.03       1352.97
## 633   633 SOUTH_CAROLINA 1973        9554.06        4348.79       1474.87
## 634   634 SOUTH_CAROLINA 1974       10014.14        4508.21       1562.14
## 635   635 SOUTH_CAROLINA 1975       10637.46        4644.35       1639.24
## 636   636 SOUTH_CAROLINA 1976       11097.59        4728.06       1665.89
## 637   637 SOUTH_CAROLINA 1977       11500.56        4766.46       1673.79
## 638   638 SOUTH_CAROLINA 1978       11653.18        4715.39       1676.79
## 639   639 SOUTH_CAROLINA 1979       11911.50        4700.13       1744.90
## 640   640 SOUTH_CAROLINA 1980       12263.76        4689.82       1804.03
## 641   641 SOUTH_CAROLINA 1981       12577.08        4671.24       1838.99
## 642   642 SOUTH_CAROLINA 1982       12972.01        4633.78       1932.60
## 643   643 SOUTH_CAROLINA 1983       13110.97        4522.20       1997.51
## 644   644 SOUTH_CAROLINA 1984       13172.84        4448.16       2086.57
## 645   645 SOUTH_CAROLINA 1985       13211.81        4462.60       2131.34
## 646   646 SOUTH_CAROLINA 1986       13391.24        4491.38       2181.72
## 647   647   SOUTH_DAKOTA 1970        4173.17        3034.09        258.85
## 648   648   SOUTH_DAKOTA 1971        4261.98        3081.08        268.64
## 649   649   SOUTH_DAKOTA 1972        4333.46        3131.49        261.19
## 650   650   SOUTH_DAKOTA 1973        4407.53        3145.05        270.82
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## 651   651   SOUTH_DAKOTA 1974        4501.83        3195.26        272.96
## 652   652   SOUTH_DAKOTA 1975        4630.20        3238.72        279.35
## 653   653   SOUTH_DAKOTA 1976        4732.91        3256.92        287.71
## 654   654   SOUTH_DAKOTA 1977        4840.82        3291.01        286.76
## 655   655   SOUTH_DAKOTA 1978        4895.63        3274.12        290.55
## 656   656   SOUTH_DAKOTA 1979        4998.02        3263.74        308.57
## 657   657   SOUTH_DAKOTA 1980        5067.50        3244.97        327.55
## 658   658   SOUTH_DAKOTA 1981        5125.45        3228.59        349.02
## 659   659   SOUTH_DAKOTA 1982        5178.56        3222.48        372.98
## 660   660   SOUTH_DAKOTA 1983        5162.24        3201.09        394.14
## 661   661   SOUTH_DAKOTA 1984        5146.61        3199.35        406.21
## 662   662   SOUTH_DAKOTA 1985        5148.18        3211.40        422.71
## 663   663   SOUTH_DAKOTA 1986        5281.22        3231.13        523.95
## 664   664      TENNESSE 1970       20949.51        9280.24       2787.57
## 665   665      TENNESSE 1971       21687.41        9506.84       2869.86
## 666   666      TENNESSE 1972       22448.25        9660.19       3084.42
## 667   667      TENNESSE 1973       22886.75        9744.11       3117.33
## 668   668      TENNESSE 1974       23184.46        9861.13       3152.00
## 669   669      TENNESSE 1975       23972.49        9981.10       3422.44
## 670   670      TENNESSE 1976       24632.07       10093.20       3612.72
## 671   671      TENNESSE 1977       25153.79       10262.04       3728.89
## 672   672      TENNESSE 1978       25444.07       10346.22       3836.06
## 673   673      TENNESSE 1979       25820.64       10412.39       3996.54
## 674   674      TENNESSE 1980       26011.90       10468.24       4055.87
## 675   675      TENNESSE 1981       26321.05       10514.67       4196.88
## 676   676      TENNESSE 1982       26467.14       10529.66       4342.69
## 677   677      TENNESSE 1983       26394.65       10509.67       4476.56
## 678   678      TENNESSE 1984       26261.07       10523.47       4538.01
## 679   679      TENNESSE 1985       26236.06       10639.21       4527.33
## 680   680      TENNESSE 1986       26281.46       10744.85       4533.62
## 681   681         TEXAS 1970       53639.88       25941.91       8352.71
## 682   682         TEXAS 1971       55700.45       26813.21       8689.06
## 683   683         TEXAS 1972       57213.27       27558.66       8884.14
## 684   684         TEXAS 1973       59134.01       28414.53       8972.86
## 685   685         TEXAS 1974       60974.12       28683.18       9108.26
## 686   686         TEXAS 1975       62734.61       28964.12       9410.71
## 687   687         TEXAS 1976       64422.93       29304.44       9852.87
## 688   688         TEXAS 1977       65863.92       29426.06      10229.27
## 689   689         TEXAS 1978       67133.78       29487.23      10579.21
## 690   690         TEXAS 1979       69034.04       29851.00      11113.25
## 691   691         TEXAS 1980       71409.31       30308.65      11992.75
## 692   692         TEXAS 1981       74168.05       30933.18      12624.39
## 693   693         TEXAS 1982       76260.44       31570.69      13030.77
## 694   694         TEXAS 1983       78159.02       32349.61      13466.37
## 695   695         TEXAS 1984       80067.98       32880.15      13775.33
## 696   696         TEXAS 1985       82196.09       33234.72      14101.13
## 697   697         TEXAS 1986       84303.17       33451.67      14704.89
## 698   698          UTAH 1970        6494.16        3117.57        652.40
## 699   699          UTAH 1971        6666.03        3281.38        639.42
## 700   700          UTAH 1972        6773.32        3381.43        626.52
## 701   701          UTAH 1973        6928.74        3497.85        599.48
## 702   702          UTAH 1974        7072.53        3583.37        592.91
## 703   703          UTAH 1975        7239.52        3626.31        599.94
## 704   704          UTAH 1976        7373.63        3624.95        606.43
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## 705   705          UTAH 1977       7547.71       3670.07        608.15
## 706   706          UTAH 1978       7716.92       3711.33        632.13
## 707   707          UTAH 1979       7893.14       3721.36        672.08
## 708   708          UTAH 1980       8057.45       3734.37        706.28
## 709   709          UTAH 1981       8334.41       3801.07        723.09
## 710   710          UTAH 1982       8606.09       3841.88        727.72
## 711   711          UTAH 1983       8908.45       3867.21        731.40
## 712   712          UTAH 1984       9453.63       3925.74        746.32
## 713   713          UTAH 1985      10311.40       4014.23        807.78
## 714   714          UTAH 1986      11392.00       4150.02        867.39
## 715   715       VERMONT 1970       2627.12       1827.14        261.49
## 716   716       VERMONT 1971       2756.19       1881.33        256.48
## 717   717       VERMONT 1972       2894.58       1940.72        264.67
## 718   718       VERMONT 1973       2967.25       1965.24        272.79
## 719   719       VERMONT 1974       3025.15       2004.94        276.93
## 720   720       VERMONT 1975       3083.07       2014.34        276.54
## 721   721       VERMONT 1976       3075.61       2009.05        268.07
## 722   722       VERMONT 1977       3055.26       1998.08        262.76
## 723   723       VERMONT 1978       3019.42       1989.61        255.73
## 724   724       VERMONT 1979       3020.06       1968.36        261.21
## 725   725       VERMONT 1980       3032.36       1941.41        269.08
## 726   726       VERMONT 1981       3016.79       1912.68        280.15
## 727   727       VERMONT 1982       2983.19       1875.51        287.47
## 728   728       VERMONT 1983       2950.98       1857.38        292.00
## 729   729       VERMONT 1984       2927.85       1847.43        304.49
## 730   730       VERMONT 1985       2925.39       1838.69        323.36
## 731   731       VERMONT 1986       2936.44       1830.16        335.51
## 732   732      VIRGINIA 1970      20732.56      11264.21       2677.11
## 733   733      VIRGINIA 1971      21582.28      11608.60       2716.73
## 734   734      VIRGINIA 1972      22348.28      11917.89       2788.37
## 735   735      VIRGINIA 1973      22927.00      12172.65       2853.28
## 736   736      VIRGINIA 1974      23570.72      12581.86       2903.27
## 737   737      VIRGINIA 1975      24524.64      13035.16       3042.39
## 738   738      VIRGINIA 1976      25440.39      13397.64       3306.99
## 739   739      VIRGINIA 1977      26020.05      13663.61       3556.38
## 740   740      VIRGINIA 1978      26621.80      13983.04       3787.02
## 741   741      VIRGINIA 1979      27058.08      14155.94       3969.02
## 742   742      VIRGINIA 1980      27606.76      14326.92       4212.09
## 743   743      VIRGINIA 1981      27993.19      14398.22       4404.46
## 744   744      VIRGINIA 1982      28206.71      14410.54       4615.59
## 745   745      VIRGINIA 1983      28109.50      14296.38       4742.34
## 746   746      VIRGINIA 1984      28031.46      14265.90       4743.87
## 747   747      VIRGINIA 1985      27922.62      14248.70       4740.24
## 748   748      VIRGINIA 1986      28000.68      14253.92       4786.93
## 749   749    WASHINGTON 1970      25751.49       8657.13       3436.60
## 750   750    WASHINGTON 1971      26775.46       9022.43       3514.56
## 751   751    WASHINGTON 1972      27853.91       9398.12       3556.74
## 752   752    WASHINGTON 1973      28392.60       9681.89       3549.61
## 753   753    WASHINGTON 1974      29137.60      10078.96       3651.21
## 754   754    WASHINGTON 1975      29497.89      10208.42       3728.15
## 755   755    WASHINGTON 1976      29997.51      10297.58       3849.45
## 756   756    WASHINGTON 1977      30862.78      10279.83       4336.53
## 757   757    WASHINGTON 1978      31968.10      10394.74       4759.35
## 758   758    WASHINGTON 1979      33454.73      10470.75       4823.12
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## 759   759     WASHINGTON 1980       35106.09       10631.04       4916.60
## 760   760     WASHINGTON 1981       36528.00       10769.82       4963.37
## 761   761     WASHINGTON 1982       37941.50       10912.53       4852.84
## 762   762     WASHINGTON 1983       39515.57       11058.86       4830.54
## 763   763     WASHINGTON 1984       40454.47       11335.77       4817.01
## 764   764     WASHINGTON 1985       40775.81       11478.52       4890.40
## 765   765     WASHINGTON 1986       41136.36       11738.08       5042.96
## 766   766  WEST_VIRGINIA 1970        6482.87        4049.12        594.58
## 767   767  WEST_VIRGINIA 1971        7051.17        4439.47        573.20
## 768   768  WEST_VIRGINIA 1972        7652.54        4937.39        568.23
## 769   769  WEST_VIRGINIA 1973        8245.21        5519.66        562.16
## 770   770  WEST_VIRGINIA 1974        8735.95        6023.03        552.03
## 771   771  WEST_VIRGINIA 1975        9220.62        6401.46        555.39
## 772   772  WEST_VIRGINIA 1976        9624.86        6667.31        571.10
## 773   773  WEST_VIRGINIA 1977        9942.15        6874.36        571.08
## 774   774  WEST_VIRGINIA 1978       10115.55        6973.03        577.99
## 775   775  WEST_VIRGINIA 1979       10457.33        7117.63        598.26
## 776   776  WEST_VIRGINIA 1980       10705.18        7254.08        607.48
## 777   777  WEST_VIRGINIA 1981       10943.56        7400.82        636.76
## 778   778  WEST_VIRGINIA 1982       11059.62        7502.31        686.36
## 779   779  WEST_VIRGINIA 1983       11078.85        7550.99        756.21
## 780   780  WEST_VIRGINIA 1984       11072.89        7561.72        808.86
## 781   781  WEST_VIRGINIA 1985       11000.70        7542.71        821.89
## 782   782  WEST_VIRGINIA 1986       10984.38        7544.99        834.01
## 783   783      WISCONSIN 1970       23565.08        9690.08       3968.16
## 784   784      WISCONSIN 1971       24271.67        9903.02       3987.80
## 785   785      WISCONSIN 1972       24747.06       10041.03       3995.29
## 786   786      WISCONSIN 1973       25226.91       10214.01       4078.00
## 787   787      WISCONSIN 1974       25539.33       10420.38       4170.32
## 788   788      WISCONSIN 1975       25799.34       10502.77       4290.18
## 789   789      WISCONSIN 1976       25842.14       10498.44       4359.98
## 790   790      WISCONSIN 1977       25945.01       10554.33       4401.65
## 791   791      WISCONSIN 1978       25858.17       10580.21       4415.95
## 792   792      WISCONSIN 1979       25885.94       10564.08       4500.91
## 793   793      WISCONSIN 1980       25894.16       10593.25       4507.19
## 794   794      WISCONSIN 1981       25984.74       10647.18       4586.04
## 795   795      WISCONSIN 1982       26034.63       10705.66       4668.07
## 796   796      WISCONSIN 1983       26289.52       10843.84       4789.47
## 797   797      WISCONSIN 1984       26225.89       10830.84       4956.72
## 798   798      WISCONSIN 1985       26304.98       10872.29       5140.45
## 799   799      WISCONSIN 1986       26400.60       10848.68       5292.62
## 800   800        WYOMING 1970        3674.01        2696.26        282.35
## 801   801        WYOMING 1971        3701.91        2736.69        275.04
## 802   802        WYOMING 1972        3701.91        2760.91        270.68
## 803   803        WYOMING 1973        3722.93        2785.44        261.83
## 804   804        WYOMING 1974        3732.09        2804.60        258.49
## 805   805        WYOMING 1975        3772.46        2796.67        262.73
## 806   806        WYOMING 1976        3884.01        2804.28        273.45
## 807   807        WYOMING 1977        4037.03        2898.34        291.64
## 808   808        WYOMING 1978        4115.61        2920.85        294.73
## 809   809        WYOMING 1979        4268.71        2950.53        313.47
## 810   810        WYOMING 1980        4399.69        2979.23        338.06
## 811   811        WYOMING 1981        4572.67        3005.62        379.19
## 812   812        WYOMING 1982        4731.98        3060.64        408.43
```

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## 813   813        WYOMING 1983        4950.82        3119.98        445.59
## 814   814        WYOMING 1984        5184.73        3195.68        476.57
## 815   815        WYOMING 1985        5448.38        3295.92        523.01
## 816   816        WYOMING 1986        5700.41        3400.96        565.58
##     utility_capital public_capital state_product employment
## 1           6051.20       35793.80         28418     1010.5
## 2           6254.98       37299.91         29375     1021.9
## 3           6442.23       38670.30         31303     1072.3
## 4           6756.19       40084.01         33430     1135.5
## 5           7002.29       42057.31         33749     1169.8
## 6           7405.76       43971.71         33604     1155.4
## 7           7704.93       50221.57         35764     1207.0
## 8           7901.15       51084.99         37463     1269.2
## 9           8008.59       52604.05         39964     1336.5
## 10          8158.97       54525.86         40979     1362.0
## 11          8210.33       56589.16         40380     1356.1
## 12          8270.79       56481.93         41105     1347.6
## 13          8257.26       58021.69         40328     1312.5
## 14          8278.63       58893.97         42245     1328.8
## 15          8366.37       59446.86         45118     1387.7
## 16          8454.09       60688.04         46849     1427.1
## 17          8601.14       61628.88         48409     1463.3
## 18          3963.75       23585.99         19288      547.4
## 19          4231.23       24924.82         21040      581.4
## 20          4515.11       26058.65         23289      646.3
## 21          4986.92       27304.64         25244      714.5
## 22          5379.69       28829.44         25698      746.0
## 23          6000.77       30243.29         24915      729.1
## 24          6443.63       29384.15         26041      758.7
## 25          6843.50       30072.60         28110      809.3
## 26          7303.73       31139.49         31062      895.4
## 27          7812.01       32377.41         33943      979.9
## 28          8458.88       33769.92         34708     1014.0
## 29          9006.84       36387.15         35244     1040.8
## 30          9354.87       37332.09         33603     1029.8
## 31          9574.99       37829.83         35963     1077.8
## 32         10115.86       38330.02         40010     1181.9
## 33         10394.97       39246.83         43350     1278.6
## 34         10735.88       44189.19         46058     1337.8
## 35          3320.54       19749.63         15392      536.2
## 36          3643.44       20636.47         16177      551.0
## 37          3860.47       21245.48         17702      581.5
## 38          3813.06       21654.02         18825      614.5
## 39          3799.44       22635.84         19287      640.7
## 40          3857.10       23519.27         19024      623.8
## 41          3975.13       26158.59         20277      660.0
## 42          4124.79       26716.93         21410      695.6
## 43          4147.86       27428.45         23063      732.7
## 44          4212.40       28394.22         23501      749.4
## 45          4283.48       29476.51         23210      742.3
## 46          4347.47       31235.95         24134      740.1
## 47          4331.93       32008.74         23462      720.1
## 48          4264.94       32385.62         24415      741.3
## 49          4165.58       32625.51         26512      780.2
```

