DSC630 3.2 Assignment MLB Attendance

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Load Dodgers data

```
dodgers_df <- read.csv('dodgers-2022.csv')
```

View data

```
head(dodgers_df)
```

```
##   month day attend day_of_week opponent temp  skies day_night cap shirt
## 1   APR  10  56000     Tuesday  Pirates   67 Clear        Day  NO    NO
## 2   APR  11  29729   Wednesday  Pirates   58 Cloudy      Night  NO    NO
## 3   APR  12  28328    Thursday  Pirates   57 Cloudy      Night  NO    NO
## 4   APR  13  31601      Friday   Padres   54 Cloudy      Night  NO    NO
## 5   APR  14  46549    Saturday   Padres   57 Cloudy      Night  NO    NO
## 6   APR  15  38359      Sunday   Padres   65 Clear        Day  NO    NO
##   fireworks bobblehead
## 1        NO         NO
## 2        NO         NO
## 3        NO         NO
## 4       YES         NO
## 5        NO         NO
## 6        NO         NO
```

Inspect data

```
str(dodgers_df)
```

```
## 'data.frame':    81 obs. of  12 variables:
##  $ month      : chr  "APR" "APR" "APR" "APR" ...
##  $ day        : int  10 11 12 13 14 15 23 24 25 27 ...
##  $ attend     : int  56000 29729 28328 31601 46549 38359 26376 44014 26345 44807 ...
##  $ day_of_week: chr  "Tuesday" "Wednesday" "Thursday" "Friday" ...
##  $ opponent   : chr  "Pirates" "Pirates" "Pirates" "Padres" ...
##  $ temp       : int  67 58 57 54 57 65 60 63 64 66 ...
##  $ skies      : chr  "Clear " "Cloudy" "Cloudy" "Cloudy" ...
##  $ day_night  : chr  "Day" "Night" "Night" "Night" ...
##  $ cap        : chr  "NO" "NO" "NO" "NO" ...
##  $ shirt      : chr  "NO" "NO" "NO" "NO" ...
##  $ fireworks  : chr  "NO" "NO" "NO" "YES" ...
##  $ bobblehead : chr  "NO" "NO" "NO" "NO" ...
```

Check for unique values

```
unique(dodgers_df)
```

```
##       month day attend day_of_week   opponent temp   skies day_night cap shirt
## 1      APR  10  56000     Tuesday    Pirates   67 Clear       Day  NO    NO
## 2      APR  11  29729   Wednesday    Pirates   58 Cloudy     Night  NO    NO
## 3      APR  12  28328    Thursday    Pirates   57 Cloudy     Night  NO    NO
## 4      APR  13  31601      Friday     Padres   54 Cloudy     Night  NO    NO
## 5      APR  14  46549    Saturday     Padres   57 Cloudy     Night  NO    NO
## 6      APR  15  38359      Sunday     Padres   65 Clear       Day  NO    NO
## 7      APR  23  26376      Monday     Braves   60 Cloudy     Night  NO    NO
## 8      APR  24  44014     Tuesday     Braves   63 Cloudy     Night  NO    NO
## 9      APR  25  26345   Wednesday     Braves   64 Cloudy     Night  NO    NO
## 10     APR  27  44807      Friday  Nationals   66 Clear     Night  NO    NO
## 11     APR  28  54242    Saturday  Nationals   71 Clear     Night  NO    NO
## 12     APR  29  48753      Sunday  Nationals   74 Clear       Day  NO   YES
## 13     MAY   7  43713      Monday     Giants   67 Clear     Night  NO    NO
## 14     MAY   8  32799     Tuesday     Giants   75 Clear     Night  NO    NO
## 15     MAY   9  33993   Wednesday     Giants   71 Clear     Night  NO    NO
## 16     MAY  11  35591      Friday    Rockies   65 Clear     Night  NO    NO
## 17     MAY  12  33735    Saturday    Rockies   65 Clear     Night  NO    NO
## 18     MAY  13  49124      Sunday    Rockies   70 Clear       Day  NO    NO
## 19     MAY  14  24312      Monday      Snakes   67 Clear     Night  NO    NO
## 20     MAY  15  47077     Tuesday      Snakes   70 Clear     Night  NO    NO
## 21     MAY  18  40906      Friday  Cardinals   64 Clear     Night  NO    NO
## 22     MAY  19  39383    Saturday  Cardinals   67 Clear     Night  NO    NO
## 23     MAY  20  44005      Sunday  Cardinals   77 Clear     Night  NO    NO
## 24     MAY  25  36283      Friday      Astros   59 Cloudy     Night  NO    NO
## 25     MAY  26  36561    Saturday      Astros   61 Cloudy     Night  NO    NO
## 26     MAY  27  33306      Sunday      Astros   70 Clear       Day  NO    NO
## 27     MAY  28  38016      Monday     Brewers   73 Clear     Night  NO    NO
## 28     MAY  29  51137     Tuesday     Brewers   74 Clear     Night  NO    NO
## 29     MAY  30  25509   Wednesday     Brewers   69 Clear     Night  NO    NO
## 30     MAY  31  26773    Thursday     Brewers   70 Clear     Night  NO    NO
## 31     JUN  11  50559      Monday      Angels   68 Clear     Night  NO   YES
## 32     JUN  12  55279     Tuesday      Angels   66 Cloudy     Night  NO    NO
## 33     JUN  13  43494   Wednesday      Angels   67 Clear     Night  NO    NO
## 34     JUN  15  40432      Friday  White Sox   67 Clear     Night  NO    NO
## 35     JUN  16  45210    Saturday  White Sox   68 Clear     Night  NO    NO
## 36     JUN  17  53504      Sunday  White Sox   74 Clear       Day  NO    NO
## 37     JUN  28  49006    Thursday        Mets   75 Clear     Night  NO    NO
## 38     JUN  29  49763      Friday        Mets   72 Clear     Night  NO    NO
## 39     JUN  30  44217    Saturday        Mets   78 Clear       Day  NO    NO
## 40     JUL   1  55359      Sunday        Mets   75 Clear     Night  NO    NO
## 41     JUL   2  34493      Monday        Reds   70 Clear     Night  NO    NO
## 42     JUL   3  33884     Tuesday        Reds   70 Cloudy     Night YES    NO
## 43     JUL   4  53570   Wednesday        Reds   70 Clear     Night  NO    NO
## 44     JUL  13  43873      Friday     Padres   76 Cloudy     Night  NO    NO
## 45     JUL  14  54014    Saturday     Padres   75 Clear     Night  NO    NO
## 46     JUL  15  39715      Sunday     Padres   77 Clear       Day  NO    NO
## 47     JUL  16  32238      Monday   Phillies   67 Clear     Night  NO    NO
## 48     JUL  17  53498     Tuesday   Phillies   70 Clear