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## 50          4089.13       33229.46         27159      797.1
## 51          4173.84       32889.30         28168      813.8
## 52         67746.79      172791.92        263933     6946.2
## 53         69046.92      180864.28        265600     6917.0
## 54         69592.17      187587.86        281159     7209.9
## 55         69839.43      193535.82        293735     7621.9
## 56         70162.00      204096.43        298408     7834.3
## 57         71133.44      213216.84        304518     7847.2
## 58         71598.89      221958.93        320160     8154.2
## 59         71757.78      226544.27        338040     8599.7
## 60         71379.60      233936.43        359603     9199.8
## 61         71787.54      243776.26        374928     9664.6
## 62         71253.16      255305.95        380221     9848.8
## 63         71328.17      286402.55        378436     9985.3
## 64         71239.48      297844.03        372541     9810.3
## 65         70679.82      305210.16        390528     9965.8
## 66         70433.71      312008.57        420525    10574.0
## 67         70483.33      324335.15        444082    10979.0
## 68         71099.80      363779.70        464550    11258.0
## 69          4834.28       23709.75         25689      750.2
## 70          4980.33       25186.80         27341      787.0
## 71          5119.84       26010.17         29624      869.4
## 72          5284.65       27387.44         32417      936.0
## 73          5507.92       28763.31         33039      959.7
## 74          5796.53       29939.43         33593      963.5
## 75          6154.52       34680.90         35223     1003.4
## 76          6525.79       35116.03         37429     1058.1
## 77          6754.09       36213.58         40522     1150.0
## 78          6926.75       37674.72         42917     1218.0
## 79          7231.19       39349.98         43888     1251.1
## 80          7307.84       45660.95         44695     1295.2
## 81          7462.46       47010.56         45252     1316.6
## 82          7612.28       47724.11         46523     1327.2
## 83          7842.15       48372.91         49332     1402.3
## 84          8116.55       49793.31         50820     1418.7
## 85          8400.50       47485.05         51781     1408.3
## 86          6420.42       24082.38         38880     1197.5
## 87          6840.91       25147.44         38515     1164.3
## 88          7296.80       26191.58         40037     1190.4
## 89          7569.84       27301.99         42157     1238.7
## 90          7793.45       28832.91         41827     1264.0
## 91          8073.90       30306.10         39870     1223.4
## 92          8179.59       27628.42         41326     1239.7
## 93          8129.91       28268.33         42976     1282.3
## 94          8020.13       29207.04         44844     1346.1
## 95          7918.05       30449.45         46008     1398.0
## 96          7806.72       31844.08         45949     1426.8
## 97          7770.67       31895.65         47397     1438.7
## 98          7641.11       32967.44         47241     1429.8
## 99          7447.65       33668.53         50594     1446.5
## 100         7303.19       34439.31         55117     1520.5
## 101         7142.44       35816.37         58263     1562.3
## 102         7097.92       40413.22         61750     1604.2
## 103         1937.77        6108.14          6863      216.8
```

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## 104         2098.67        6361.22         7399      224.9
## 105         2221.82        6602.65         7829      232.4
## 106         2315.40        6892.09         8604      239.4
## 107         2407.71        7263.84         7777      233.1
## 108         2441.23        7624.03         7625      229.9
## 109         2439.86        7706.19         8061      236.7
## 110         2399.41        7845.75         8313      238.8
## 111         2378.38        8100.95         8390      247.8
## 112         2350.89        8435.96         8360      256.7
## 113         2309.14        8811.38         8200      259.2
## 114         2284.40        9049.52         8344      259.2
## 115         2259.82        9327.72         8435      259.2
## 116         2255.93        9486.76         8883      266.1
## 117         2223.30        9630.61         9347      280.0
## 118         2197.20        9921.23         9699      293.4
## 119         2172.53       10655.00        10072      303.2
## 120        12899.67       57178.05        69641     2152.1
## 121        13526.49       60238.01        73170     2276.4
## 122        14346.86       62873.97        81313     2513.1
## 123        15212.91       66432.27        90897     2778.6
## 124        15781.65       70452.68        92163     2863.8
## 125        16582.51       73809.64        89502     2746.4
## 126        17678.06       87196.50        90957     2784.3
## 127        18198.72       88699.63        95449     2933.2
## 128        18750.48       91517.51       103064     3180.6
## 129        19260.59       95108.50       109121     3381.2
## 130        19736.88       99248.64       113857     3576.2
## 131        20156.15      108486.86       118145     3736.0
## 132        20724.45      111867.96       118301     3761.9
## 133        21650.87      113951.55       126322     3905.4
## 134        22457.33      116417.20       136572     4204.2
## 135        23681.04      120719.68       145171     4410.0
## 136        24847.26      135673.02       152269     4599.4
## 137         8178.48       41597.80        43105     1557.5
## 138         8914.03       43732.94        45438     1602.9
## 139         9568.54       45402.82        49402     1695.2
## 140        10071.47       47422.01        52824     1802.5
## 141        10358.19       49969.83        52390     1827.5
## 142        10723.22       52261.84        50900     1755.7
## 143        11081.48       56287.82        54469     1839.1
## 144        11323.60       56992.14        58085     1926.4
## 145        11635.78       58642.67        61607     2050.1
## 146        12228.86       60866.47        63825     2127.5
## 147        12934.18       63341.08        64216     2159.4
## 148        13470.89       67537.87        66352     2198.6
## 149        13919.41       69347.75        66766     2201.5
## 150        14202.38       70436.24        71485     2279.5
## 151        14569.68       71624.33        78797     2448.7
## 152        14848.38       73979.66        83461     2569.8
## 153        15403.46       83458.28        88827     2672.4
## 154          948.67        9202.07         7175      207.8
## 155         1046.52        9488.47         7255      217.1
## 156         1074.64        9756.40         7898      236.5
## 157         1101.51       10251.95         8352      251.7
```

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## 158        1118.44       10725.66         8970      266.8
## 159        1181.11       11134.59         9099      273.0
## 160        1292.56       12401.79         9709      291.0
## 161        1377.31       12498.22         9967      307.4
## 162        1434.70       12813.38        10828      331.3
## 163        1498.47       13264.09        10924      338.0
## 164        1540.85       13771.17        11002      330.0
## 165        1577.00       13808.97        10959      327.8
## 166        1603.36       14020.30        10432      312.2
## 167        1593.63       14028.64        10879      317.9
## 168        1598.95       14049.02        11262      330.5
## 169        1598.36       14290.67        11815      336.0
## 170        1598.44       13612.16        11672      328.2
## 171       22252.68      114860.83       145792     4345.6
## 172       23384.86      119783.11       148503     4296.4
## 173       24261.85      124239.59       154413     4314.8
## 174       25032.14      129514.10       163125     4466.9
## 175       26071.09      136292.35       161725     4545.7
## 176       26728.17      142558.62       157366     4418.9
## 177       27256.29      140831.43       163112     4565.7
## 178       27695.71      146285.62       168627     4655.5
## 179       27791.28      150855.46       173767     4788.8
## 180       27904.24      156751.98       173817     4880.0
## 181       27718.08      163355.48       165722     4850.3
## 182       27619.33      150688.85       166029     4732.3
## 183       27277.69      154806.13       159778     4593.3
## 184       26832.94      157095.80       160856     4530.6
## 185       26383.99      159388.00       173602     4672.3
## 186       26142.86      164794.50       178493     4755.3
## 187       26046.72      161198.99       183849     4790.7
## 188        9093.83       63646.79        56769     1849.0
## 189        9605.74       65528.57        58540     1841.1
## 190       10046.81       67722.97        61613     1921.9
## 191       10587.15       70189.83        66534     2028.1
## 192       10820.17       73448.90        64313     2031.4
## 193       10974.88       76823.26        61200     1941.7
## 194       11063.10       74736.15        65479     2023.8
## 195       11083.12       77477.95        68832     2114.0
## 196       11094.31       79763.07        71717     2205.5
## 197       11126.23       82742.13        72047     2236.3
## 198       11083.41       86012.21        67930     2129.5
## 199       11146.90       80364.43        68135     2114.4
## 200       11192.68       82361.44        64042     2028.0
## 201       11141.74       83359.59        65211     2029.5
## 202       11042.58       83946.98        70975     2122.3
## 203       10997.08       85849.71        73392     2168.6
## 204       10980.47       87053.98        75924     2221.8
## 205        4666.14       33400.46        29173      876.9
## 206        4932.67       34819.44        29312      882.7
## 207        5005.33       35846.90        31159      912.3
## 208        5073.62       37693.89        33798      961.3
## 209        5069.54       39460.57        33591      999.0
## 210        5169.08       41068.52        34378      998.7
## 211        5314.33       43868.88        35752     1036.9
```

```
## 212        5395.98       46649.69        37277     1079.2
## 213        5396.38       47977.54        39087     1119.2
## 214        5495.97       49653.76        39863     1131.7
## 215        5597.40       51530.31        38919     1109.9
## 216        5707.25       47985.77        40630     1088.6
## 217        5821.07       48698.55        37634     1041.9
## 218        5869.42       48731.50        35937     1040.4
## 219        5753.11       48741.81        38704     1074.7
## 220        5682.34       49781.83        39344     1074.2
## 221        5644.84       43209.95        40425     1073.8
## 222        3677.32       33207.74        26311      678.8
## 223        3981.34       34117.09        26950      677.8
## 224        4099.80       34862.71        28330      717.5
## 225        4255.17       36179.12        29486      763.3
## 226        4381.44       37588.65        29506      790.0
## 227        4650.19       38828.22        29530      801.2
## 228        4762.47       41282.58        30655      834.8
## 229        4941.35       41246.04        31032      871.0
## 230        5137.97       42277.86        32232      912.5
## 231        5455.90       43689.61        33680      946.8
## 232        5670.69       45281.71        32844      944.7
## 233        5883.27       47858.83        33707      949.7
## 234        5959.84       49569.38        33287      921.4
## 235        5858.35       49688.66        33638      921.6
## 236        5816.94       49959.27        35582      960.8
## 237        5740.71       51037.85        36560      967.9
## 238        5673.29       51347.26        37783      984.8
## 239        5307.01       30525.64        32182      910.1
## 240        5715.17       31822.72        33276      931.5
## 241        5853.96       32994.50        35351      988.3
## 242        5965.55       34039.58        37305     1038.6
## 243        6117.59       35741.89        37458     1065.9
## 244        6211.97       37366.28        36717     1057.6
## 245        6337.29       41587.55        39138     1103.1
## 246        6467.91       42985.92        41137     1148.3
## 247        6593.24       44402.66        43098     1209.9
## 248        6684.60       46082.95        44188     1245.4
## 249        6854.46       47878.44        42637     1210.0
## 250        6994.74       47983.96        43595     1196.0
## 251        6984.21       49141.96        42286     1160.7
## 252        6789.20       49720.78        42668     1152.3
## 253        6625.79       50066.78        45998     1213.8
## 254        6525.48       51135.28        46753     1250.3
## 255        6481.89       51911.38        47502     1274.1
## 256        7086.12       97802.38        62666     1033.6
## 257        7169.00       99483.90        64851     1055.9
## 258        7725.31      100299.59        67439     1128.6
## 259        8068.78      101336.45        67100     1176.1
## 260        8267.34      103761.88        64919     1220.8
## 261        8470.76      106564.55        63128     1249.5
## 262        8589.19      100358.47        66338     1314.4
## 263        8818.04      102931.73        68209     1364.6
## 264        9069.94      106574.97        72221     1463.5
## 265        9209.56      111082.30        73681     1517.4
```

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## 266        9367.30      117127.42        75312     1578.9
## 267        9564.78      117911.54        77342     1630.5
## 268        9721.23      124453.54        75743     1607.0
## 269        9850.82      128610.28        72535     1565.2
## 270        9962.60      130129.72        75349     1601.5
## 271       10133.22      133300.12        73777     1591.2
## 272       10070.74      134624.42        68508     1518.5
## 273        1179.39        9305.13         8844      332.2
## 274        1248.46        9582.60         8958      332.3
## 275        1326.92        9906.21         9449      343.7
## 276        1329.01       10255.45         9949      354.8
## 277        1359.42       10747.95         9976      361.5
## 278        1435.12       11224.50         9672      356.9
## 279        1464.69       11017.15        10555      375.3
## 280        1467.79       11201.57        10916      387.8
## 281        1419.50       11494.06        11434      405.6
## 282        1405.36       11929.56        11765      415.9
## 283        1414.64       12404.60        11731      418.3
## 284        1409.24       11733.60        12013      419.2
## 285        1406.72       12095.07        12099      415.5
## 286        1389.35       12308.54        12813      425.0
## 287        1387.53       12475.82        13652      445.7
## 288        1378.60       12817.15        14238      458.4
## 289        1359.97       13919.23        15056      477.4
## 290        7570.64       29115.59        42971     1349.2
## 291        8110.79       30631.20        44111     1371.5
## 292        8769.25       31964.23        46121     1415.0
## 293        9377.71       33413.53        48728     1471.5
## 294        9861.66       35364.63        48514     1493.6
## 295       10463.09       37135.88        47751     1479.3
## 296       11020.03       35089.36        49228     1498.3
## 297       11438.15       35875.05        50507     1545.6
## 298       11829.94       37068.32        52317     1625.8
## 299       12237.64       38627.83        52804     1691.3
## 300       12506.75       40397.33        52361     1711.8
## 301       12884.49       40578.02        53231     1715.8
## 302       12901.82       41844.34        52583     1675.8
## 303       12863.92       42589.53        55323     1724.1
## 304       12861.42       43493.99        58925     1814.0
## 305       12660.18       45119.15        62179     1887.8
## 306       12701.94       49257.92        65408     1952.0
## 307       11141.18       37917.57        64429     2243.5
## 308       11943.51       39727.03        65276     2211.4
## 309       12821.72       41461.37        68096     2251.7
## 310       13976.94       43388.76        70876     2333.5
## 311       15162.30       45943.04        68955     2353.7
## 312       16109.18       48221.47        66448     2273.1
## 313       16452.76       45024.55        68467     2323.5
## 314       16707.46       46061.69        71258     2416.0
## 315       16612.37       47564.53        73575     2526.3
## 316       16567.56       49564.81        75180     2603.5
## 317       16837.63       51862.37        75289     2652.2
## 318       16855.91       54146.22        77490     2668.3
## 319       16836.47       55990.97        77166     2638.0
```

```
## 320        16866.96       57244.08        82489     2692.5
## 321        16940.19       58684.77        90684     2851.8
## 322        17041.78       61180.21        96698     2926.0
## 323        17251.86       69574.24       102279     2984.8
## 324        18379.42       84755.95       102172     2999.0
## 325        19190.33       87827.03       107116     2995.0
## 326        19402.02       91039.26       113837     3118.9
## 327        19532.75       94302.49       122991     3284.3
## 328        19745.17       99072.42       115796     3277.6
## 329        20311.41      103711.23       109217     3136.6
## 330        20861.88      104330.83       119929     3283.0
## 331        21132.41      106687.08       129279     3442.3
## 332        21163.79      109995.68       135247     3609.4
## 333        21218.27      114436.69       132845     3637.1
## 334        21281.74      119398.08       121360     3442.8
## 335        21352.04      112346.20       118356     3364.4
## 336        21316.04      115911.34       108627     3193.3
## 337        21012.58      118105.75       114259     3223.1
## 338        20634.78      119778.97       123886     3381.0
## 339        20604.47      123249.89       131417     3561.5
## 340        20517.06      125148.83       136433     3657.3
## 341         7981.36       43287.56        41734     1315.3
## 342         8580.04       45132.89        42467     1310.2
## 343         9218.14       46882.97        44123     1357.1
## 344         9748.98       48841.94        47805     1436.1
## 345        10021.65       51426.02        47482     1481.0
## 346        10356.08       53798.39        46967     1474.4
## 347        10724.65       49634.58        48795     1520.9
## 348        11041.03       51784.08        51661     1597.3
## 349        11128.96       53517.11        54138     1689.3
## 350        11235.14       55679.83        56239     1767.0
## 351        11258.90       58050.22        55874     1770.2
## 352        11509.07       58041.33        56748     1761.3
## 353        11544.29       59374.92        55919     1707.3
## 354        11499.93       59871.42        57167     1718.4
## 355        11405.14       60369.40        62730     1819.8
## 356        11537.35       61935.21        65463     1864.8
## 357        11679.01       60525.85        68117     1892.5
## 358         4254.87       22569.14        17306      583.9
## 359         4521.82       23557.96        18027      602.2
## 360         4633.44       24157.50        19340      649.3
## 361         4661.69       24473.04        20605      693.2
## 362         4649.04       25485.57        20208      710.8
## 363         4766.11       26426.83        20184      692.3
## 364         4882.64       28130.16        22282      727.5
## 365         4931.48       28447.98        23628      765.9
## 366         4990.03       29243.06        24880      813.7
## 367         5025.54       30326.78        25611      838.1
## 368         5063.94       31541.40        25082      829.3
## 369         5083.17       32193.92        26017      819.1
## 370         5064.02       33198.66        25537      790.9
## 371         4966.40       33751.34        25570      792.8
## 372         4808.60       34052.06        27342      820.8
## 373         4700.88       34822.24        27778      838.9
```

```
## 374        4618.14       34116.19        27987      848.2
## 375        7381.12       43905.35        50196     1668.0
## 376        7763.50       46044.28        51945     1660.8
## 377        8202.85       47785.13        54198     1700.1
## 378        8762.66       49585.63        56789     1770.6
## 379        9029.55       52270.92        55056     1789.5
## 380        9183.98       54632.86        53932     1740.6
## 381        9278.30       54083.75        57183     1797.8
## 382        9310.05       55279.22        60424     1861.8
## 383        9246.57       56916.63        63375     1953.1
## 384        9205.17       59048.79        64333     2011.1
## 385        9168.55       61409.73        61574     1969.8
## 386        9283.69       61738.44        62540     1956.3
## 387        9301.16       63186.99        61226     1922.4
## 388        9209.99       63907.08        63655     1937.0
## 389        9069.39       64752.02        68490     2032.7
## 390        9054.68       66783.29        70830     2094.7
## 391        9037.86       68087.26        72629     2142.6
## 392        1043.45       14320.39         7896      199.1
## 393        1068.56       14461.39         7829      204.8
## 394        1069.09       14730.06         8524      215.3
## 395        1094.33       15347.47         8948      224.2
## 396        1132.59       15871.08         9176      234.0
## 397        1173.43       16347.55         9288      238.1
## 398        1214.20       18140.99         9524      251.1
## 399        1243.99       18199.92         9675      264.8
## 400        1272.61       18653.37        10580      280.4
## 401        1341.06       19264.06        10952      283.8
## 402        1414.02       19941.84        11114      280.4
## 403        1467.63       19265.48        11394      281.8
## 404        1465.20       19724.98        11007      273.7
## 405        1429.77       19877.97        10911      276.0
## 406        1410.99       19888.70        10817      281.1
## 407        1424.71       20199.10        10323      279.1
## 408        1456.97       19414.55        10763      275.4
## 409        4034.52       19160.51        16067      484.3
## 410        4461.20       19747.34        16648      490.8
## 411        4875.63       20268.79        17429      517.0
## 412        5273.60       21324.54        18284      541.3
## 413        5636.69       22286.74        18151      562.1
## 414        6010.44       23106.64        18717      557.8
## 415        6432.33       24592.23        19189      572.1
## 416        6793.64       24992.27        19563      593.7
## 417        7269.37       25629.40        20298      609.9
## 418        7821.08       26477.07        20943      631.2
## 419        8164.06       27424.29        20575      627.6
## 420        8341.77       29177.88        21777      623.2
## 421        8461.08       29566.74        21244      609.8
## 422        8458.22       29555.66        20647      610.8
## 423        8389.81       29573.43        22164      635.4
## 424        8291.11       30189.60        23300      650.5
## 425        8230.68       28468.92        23673      652.5
## 426        1311.21       10805.73         7354      203.3
## 427        1353.76       11252.01         7599      210.5
```

```
## 428        1430.73       11706.31         8076      223.4
## 429        1535.66       12261.06         8774      244.6
## 430        1627.70       12901.95         8861      256.1
## 431        1729.28       13377.10         9084      263.1
## 432        1796.21       15048.03         9720      279.8
## 433        1827.37       15231.21        10673      308.2
## 434        1844.14       15437.13        12233      350.3
## 435        1905.53       15781.26        13343      383.7
## 436        1946.91       16264.91        13991      399.9
## 437        2027.68       17556.21        14365      411.2
## 438        2127.88       17981.16        13796      401.1
## 439        2192.36       18297.17        14103      402.8
## 440        2241.92       18813.07        14790      426.0
## 441        2299.35       19705.62        15474      446.4
## 442        2345.55       22724.26        16092      468.1
## 443         941.63        5957.55         6852      258.5
## 444        1028.95        6436.54         7042      259.9
## 445        1108.37        6680.89         7516      278.5
## 446        1179.87        6965.50         8098      297.8
## 447        1190.86        7332.32         8016      300.3
## 448        1218.73        7671.07         7819      292.8
## 449        1272.44        7536.15         8470      313.4
## 450        1350.35        7674.13         9084      337.1
## 451        1410.14        7886.88        10002      359.6
## 452        1428.85        8200.74        10572      378.5
## 453        1446.56        8562.82        10738      385.4
## 454        1446.42        9134.69        11332      394.6
## 455        1415.59        9412.72        11606      394.4
## 456        1395.82        9575.38        12743      409.5
## 457        1373.34        9751.27        14100      441.5
## 458        1345.08       10057.05        15541      466.0
## 459        1343.91       11863.55        17073      490.1
## 460       10508.80       57996.40        86366     2606.2
## 461       11264.07       59928.09        89073     2607.6
## 462       12007.61       62437.39        93384     2672.5
## 463       12345.07       65220.99        97847     2759.7
## 464       12726.11       68911.99        94864     2783.0
## 465       13362.75       72364.36        90693     2699.9
## 466       13766.27       65688.10        94049     2753.7
## 467       14017.37       67158.09        97370     2836.9
## 468       14182.81       69360.18       101593     2961.9
## 469       14220.29       72312.47       103350     3027.2
## 470       14290.51       75670.48       102571     3060.4
## 471       14324.53       77193.36       105835     3098.9
## 472       14595.64       79782.27       106705     3092.8
## 473       14696.88       81590.08       113408     3165.1
## 474       14686.65       83749.02       121388     3329.2
## 475       14650.02       87514.13       126460     3414.1
## 476       14588.46       95540.08       133468     3489.9
## 477        2022.44       18909.26        12837      292.6
## 478        2029.41       19467.69        13284      305.7
## 479        2053.14       19864.93        13874      327.5
## 480        2103.74       20592.77        14588      346.0
## 481        2136.37       21314.16        15247      360.2
```

```
## 482        2177.66       21958.76        15541      370.2
## 483        2248.71       23919.97        15932      390.0
## 484        2332.92       24441.46        16932      415.4
## 485        2394.43       25269.39        18122      444.3
## 486        2463.18       26247.31        19078      461.0
## 487        2552.60       27361.11        19664      465.4
## 488        2663.68       26939.76        20265      475.5
## 489        2731.23       28025.98        20023      473.6
## 490        2823.58       28657.43        20283      479.5
## 491        2909.89       28916.61        21331      502.8
## 492        3049.69       29544.48        21741      520.2
## 493        3188.45       30208.23        21154      525.9
## 494       61682.14      136663.66       242791     7156.4
## 495       64528.42      142795.91       245018     7011.4
## 496       68072.70      149415.66       251249     7038.5
## 497       71964.82      157017.53       258498     7132.2
## 498       75762.25      166920.58       250208     7077.1
## 499       78704.03      175080.71       242463     6829.9
## 500       80642.95      153578.05       245161     6789.5
## 501       80728.14      156804.67       251092     6857.6
## 502       80566.85      162223.44       254194     7044.5
## 503       79961.03      169324.73       254314     7179.4
## 504       78888.13      177499.16       249770     7207.1
## 505       77537.26      173471.27       256199     7287.3
## 506       76328.03      179574.26       255686     7254.6
## 507       75911.43      183921.34       267916     7313.3
## 508       75171.54      189443.48       285080     7570.4
## 509       75006.37      199426.84       296381     7751.3
## 510       75237.07      199092.60       309273     7907.9
## 511        6815.68       43497.41        48047     1782.7
## 512        7243.65       46378.35        50127     1813.8
## 513        7547.86       48129.87        54624     1911.9
## 514        7813.07       49858.52        57975     2018.1
## 515        8004.09       52460.28        57546     2048.2
## 516        8360.16       54990.14        56288     1979.9
## 517        8789.33       57959.71        59462     2082.7
## 518        9252.54       59106.74        62681     2170.4
## 519        9500.55       60848.16        66409     2277.4
## 520        9767.29       63150.19        68039     2373.0
## 521       10292.49       65641.48        68065     2380.0
## 522       10499.90       67293.41        70395     2391.6
## 523       10599.74       69071.06        69128     2347.0
## 524       10640.14       70037.15        73553     2419.2
## 525       10632.06       70834.50        80020     2565.2
## 526       10690.68       72753.04        83170     2651.2
## 527       11024.30       84000.92        87371     2744.1
## 528        1148.30       11571.80         6024      163.6
## 529        1173.15       11843.02         6551      167.0
## 530        1174.22       12036.32         7015      176.1
## 531        1187.01       12675.35         8120      183.9
## 532        1191.58       13112.72         8000      193.8
## 533        1222.72       13488.09         8267      203.6
## 534        1240.67       15078.43         8167      215.0
## 535        1260.58       15049.51         8077      221.1
```

```
## 536        1249.10       15397.12          9020      234.0
## 537        1261.33       15889.87          9562      244.2
## 538        1282.89       16426.81          9525      245.2
## 539        1318.70       20919.99         10532      249.4
## 540        1318.18       21461.22         10293      249.7
## 541        1344.54       21655.24          9700      250.6
## 542        1343.81       21663.82         10043      252.5
## 543        1340.13       22019.74          9884      252.0
## 544        1343.70       21556.51          9806      249.9
## 545       16621.59      106396.06        121293     3880.7
## 546       17723.55      110274.99        122871     3839.6
## 547       18440.00      114219.33        128649     3938.4
## 548       19292.23      118487.46        137636     4112.9
## 549       19794.25      124345.66        134923     4169.4
## 550       20246.59      130164.06        127128     4016.2
## 551       21024.99      123122.24        133697     4094.6
## 552       21881.51      126663.68        140466     4230.1
## 553       22421.61      130514.81        146947     4394.9
## 554       22683.09      135552.69        147766     4484.8
## 555       22729.93      141143.03        140782     4367.4
## 556       22889.95      130138.76        141743     4317.7
## 557       22987.83      133828.40        134204     4124.3
## 558       22815.02      135942.45        137411     4092.5
## 559       22740.88      137605.78        147979     4260.2
## 560       22290.03      141449.34        152689     4372.9
## 561       22089.14      139129.61        156541     4471.4
## 562        3948.89       38990.92         33262      762.6
## 563        4059.04       40190.70         33879      774.4
## 564        4195.95       40932.34         35190      811.9
## 565        4633.60       41815.94         36333      851.9
## 566        4701.03       43288.99         36110      886.9
## 567        4942.83       44637.52         35967      899.7
## 568        5222.08       49044.39         37376      931.1
## 569        5382.55       49679.55         39235      971.5
## 570        5484.88       51180.23         41564     1035.7
## 571        5616.29       53110.66         43535     1087.9
## 572        5817.46       55318.19         44944     1138.1
## 573        6101.08       63264.52         47236     1201.2
## 574        6339.19       65824.58         48700     1216.9
## 575        6499.26       67358.60         46425     1170.6
## 576        6661.26       68096.06         47499     1180.3
## 577        6852.59       69848.25         47178     1165.3
## 578        7015.33       64625.86         45928     1124.4
## 579        3921.39       22546.05         22350      710.5
## 580        4112.59       23425.25         23280      729.1
## 581        4158.15       24286.22         25356      774.7
## 582        4240.64       25304.46         26976      816.2
## 583        4737.40       26641.39         27744      838.2
## 584        4927.46       27836.41         27474      837.4
## 585        5201.85       30422.64         29559      878.5
## 586        5339.24       31180.19         31397      936.9
## 587        5640.77       32072.20         33793     1009.2
## 588        5864.62       33272.01         35296     1056.0
## 589        6050.53       34618.64         34762     1044.6
```

```
## 590        6247.10       36469.81        33614     1018.7
## 591        6358.04       37341.17        31148      961.1
## 592        6308.57       37792.98        31899      966.7
## 593        6292.70       38276.78        33747     1006.9
## 594        6290.43       39308.40        34769     1030.0
## 595        6300.93       37419.60        35934     1058.5
## 596       22047.83      105738.93       129967     4351.6
## 597       23476.44      109965.27       130120     4291.3
## 598       24977.05      114031.51       136028     4400.0
## 599       26134.60      118691.16       142970     4506.5
## 600       26885.28      124688.11       140616     4514.6
## 601       27646.23      130578.37       135828     4435.8
## 602       28090.92      124414.86       140178     4512.8
## 603       28561.39      127274.82       144091     4565.2
## 604       28426.98      131212.42       148130     4716.2
## 605       28255.68      136305.43       149431     4806.1
## 606       28346.47      141870.43       145367     4753.1
## 607       28344.83      132965.78       146570     4728.9
## 608       28076.61      136800.58       141282     4580.1
## 609       27795.12      139072.15       143923     4524.3
## 610       27872.58      141054.14       151405     4654.8
## 611       27784.41      145339.04       155809     4730.3
## 612       27563.10      145433.99       160862     4790.9
## 613        1473.37        5437.28         9824      344.1
## 614        1581.31        5610.11         9849      342.8
## 615        1697.34        5845.79        10247      358.1
## 616        1755.15        6109.18        10496      365.9
## 617        1769.75        6470.03         9888      367.0
## 618        1770.11        6799.79         9433      349.2
## 619        1781.06        6123.78         9968      366.7
## 620        1801.90        6286.71        10323      381.7
## 621        1769.88        6499.15        10610      395.8
## 622        1748.08        6803.93        10734      400.0
## 623        1725.25        7154.94        10518      398.3
## 624        1712.92        7057.35        10848      401.4
## 625        1670.79        7323.77        10592      390.5
## 626        1653.83        7503.27        11022      396.3
## 627        1629.50        7684.10        12011      416.4
## 628        1590.94        8001.04        12572      429.2
## 629        1569.50        8191.84        13283      442.5
## 630        3152.11       24322.74        20924      842.0
## 631        3403.39       26387.60        21626      862.6
## 632        3527.22       27298.70        23156      920.3
## 633        3730.40       28224.77        24919      984.0
## 634        3943.79       29549.55        25153     1015.8
## 635        4353.87       30901.75        24483      982.6
## 636        4703.64       34992.84        26304     1038.1
## 637        5060.31       35544.29        27791     1081.7
## 638        5260.99       36518.61        29587     1137.5
## 639        5466.48       37807.33        30989     1176.0
## 640        5769.91       39198.08        31303     1188.8
## 641        6066.85       40311.84        32533     1196.4
## 642        6405.63       41342.05        31940     1162.3
## 643        6591.27       41914.56        33914     1189.0
```

```
## 644        6638.11       42318.87        36736     1262.5
## 645        6617.87       43299.52        37687     1296.2
## 646        6718.14       48248.27        39281     1338.0
## 647         880.23        9202.46         5864      175.4
## 648         912.26        9436.08         6065      179.0
## 649         940.78        9688.61         6481      189.9
## 650         991.66       10017.65         7048      199.1
## 651        1033.61       10458.03         6936      206.6
## 652        1112.12       10832.66         7154      209.3
## 653        1188.28       11153.46         6922      218.6
## 654        1263.05       11058.96         7411      226.6
## 655        1330.97       11324.24         7800      236.6
## 656        1425.71       11686.06         8164      241.4
## 657        1494.98       12084.49         7841      238.0
## 658        1547.83       11911.36         8009      236.0
## 659        1583.10       12036.85         7835      230.2
## 660        1567.01       11996.73         7660      235.3
## 661        1541.04       11982.06         8200      247.0
## 662        1514.07       12209.44         8418      249.4
## 663        1526.14       11305.15         8760      251.9
## 664        8881.70       38417.96        34769     1327.6
## 665        9310.70       40374.38        36771     1356.8
## 666        9703.64       41983.03        40403     1450.1
## 667       10025.31       43491.51        43424     1531.1
## 668       10171.34       45836.89        43052     1558.2
## 669       10568.95       48060.68        42098     1505.7
## 670       10926.15       51076.68        45309     1575.4
## 671       11162.86       52181.92        47941     1648.1
## 672       11261.78       53812.70        51630     1737.0
## 673       11411.71       55904.10        52759     1777.3
## 674       11487.78       58207.51        51810     1746.6
## 675       11609.50       58678.19        52804     1755.4
## 676       11594.79       60244.50        51967     1703.0
## 677       11408.41       61160.01        54217     1719.0
## 678       11199.59       62031.97        58810     1812.0
## 679       11069.53       63885.31        61337     1867.8
## 680       11003.00       65065.24        64124     1929.8
## 681       19345.25      213676.41       160922     3624.9
## 682       20198.19      220715.86       164088     3683.5
## 683       20770.47      224933.82       172360     3884.4
## 684       21746.62      229705.43       183467     4141.7
## 685       23182.68      237780.47       189079     4360.2
## 686       24359.78      245917.64       193920     4462.9
## 687       25265.62      270830.23       205542     4683.7
## 688       26208.59      274770.61       218733     4906.8
## 689       27067.33      283942.50       232319     5271.6
## 690       28069.78      295486.62       240424     5601.8
## 691       29107.92      308526.88       244359     5851.2
## 692       30610.47      334167.45       254691     6180.0
## 693       31658.99      349440.59       254508     6263.4
## 694       32343.03      359069.09       257245     6193.6
## 695       33412.51      364324.47       273685     6492.4
## 696       34860.23      375341.60       283388     6663.1
## 697       36146.60      362209.94       276313     6564.2
```

```
## 698        2724.19       11252.62        10750      357.0
## 699        2745.23       11621.13        11242      369.3
## 700        2765.36       11981.62        12083      393.0
## 701        2831.40       12493.50        12850      414.8
## 702        2896.24       13079.28        13267      434.1
## 703        3013.28       13616.96        13482      440.3
## 704        3142.26       16090.73        14315      462.8
## 705        3269.49       16584.22        15324      488.7
## 706        3373.46       17142.71        16611      525.4
## 707        3499.69       17874.79        17291      548.4
## 708        3616.81       18707.02        17639      550.8
## 709        3810.25       19165.89        18093      558.0
## 710        4036.49       19798.38        17892      560.9
## 711        4309.84       20132.57        18570      566.9
## 712        4781.57       20339.64        20177      601.2
## 713        5489.39       20850.77        20920      624.3
## 714        6374.59       22757.30        21193      634.1
## 715         538.49        4052.71         4354      147.9
## 716         618.38        4250.30         4438      148.1
## 717         689.19        4402.86         4611      153.6
## 718         729.22        4577.60         4801      161.3
## 719         743.27        4806.48         4652      162.8
## 720         792.19        5017.84         4528      162.1
## 721         798.49        4790.14         4760      168.4
## 722         794.41        4805.94         4913      178.4
## 723         774.08        4926.20         5363      190.6
## 724         790.48        5105.86         5569      197.9
## 725         821.87        5308.11         5634      200.1
## 726         823.96        5514.75         5875      204.3
## 727         820.21        5671.16         5871      202.9
## 728         801.59        5756.72         6261      206.4
## 729         775.93        5832.70         6669      214.9
## 730         763.34        6001.79         7142      224.7
## 731         770.78        6939.39         7585      234.4
## 732        6791.24       34706.84        48269     1518.9
## 733        7256.95       36795.57        50049     1567.2
## 734        7642.02       38243.38        52927     1655.2
## 735        7901.07       39992.09        56762     1753.4
## 736        8085.60       42155.45        57441     1804.3
## 737        8447.10       44147.96        57290     1778.7
## 738        8735.77       48475.72        60122     1848.1
## 739        8800.06       49402.95        63151     1930.4
## 740        8851.74       50991.39        66445     2033.5
## 741        8933.12       53106.81        68123     2115.0
## 742        9067.75       55464.07        68787     2157.2
## 743        9190.51       57163.94        70711     2160.8
## 744        9180.58       58820.49        70375     2146.4
## 745        9070.77       59774.36        74360     2206.9
## 746        9021.70       60756.37        79329     2333.3
## 747        8933.68       62710.66        83143     2454.7
## 748        8959.83       71355.78        88171     2557.7
## 749       13657.76       37406.43        39224     1079.4
## 750       14238.46       39258.70        38966     1064.5
## 751       14899.05       40764.39        40535     1100.1
```

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## 752       15161.10       42227.19        43470     1152.3
## 753       15407.43       44463.18        45385     1199.1
## 754       15561.32       46519.96        46367     1225.7
## 755       15850.49       50312.30        48697     1282.9
## 756       16246.42       51506.38        51511     1367.0
## 757       16814.01       52994.95        56875     1485.4
## 758       18160.86       54907.23        60175     1581.2
## 759       19558.46       57001.52        59796     1608.3
## 760       20794.81       60190.96        58977     1612.0
## 761       22176.13       61677.79        56745     1568.6
## 762       23626.17       62465.52        58828     1586.1
## 763       24301.68       63256.31        61507     1659.6
## 764       24406.90       64929.03        63664     1710.4
## 765       24355.32       66033.81        67158     1769.9
## 766        1839.17       24310.26        18063      516.5
## 767        2038.49       25312.77        18438      520.0
## 768        2146.91       26202.33        19314      540.5
## 769        2163.39       27227.32        19741      561.6
## 770        2160.88       28458.57        19041      572.4
## 771        2263.77       29691.14        19029      574.7
## 772        2386.45       32491.78        20292      596.3
## 773        2496.71       33448.52        21193      611.6
## 774        2564.53       34622.97        22036      633.1
## 775        2741.45       35916.40        22592      658.6
## 776        2843.63       37252.50        22349      645.9
## 777        2905.97       34681.29        22053      628.5
## 778        2870.96       35504.01        21370      607.8
## 779        2771.64       35932.73        20822      582.3
## 780        2702.30       36068.20        21615      596.6
## 781        2636.10       36549.44        21629      597.2
## 782        2605.38       35781.74        21705      597.5
## 783        9906.84       39311.00        45301     1530.4
## 784       10380.86       40880.50        46505     1525.4
## 785       10710.74       42260.97        48879     1580.8
## 786       10934.89       43778.56        52062     1660.5
## 787       10948.63       45934.43        51830     1703.4
## 788       11006.39       47948.09        50930     1676.8
## 789       10983.72       48872.43        53853     1725.9
## 790       10989.03       50089.81        57055     1798.9
## 791       10862.01       51469.93        59908     1887.0
## 792       10820.95       53386.11        61689     1960.2
## 793       10793.72       55505.34        60255     1938.1
## 794       10751.52       54915.52        60815     1923.2
## 795       10660.90       56262.51        59558     1866.7
## 796       10656.21       56912.51        61053     1864.6
## 797       10438.33       57440.23        65461     1949.2
## 798       10292.24       58904.79        67469     1983.1
## 799       10259.30       60241.65        70171     2023.9
## 800         695.41       14309.75         7924      108.3
## 801         690.19       14459.14         7504      111.0
## 802         670.32       14583.78         7807      117.3
## 803         675.66       14936.34         8067      126.1
## 804         669.00       15284.90         8831      136.5
## 805         713.06       15670.00         8949      146.0
```

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## 806          806.27       19539.47          9057      156.5
## 807          847.04       19977.67          9779      170.5
## 808          900.04       20760.24         11038      187.4
## 809         1004.71       21643.50         11988      200.7
## 810         1082.40       22628.22         13027      210.2
## 811         1187.86       26330.20         13717      223.5
## 812         1262.90       27724.96         13056      217.7
## 813         1385.25       28586.46         11922      202.5
## 814         1512.48       28794.80         12073      204.3
## 815         1629.45       29326.94         12022      206.9
## 816         1733.88       27110.51         10870      196.3
##     unemployment_rate
## 1                 4.7
## 2                 5.2
## 3                 4.7
## 4                 3.9
## 5                 5.5
## 6                 7.7
## 7                 6.8
## 8                 7.4
## 9                 6.3
## 10                7.1
## 11                8.8
## 12               11.0
## 13               14.0
## 14               14.0
## 15               11.0
## 16                8.9
## 17                9.8
## 18                4.4
## 19                4.7
## 20                4.2
## 21                4.1
## 22                5.6
## 23               12.0
## 24                9.8
## 25                8.2
## 26                6.1
## 27                5.1
## 28                6.7
## 29                6.1
## 30                9.9
## 31                9.1
## 32                5.0
## 33                6.5
## 34                6.9
## 35                5.0
## 36                5.4
## 37                4.6
## 38                4.1
## 39                4.8
## 40                9.5
## 41                7.1
## 42                6.6
```

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## 43              6.4
## 44              6.2
## 45              7.6
## 46              9.1
## 47              9.8
## 48             10.0
## 49              8.9
## 50              8.7
## 51              8.7
## 52              7.2
## 53              8.8
## 54              7.6
## 55              7.0
## 56              7.7
## 57              9.9
## 58              9.2
## 59              8.2
## 60              7.1
## 61              6.2
## 62              6.8
## 63              7.4
## 64              9.9
## 65              9.7
## 66              7.8
## 67              7.2
## 68              6.7
## 69              4.4
## 70              4.0
## 71              3.6
## 72              3.4
## 73              3.8
## 74              6.9
## 75              5.9
## 76              6.2
## 77              5.6
## 78              4.8
## 79              5.9
## 80              5.5
## 81              7.7
## 82              6.6
## 83              5.6
## 84              5.9
## 85              7.4
## 86              5.6
## 87              8.9
## 88              8.2
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## 90              6.2
## 91              9.1
## 92              9.5
## 93              7.0
## 94              5.3
## 95              5.1
## 96              5.9
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## 97              6.2
## 98              6.9
## 99              6.0
## 100             4.6
## 101             4.9
## 102             3.8
## 103             4.8
## 104             5.7
## 105             4.7
## 106             4.6
## 107             6.0
## 108             9.7
## 109             8.9
## 110             8.4
## 111             7.5
## 112             8.0
## 113             7.7
## 114             7.9
## 115             8.5
## 116             8.1
## 117             6.2
## 118             5.3
## 119             4.3
## 120             4.4
## 121             4.9
## 122             4.5
## 123             4.3
## 124             6.2
## 125            11.0
## 126             9.0
## 127             8.2
## 128             6.6
## 129             6.0
## 130             5.9
## 131             6.8
## 132             8.2
## 133             8.6
## 134             6.3
## 135             6.0
## 136             5.7
## 137             4.1
## 138             3.9
## 139             4.1
## 140             3.9
## 141             5.0
## 142             8.6
## 143             8.1
## 144             6.9
## 145             5.7
## 146             5.1
## 147             6.4
## 148             6.4
## 149             7.8
## 150             7.5
```

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## 152              6.5
## 153              5.9
## 154              5.8
## 155              6.3
## 156              6.2
## 157              5.6
## 158              6.0
## 159              6.2
## 160              5.7
## 161              6.1
## 162              5.6
## 163              5.6
## 164              7.9
## 165              7.5
## 166              9.9
## 167              9.8
## 168              7.2
## 169              8.0
## 170              8.7
## 171              4.1
## 172              5.1
## 173              5.1
## 174              4.1
## 175              4.5
## 176              7.1
## 177              6.5
## 178              6.2
## 179              6.0
## 180              5.5
## 181              8.3
## 182              8.5
## 183             11.0
## 184             11.0
## 185              9.1
## 186              9.0
## 187              8.1
## 188              5.0
## 189              5.7
## 190              4.5
## 191              4.2
## 192              5.9
## 193              8.6
## 194              6.1
## 195              5.7
## 196              5.7
## 197              6.4
## 198              9.6
## 199             10.0
## 200             12.0
## 201             11.0
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## 203              7.9
## 204              6.8
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## 210              4.3
## 211              4.0
## 212              4.0
## 213              4.0
## 214              4.1
## 215              5.8
## 216              6.9
## 217              8.5
## 218              8.1
## 219              7.0
## 220              8.0
## 221              7.0
## 222              4.8
## 223              5.5
## 224              4.0
## 225              3.1
## 226              3.5
## 227              4.6
## 228              4.2
## 229              4.1
## 230              3.0
## 231              3.4
## 232              4.5
## 233              4.2
## 234              6.3
## 235              6.1
## 236              5.2
## 237              5.0
## 238              5.4
## 239              5.0
## 240              5.5
## 241              4.8
## 242              4.4
## 243              4.5
## 244              7.3
## 245              5.6
## 246              4.7
## 247              5.2
## 248              5.6
## 249              8.0
## 250              8.4
## 251             11.0
## 252             12.0
## 253              9.3
## 254              9.5
## 255              9.3
## 256              6.6
## 257              7.0
## 258              6.1
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## 264              7.0
## 265              6.7
## 266              6.7
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## 271             12.0
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## 275              7.0
## 276              5.9
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## 280              8.4
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## 306              4.5
## 307              4.6
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## 309              6.4
## 310              6.7
## 311              7.2
## 312             11.0
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## 325              7.6
## 326              7.0
## 327              5.8
## 328              8.7
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## 335             12.0
## 336             16.0
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## 342              4.4
## 343              4.3
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## 345              4.3
## 346              5.9
## 347              5.9
## 348              5.1
## 349              3.8
## 350              4.2
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## 352              5.5
## 353              7.8
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## 355              6.3
## 356              6.0
## 357              5.3
## 358              4.8
## 359              4.8
## 360              3.9
## 361              3.6
## 362              4.1
## 363              8.3
## 364              6.6
## 365              7.4
## 366              7.1
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## 369              8.3
## 370             11.0
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## 374             12.0
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## 382              5.9
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## 385              7.2
## 386              7.7
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## 388              9.9
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## 390              6.4
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## 399              6.4
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## 410              3.6
## 411              3.4
## 412              3.3
## 413              3.8
## 414              4.2
## 415              3.3
## 416              3.7
## 417              3.0
## 418              3.2
## 419              4.1
## 420              4.1
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## 428              7.0
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## 433              7.0
## 434              4.4
## 435              5.1
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## 437              7.1
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## 439              9.8
## 440              7.8
## 441              8.0
## 442              6.0
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## 444              4.7
## 445              4.5
## 446              3.9
## 447              3.6
## 448              9.0
## 449              6.4
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## 453              4.7
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## 455              7.4
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## 463              5.6
## 464              6.9
## 465             10.0
## 466             10.0
## 467              9.4
## 468              7.2
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## 470              7.2
## 471              7.3
## 472              9.0
## 473              7.8
## 474              6.2
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## 488              7.3
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## 496              6.7
## 497              5.4
## 498              6.3
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## 501              9.1
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## 505              7.6
## 506              8.6
## 507              8.6
## 508              7.2
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## 510              6.3
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## 512              4.8
## 513              4.0
## 514              3.5
## 515              4.5
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## 517              6.2
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## 519              4.3
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## 523              9.0
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## 527              5.3
## 528              4.6
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## 536              4.8
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## 539              5.0
## 540              5.9
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## 545              5.4
## 546              6.5
## 547              5.5
## 548              4.3
## 549              5.0
## 550              9.1
## 551              7.8
## 552              6.5
## 553              5.4
## 554              5.9
## 555              8.4
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## 561              8.1
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## 564              4.5
## 565              4.2
## 566              4.4
## 567              7.2
## 568              5.6
## 569              5.0
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## 571              3.4
## 572              4.8
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## 574              5.7
## 575              9.0
## 576              7.0
## 577              7.1
## 578              8.2
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## 581              5.7
## 582              5.3
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## 592             11.0
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## 595              8.5
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## 597              5.4
## 598              5.4
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## 603              7.7
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## 613              5.2
## 614              6.8
## 615              6.5
## 616              6.2
## 617              7.3
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## 621              6.6
## 622              6.6
## 623              7.2
## 624              7.6
## 625             10.0
## 626              8.3
## 627              5.3
## 628              4.9
## 629              4.0
## 630              5.0
## 631              5.3
## 632              4.2
## 633              3.7
## 634              4.5
## 635              8.7
## 636              6.9
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## 639              5.0
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## 642             11.0
## 643             10.0
## 644              7.1
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## 648              3.7
## 649              3.7
## 650              3.3
## 651              3.5
## 652              3.7
## 653              3.4
## 654              3.3
## 655              3.0
## 656              3.5
## 657              4.9
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## 659              5.5
## 660              5.4
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## 663              4.7
## 664              4.8
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## 669              8.3
## 670              6.0
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## 672              5.8
## 673              5.8
## 674              7.3
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## 677             12.0
## 678              8.6
## 679              8.0
## 680              8.0
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## 682              4.9
## 683              4.5
## 684              3.9
## 685              4.3
## 686              5.6
## 687              5.7
## 688              5.3
## 689              4.8
## 690              4.2
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## 693              6.9
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## 696              7.0
## 697              8.9
## 698              6.1
## 699              6.4
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## 704              5.7
## 705              5.3
## 706              3.8
## 707              4.3
## 708              6.3
## 709              6.7
## 710              7.8
## 711              9.2
## 712              6.5
## 713              5.9
## 714              6.0
## 715              4.9
## 716              6.8
## 717              6.5
## 718              5.6
## 719              6.9
## 720              9.4
## 721              8.7
## 722              7.0
## 723              5.9
## 724              5.1
## 725              6.4
## 726              5.7
## 727              6.9
## 728              6.9
## 729              5.2
## 730              4.8
## 731              4.7
## 732              3.4
## 733              3.6
## 734              3.6
## 735              3.6
## 736              4.0
## 737              6.4
## 738              5.9
## 739              5.3
## 740              5.4
## 741              4.7
## 742              5.0
## 743              6.1
## 744              7.7
```

```
## 745              6.1
## 746              5.0
## 747              5.6
## 748              5.0
## 749              9.1
## 750             10.0
## 751              9.5
## 752              7.7
## 753              7.2
## 754              9.5
## 755              8.7
## 756              8.8
## 757              6.9
## 758              6.8
## 759              7.9
## 760              9.5
## 761             12.0
## 762             11.0
## 763              9.5
## 764              8.1
## 765              8.2
## 766              6.1
## 767              6.5
## 768              6.5
## 769              5.7
## 770              5.9
## 771              8.5
## 772              7.5
## 773              7.1
## 774              6.2
## 775              6.7
## 776              7.9
## 777             11.0
## 778             14.0
## 779             18.0
## 780             15.0
## 781             13.0
## 782             12.0
## 783              3.9
## 784              4.5
## 785              4.2
## 786              4.1
## 787              4.6
## 788              6.9
## 789              5.6
## 790              4.9
## 791              5.1
## 792              4.5
## 793              7.2
## 794              7.8
## 795             11.0
## 796             10.0
## 797              7.3
## 798              7.2
```

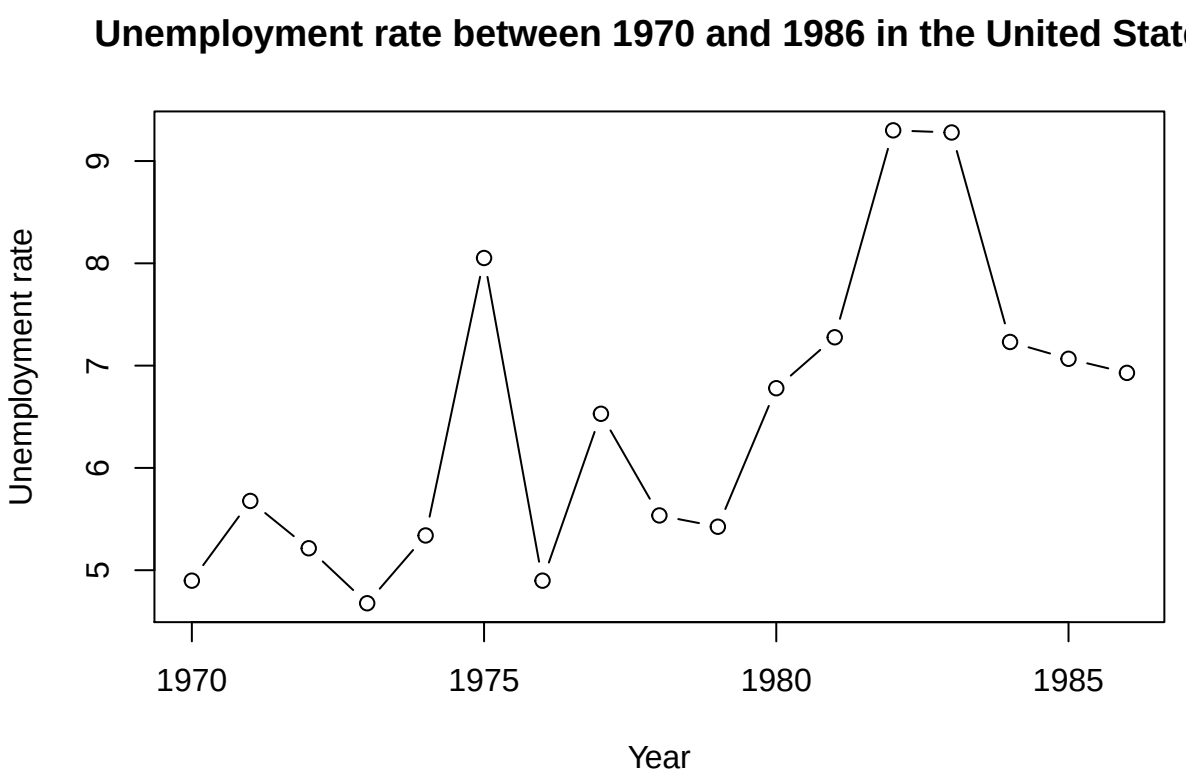
```
## 799              7.0
## 800              4.5
## 801              4.5
## 802              4.0
## 803              3.5
## 804              3.6
## 805              4.2
## 806              4.1
## 807              3.6
## 808              3.3
## 809              2.8
## 810              4.0
## 811              4.1
## 812              5.8
## 813              8.4
## 814              6.3
## 815              7.1
## 816              9.0
```

2. Visualize the following analytical perspectives using plots!

- Unemployment rate between 1970 and 1986 in the United States.

```
# Mean Unemployment rate per year
y1970 <- subset(us_states_productions, year == 1970)
rate1970 <- mean(y1970$unemployment_rate)

y1971 <- subset(us_states_productions, year == 1971)
rate1971 <- mean(y1971$unemployment_rate)

y1972 <- subset(us_states_productions, year == 1972)
rate1972 <- mean(y1972$unemployment_rate)

y1973 <- subset(us_states_productions, year == 1973)
rate1973 <- mean(y1973$unemployment_rate)

y1974 <- subset(us_states_productions, year == 1974)
rate1974 <- mean(y1974$unemployment_rate)

y1975 <- subset(us_states_productions, year == 1975)
rate1975 <- mean(y1975$unemployment_rate)

y1976 <- subset(us_states_productions, year == 1976)
rate1976 <- mean(y1970$unemployment_rate)

y1977 <- subset(us_states_productions, year == 1977)
rate1977 <- mean(y1977$unemployment_rate)

y1978 <- subset(us_states_productions, year == 1978)
rate1978 <- mean(y1978$unemployment_rate)

y1979 <- subset(us_states_productions, year == 1979)
rate1979 <- mean(y1979$unemployment_rate)
```

```r
y1980 <- subset(us_states_productions, year == 1980)
rate1980 <- mean(y1980$unemployment_rate)

y1981 <- subset(us_states_productions, year == 1981)
rate1981 <- mean(y1981$unemployment_rate)

y1982 <- subset(us_states_productions, year == 1982)
rate1982 <- mean(y1982$unemployment_rate)

y1983 <- subset(us_states_productions, year == 1983)
rate1983 <- mean(y1983$unemployment_rate)

y1984 <- subset(us_states_productions, year == 1984)
rate1984 <- mean(y1984$unemployment_rate)

y1985 <- subset(us_states_productions, year == 1985)
rate1985 <- mean(y1985$unemployment_rate)

y1986 <- subset(us_states_productions, year == 1986)
rate1986 <- mean(y1986$unemployment_rate)

rates <- c(rate1970, rate1971, rate1972, rate1973, rate1974, rate1975, rate1976, rate1977, rate1978, ra
           rate1984, rate1985, rate1986)
year <- c(1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 198
year_rate <- c(year, rates)
year_rates <- matrix(year_rate, ncol = 2, nrow = 17)

plot(year_rates, type = "b", ylab = "Unemployment rate", xlab = "Year",
              main = "Unemployment rate between 1970 and 1986 in the United States")
```



- Private capital between 1970 and 1986 for the five states having the highest private capital in average.

```
states <- unique(us_states_productions$state)

st1 <- subset(us_states_productions, state == states[1])
priv_cap <- c()
for (i in 1:48) {
  st <- subset(us_states_productions, state == states[i])
  st_avg <- mean(st$privat_capital)
  priv_cap <- c(priv_cap, st_avg)
}
order_priv_cap <- order(priv_cap, decreasing = TRUE)
highst_priv_cap <- matrix(order_priv_cap, nrow = 5, ncol = 1)
```

```
## Warning in matrix(order_priv_cap, nrow = 5, ncol = 1): Datenlänge [48] ist
## kein Teiler oder Vielfaches der Anzahl der Zeilen [5]
```

```
highst_priv_cap
```

```
##      [,1]
## [1,]    4
## [2,]   30
## [3,]   41
## [4,]   11
## [5,]   36
```

```
state1 <- states[4]
state2 <- states[30]
state3 <- states[41]
```

```r
state4 <- states[11]
state5 <- states[36]

state1
```

```
## [1] CALIFORNIA
## 48 Levels: ALABAMA ARIZONA ARKANSAS CALIFORNIA COLORADO ... WYOMING
```

```r
state2
```

```
## [1] NEW_YORK
## 48 Levels: ALABAMA ARIZONA ARKANSAS CALIFORNIA COLORADO ... WYOMING
```

```r
state3
```

```
## [1] TEXAS
## 48 Levels: ALABAMA ARIZONA ARKANSAS CALIFORNIA COLORADO ... WYOMING
```

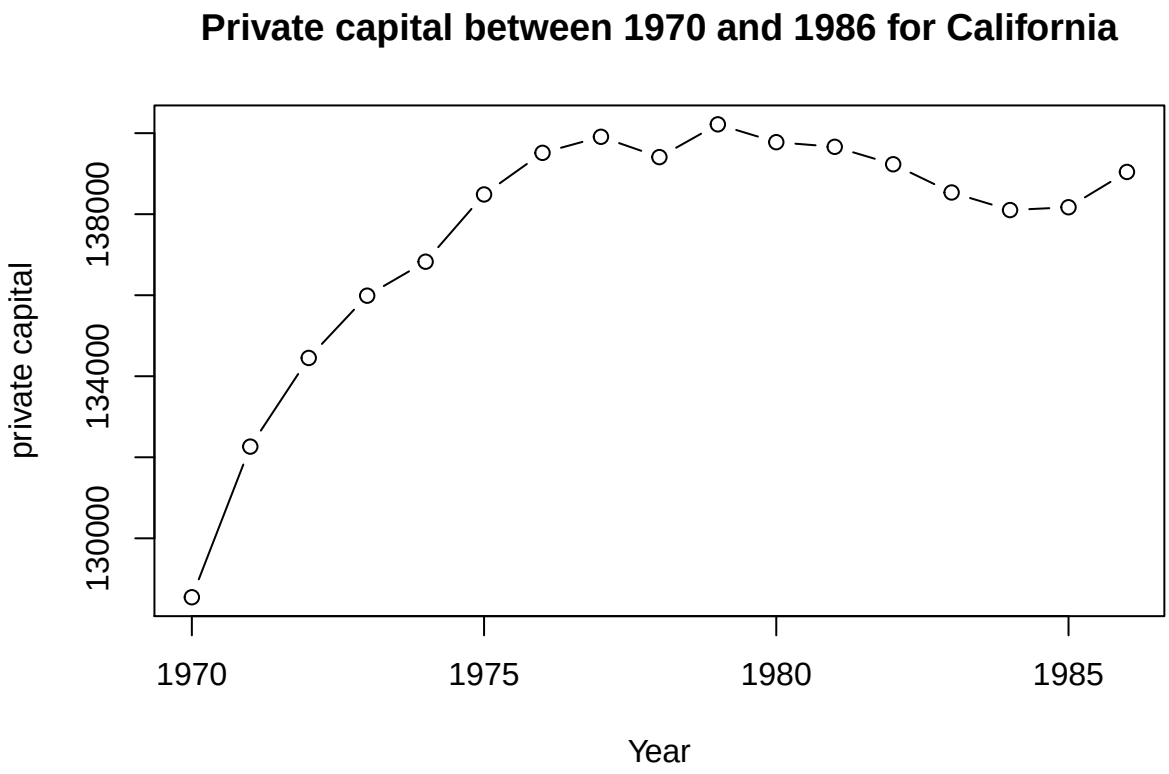
```r
state4
```

```
## [1] ILLINOIS
## 48 Levels: ALABAMA ARIZONA ARKANSAS CALIFORNIA COLORADO ... WYOMING
```

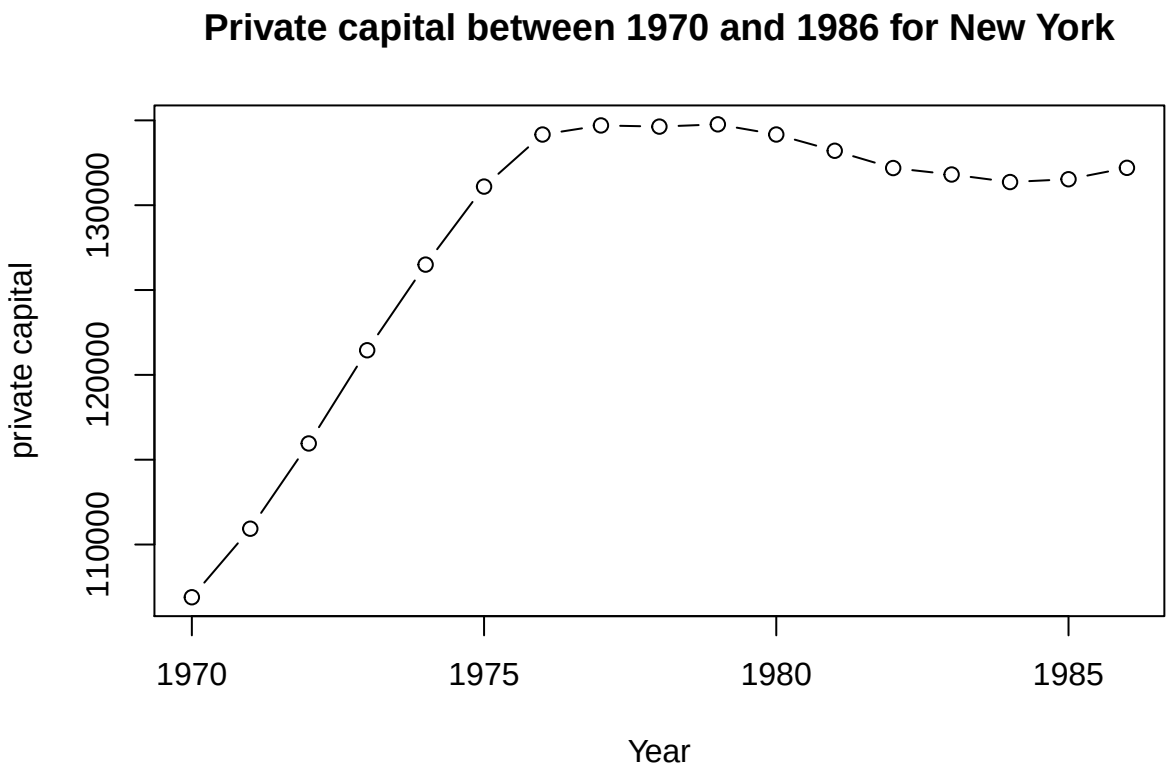
```r
state5
```

```
## [1] PENNSYLVANIA
## 48 Levels: ALABAMA ARIZONA ARKANSAS CALIFORNIA COLORADO ... WYOMING
```

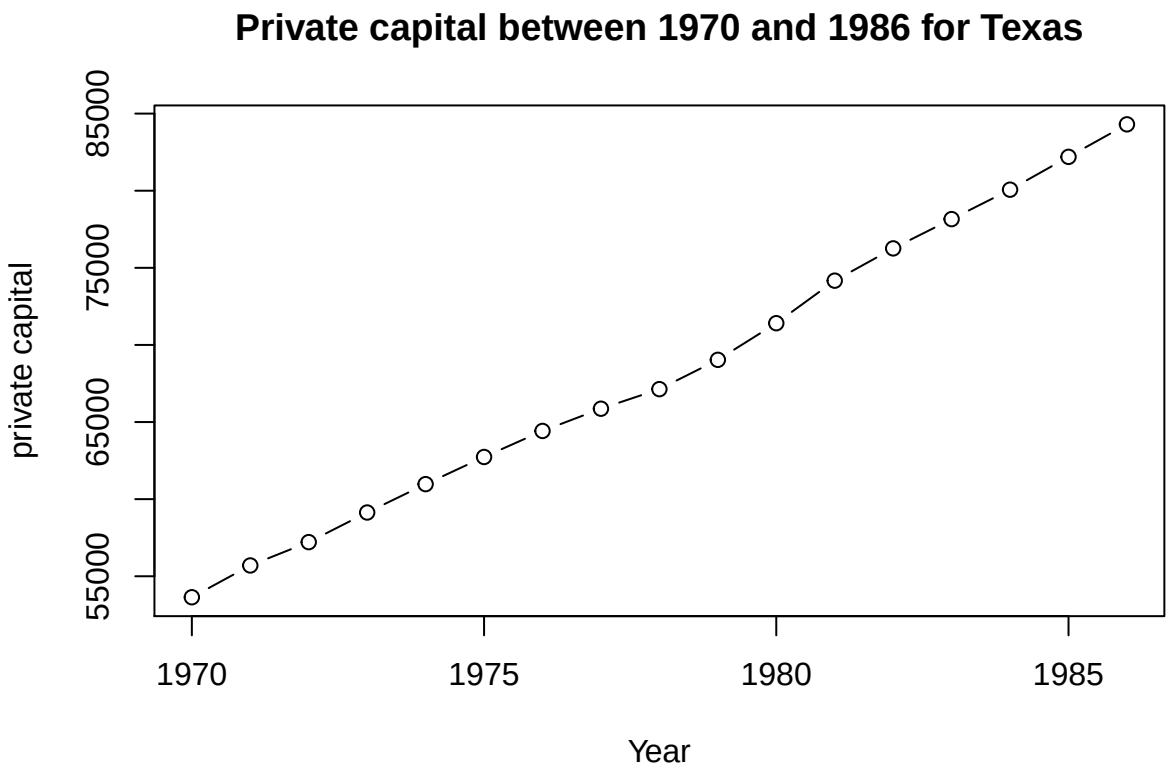
```r
five_states1 <- subset(us_states_productions, state == "CALIFORNIA")
five_states2 <- subset(us_states_productions, state == "NEW_YORK")
five_states3 <- subset(us_states_productions, state == "TEXAS")
five_states4 <- subset(us_states_productions, state == "ILLINOIS")
five_states5 <- subset(us_states_productions, state == "PENNSYLVANIA")

year_capC <- matrix(c(five_states1$year, five_states1$privat_capital), nrow = 17, ncol = 2)
year_capN <- matrix(c(five_states2$year, five_states2$privat_capital), nrow = 17, ncol = 2)
year_capT <- matrix(c(five_states3$year, five_states3$privat_capital), nrow = 17, ncol = 2)
year_capI <- matrix(c(five_states4$year, five_states4$privat_capital), nrow = 17, ncol = 2)
year_capP <- matrix(c(five_states5$year, five_states5$privat_capital), nrow = 17, ncol = 2)

plot(year_capC, type = "b", ylab = "private capital", xlab = "Year",
             main = "Private capital between 1970 and 1986 for California")
```



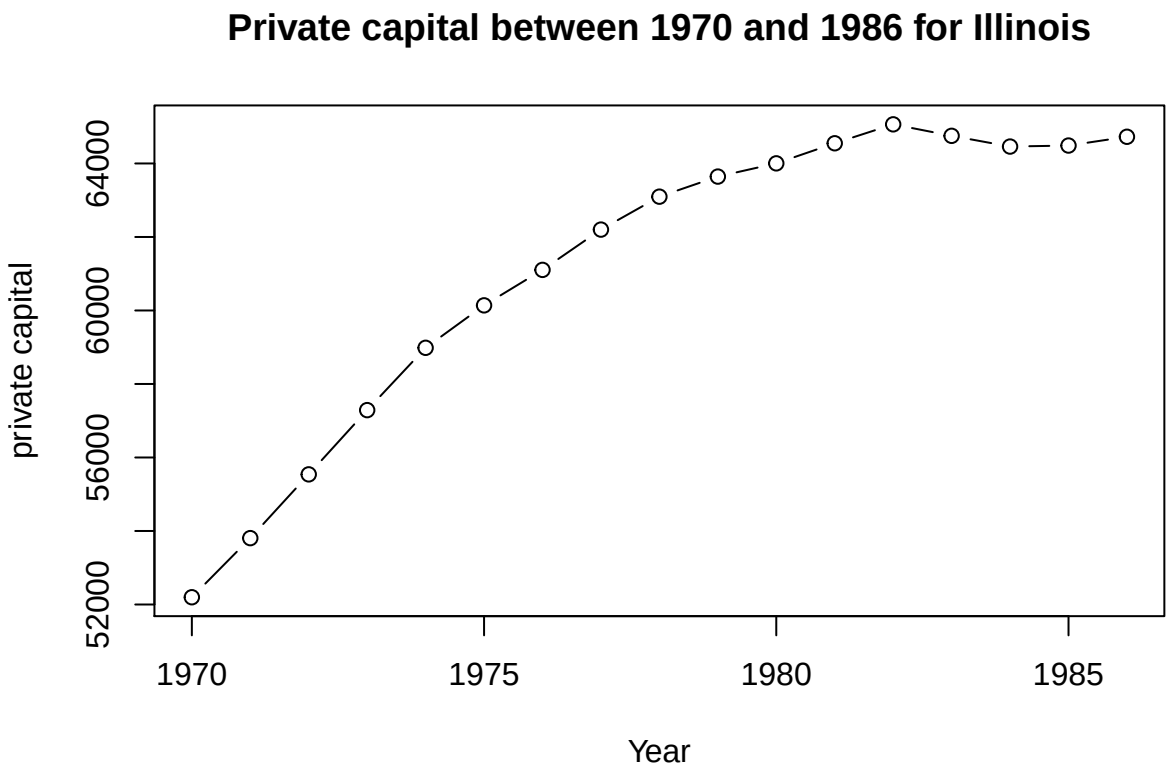

```
plot(year_capN, type = "b", ylab = "private capital", xlab = "Year",
              main = "Private capital between 1970 and 1986 for New York")
```



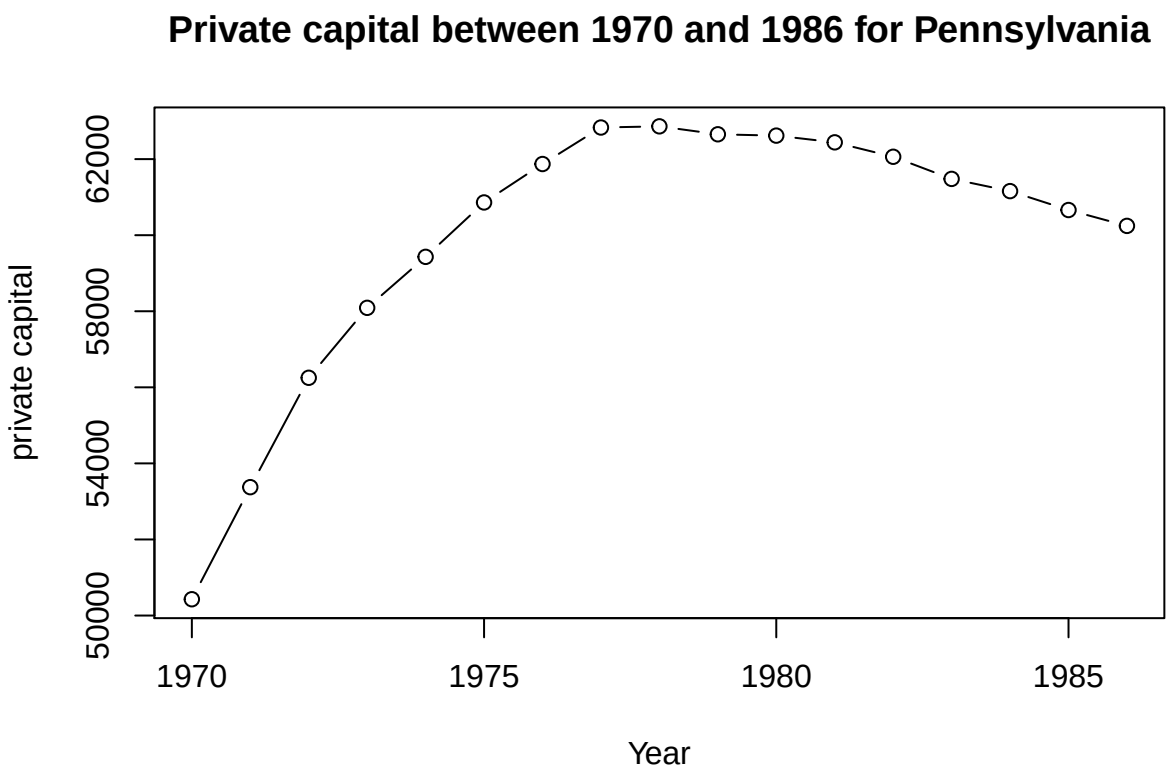

```
plot(year_capT, type = "b", ylab = "private capital", xlab = "Year",
              main = "Private capital between 1970 and 1986 for Texas")
```




```
plot(year_capI, type = "b", ylab = "private capital", xlab = "Year",
              main = "Private capital between 1970 and 1986 for Illinois")
```




```
plot(year_capP, type = "b", ylab = "private capital", xlab = "Year",
              main = "Private capital between 1970 and 1986 for Pennsylvania")
```



- Public capital between 1970 and 1986 for the state having the highest and the state having the lowest public capital in average.

```
pub_cap <- c()
for (i in 1:48) {
  st <- subset(us_states_productions, state == states[i])
  st_avg <- mean(st$public_capital)
  pub_cap <- c(pub_cap, st_avg)
}
order_high_pub_cap <- order(pub_cap, decreasing = TRUE)
order_low_pub_cap <- order(pub_cap)
highst_pub_cap <- matrix(order_high_pub_cap, nrow = 1, ncol = 1)
lowest_pub_cap <- matrix(order_low_pub_cap, nrow = 1, ncol = 1)
highst_pub_cap
```

```
##      [,1]
## [1,]   41
```

```
lowest_pub_cap
```

```
##      [,1]
## [1,]   43
```

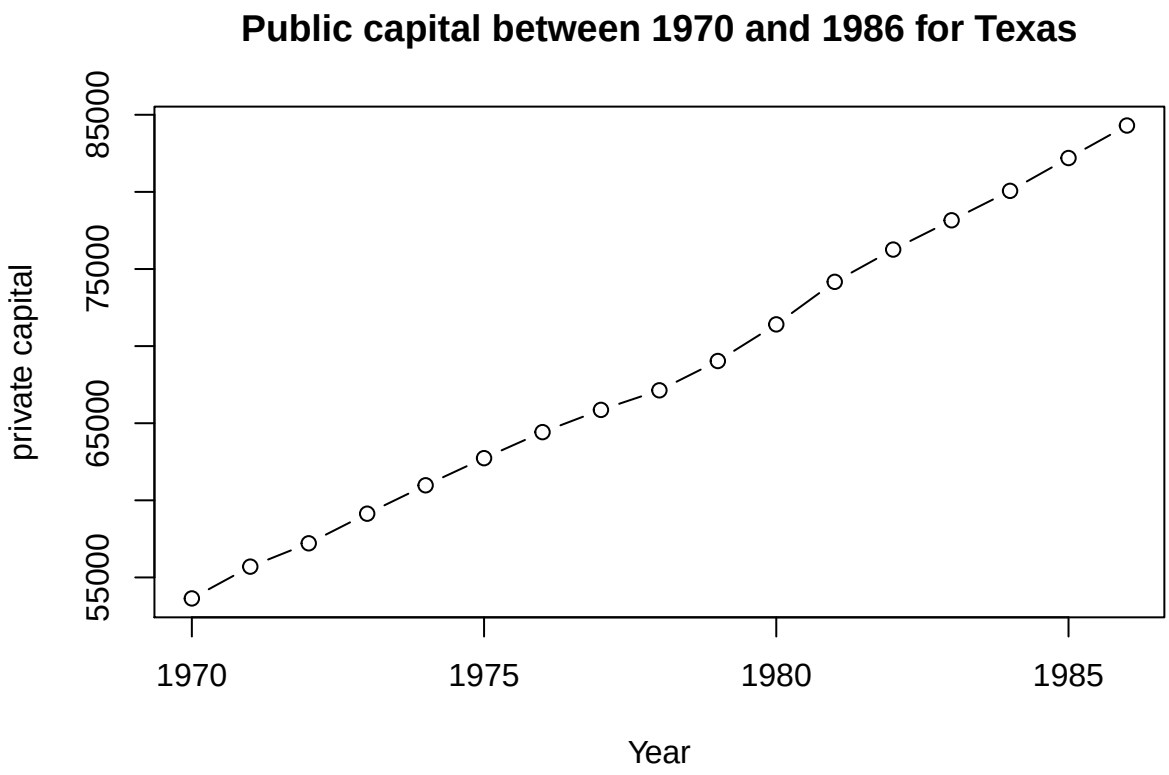
```
statePubHigh <- states[41]
statePubLow <- states[43]
statePubHigh
```

```
## [1] TEXAS
## 48 Levels: ALABAMA ARIZONA ARKANSAS CALIFORNIA COLORADO ... WYOMING
```

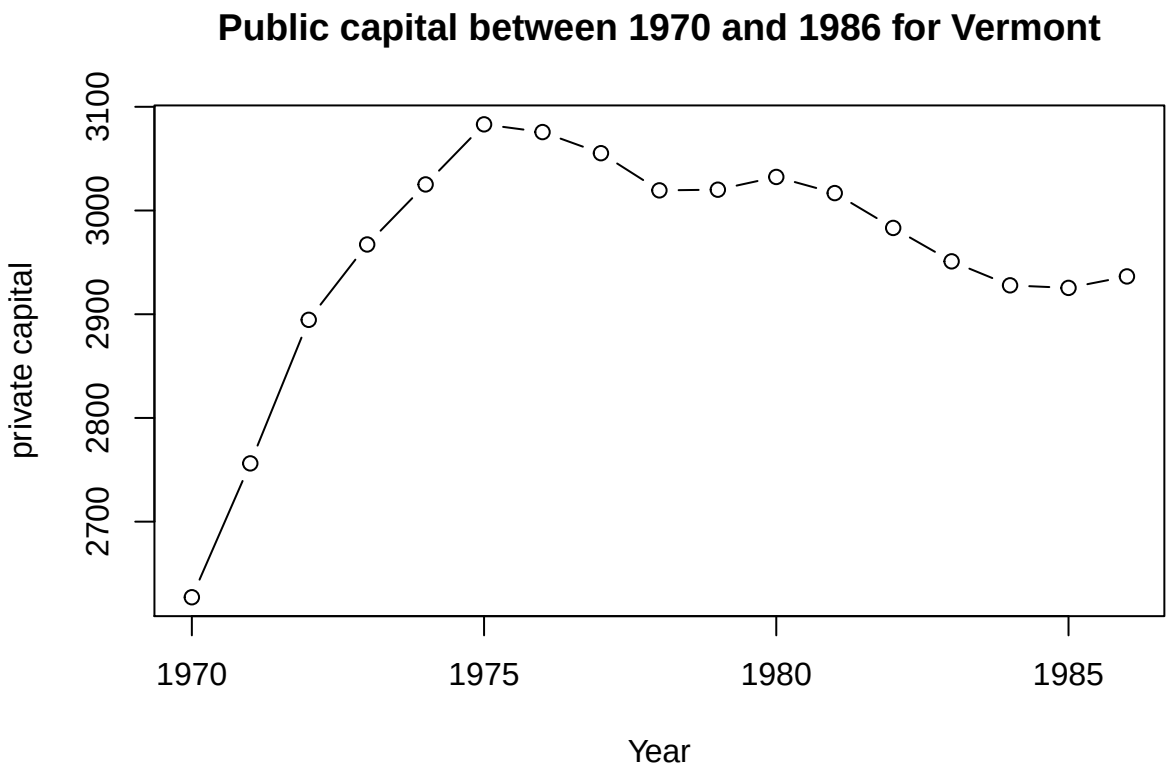
```
statePubLow
```

```
## [1] VERMONT
## 48 Levels: ALABAMA ARIZONA ARKANSAS CALIFORNIA COLORADO ... WYOMING
```

```
Texas <- subset(us_states_productions, state == "TEXAS")
Vermont <- subset(us_states_productions, state == "VERMONT")

year_pub_capT <- matrix(c(Texas$year, Texas$privat_capital), nrow = 17, ncol = 2)
year_pub_capV <- matrix(c(Vermont$year, Vermont$privat_capital), nrow = 17, ncol = 2)

plot(year_pub_capT, type = "b", ylab = "private capital", xlab = "Year",
             main = "Public capital between 1970 and 1986 for Texas")
```




```
plot(year_pub_capV, type = "b", ylab = "private capital", xlab = "Year",
             main = "Public capital between 1970 and 1986 for Vermont")
```



3. Boxplots can be used to visually detect similarities and differences in data sets. Create boxplots for the following scenarios and briefly comment on the results!

- Unemployment rate between 1970 and 1986 for the two states having the highest unemployment rate on average.

```
unemp_rate <- c()
for (i in 1:48) {
  st <- subset(us_states_productions, state == states[i])
  st_avg <- mean(st$unemployment_rate)
  unemp_rate <- c(unemp_rate, st_avg)
}
order_unemp_rate <- order(unemp_rate, decreasing = TRUE)
highst_unemp_rate <- matrix(order_unemp_rate, nrow = 2, ncol = 1)
highst_unemp_rate
```

```
##      [,1]
## [1,]   20
## [2,]   46
```

```
stateUn1 <- states[20]
stateUn2 <- states[46]

stateUn1
```

```
## [1] MICHIGAN
## 48 Levels: ALABAMA ARIZONA ARKANSAS CALIFORNIA COLORADO ... WYOMING
```

```
stateUn2
```

```
## [1] WEST_VIRGINIA
## 48 Levels: ALABAMA ARIZONA ARKANSAS CALIFORNIA COLORADO ... WYOMING
```

```
Michigan <- subset(us_states_productions, state == states[1])
W_Verginia <- subset(us_states_productions, state == states[2])

year_unempM <- matrix(c(Michigan$year, Michigan$unemployment_rate), nrow = 17, ncol = 2)
mean1 = mean(Michigan$unemployment_rate)
sd1 = sd(Michigan$unemployment_rate)
cat("mean Michigan: ", mean1, "\n")
```

```
## mean Michigan:  8.047059
```

```
cat("sd Michigan: " ,sd1, "\n")
```

```
## sd Michigan:  3.091544
```

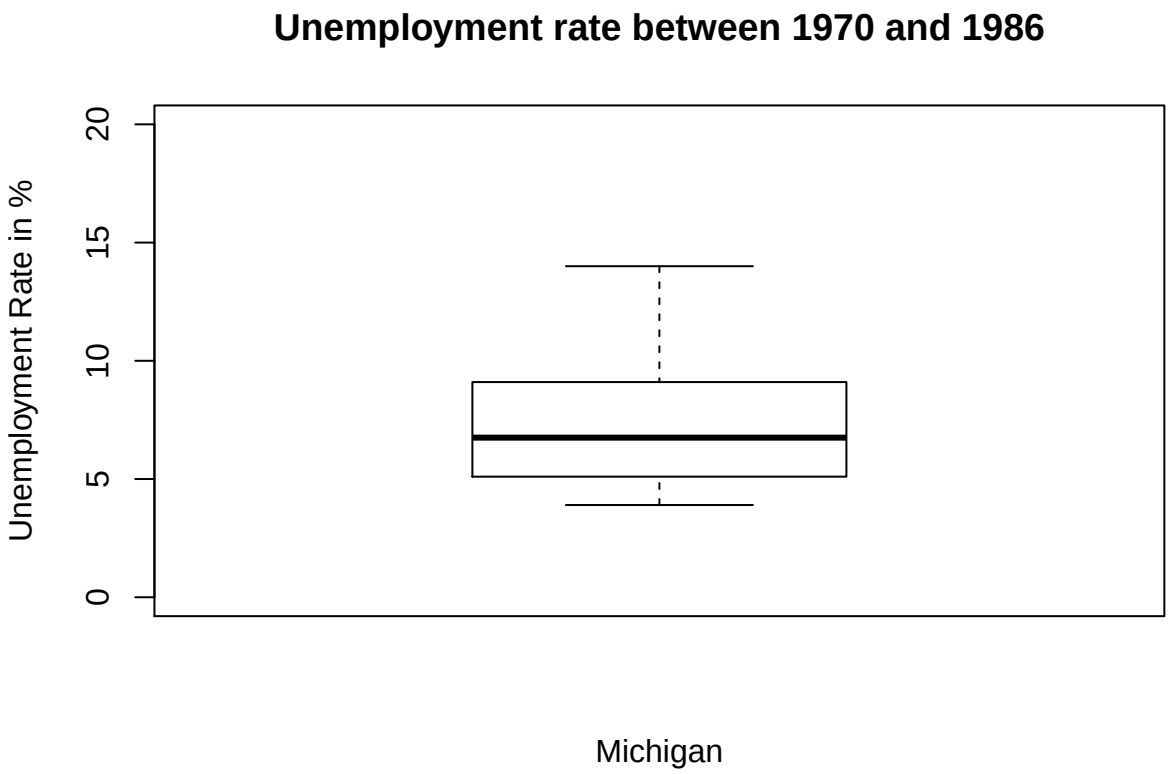
```
year_unempV <- matrix(c(W_Verginia$year, W_Verginia$unemployment_rate), nrow = 17, ncol = 2)
mean2 = mean(W_Verginia$unemployment_rate)
sd2 = sd(W_Verginia$unemployment_rate)
cat("mean W_Verginia: ",mean2, "\n")
```

```
## mean W_Verginia:  6.729412
```

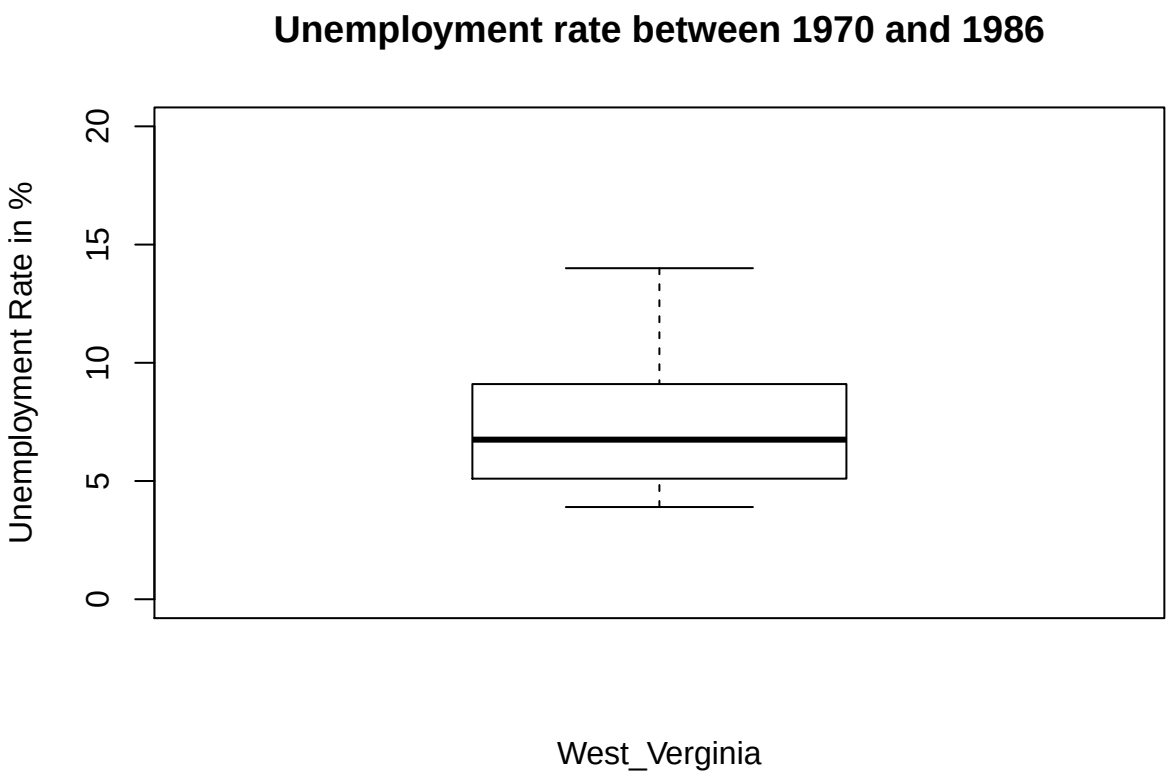
```
cat("sd W_Verginia: ", sd2, "\n")
```

```
## sd W_Verginia:  2.314294
```

```
#x <- rnorm(17, mean = 9.694118, sd = 2.881942)
#y <- rnorm(17, mean = 9.270588, sd = 3.804728)

x<-Michigan$unemployment_rate
y<-W_Verginia$unemployment_rate

d <- data.frame(treatment=c(x,y), id = year_unempM)
f <- data.frame(treatment=c(x,y), id = year_unempV)
boxplot(d[1],  ylab= "Unemployment Rate in %",
        main="Unemployment rate between 1970 and 1986", xlab = "Michigan", ylim=range(0:20))
```




```
boxplot(f[1],  ylab= "Unemployment Rate in %",
        main="Unemployment rate between 1970 and 1986", xlab = "West_Verginia",ylim = range(0:20))
```



- Highway and street capital between 1970 and 1986 for the two states having the lowest highway and street capital on average.

```
street_cap <- c()
for (i in 1:48) {
  st <- subset(us_states_productions, state == states[i])
  st_avg <- mean(st$street_capital)
  street_cap <- c(street_cap, st_avg)
}
order_street_cap <- order(street_cap)
lowest_street_cap <- matrix(order_street_cap, nrow = 2, ncol = 1)
lowest_street_cap
```

```
##      [,1]
## [1,]   43
## [2,]   37
```

```
stateStr1 <- states[43]
stateStr2 <- states[37]

stateStr1
```

```
## [1] VERMONT
## 48 Levels: ALABAMA ARIZONA ARKANSAS CALIFORNIA COLORADO ... WYOMING
```

```
stateStr2
```

```
## [1] RHODE_ISLAND
## 48 Levels: ALABAMA ARIZONA ARKANSAS CALIFORNIA COLORADO ... WYOMING
```

```r
Vermont <- subset(us_states_productions, state == "VERMONT")
R_Island <- subset(us_states_productions, state == "RHODE_ISLAND")

year_street_capV <- matrix(c(Vermont$year, Vermont$street_capital), nrow = 17, ncol = 2)
mean3 = mean(Vermont$street_capital)
sd3 = sd(Vermont$street_capital)
mean3
```

```
## [1] 1923.651
```

```r
sd3
```

```
## [1] 68.94504
```

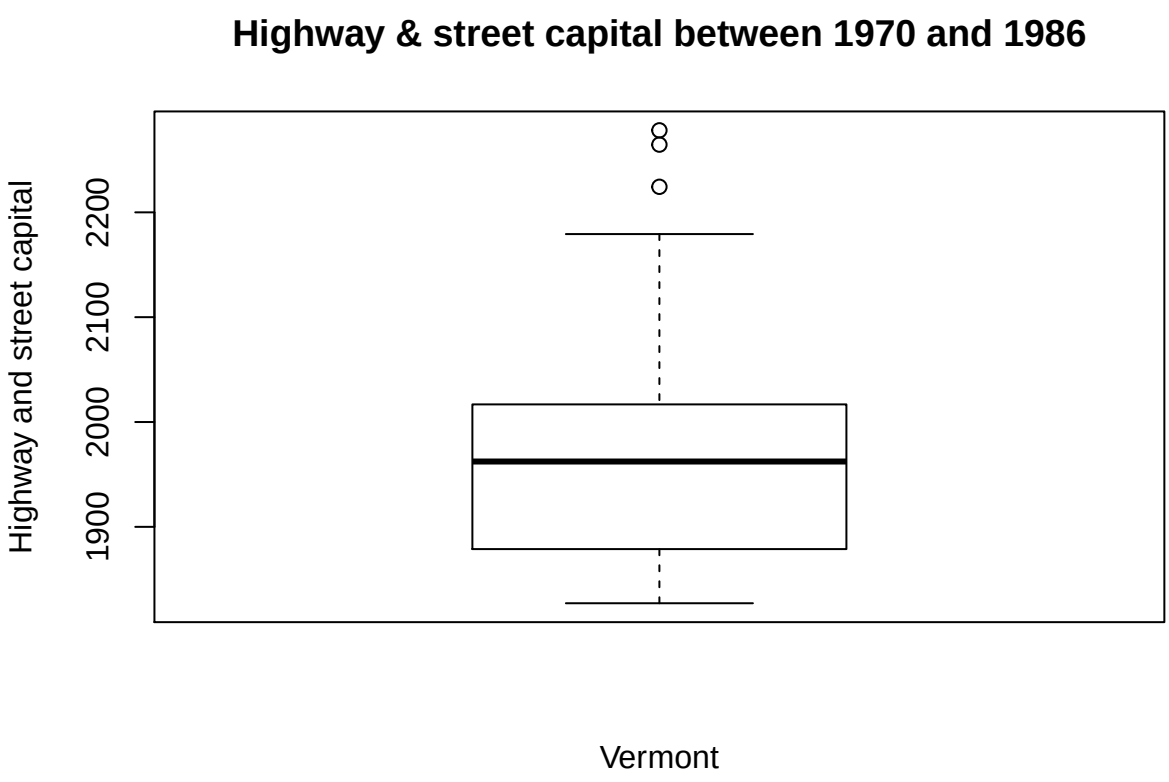
```r
year_streer_capV <- matrix(c(R_Island$year, R_Island$street_capital), nrow = 17, ncol = 2)
mean4 = mean(R_Island$street_capital)
sd4 = sd(R_Island$street_capital)
mean4
```

```
## [1] 2040.148
```

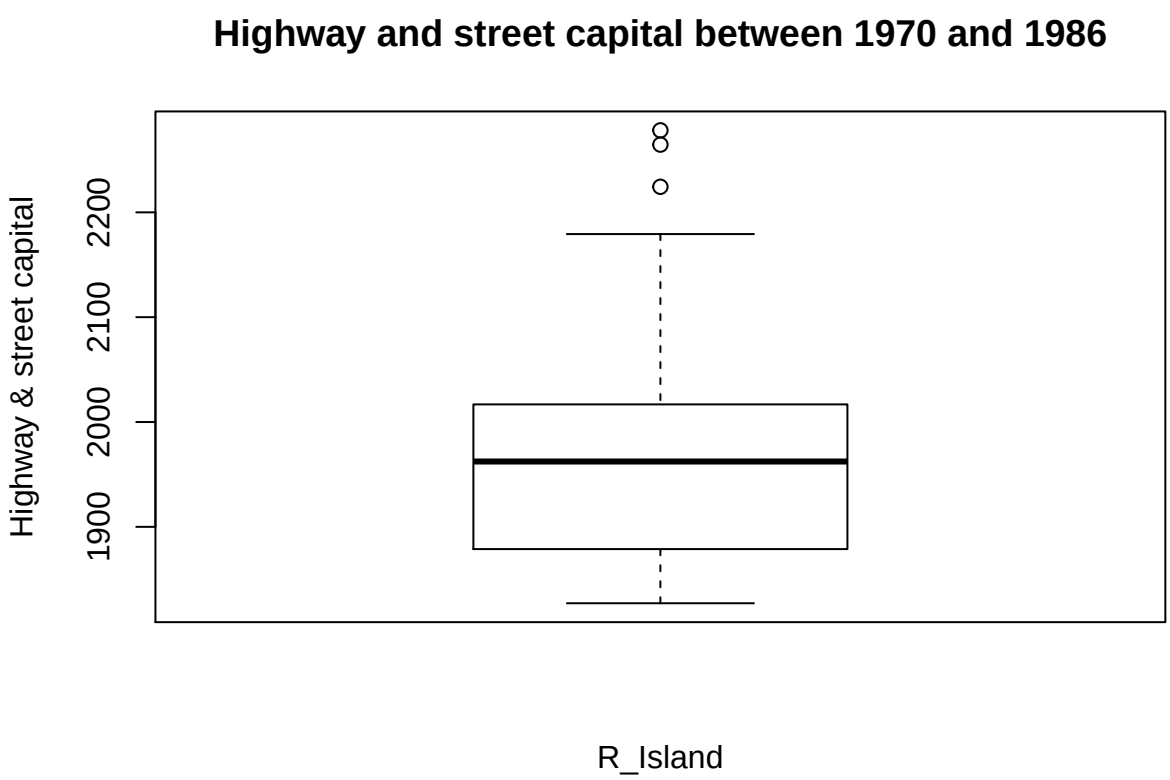
```r
sd4
```

```
## [1] 146.6524
```

```r
#x2 <- rnorm(17, mean = 1923.651, sd = 68.94504)
#y2 <- rnorm(17, mean = 2040.148, sd = 146.6524)
x2<-Vermont$street_capital
y2<-R_Island$street_capital

d2 <- data.frame(treatment=c(x2,y2), id= factor(year_streer_capV))
f2 <- data.frame(treatment=c(x2,y2), id= factor(year_street_capV))

boxplot(d2[1], ylab = "Highway and street capital",
        xlab = "Vermont",main="Highway & street capital between 1970 and 1986")
```




```
boxplot(f2[1], ylab = "Highway & street capital",
        xlab = "R_Island",main="Highway and street capital between 1970 and 1986")
```



4. We intuitively presume, that the employment value and the unemployment rate are correlated. Calculate the mean values (considering all states for each year) for both variables and plot both data series in one plot! The plot should have the years on the x-axis and two y-axes for the mean values of both variables. Finally, calculate the correlation value for the two data series and briefly comment on the results!

```
#jedes jahr von 1970 bis 1986 wird betrachtet
y<-1970:1086
```

5. Seperate the original data frames containing all observation in multiple dataframes, containing only observations belonging to a particular US state! Output the observations of the US state Florida as a csv file!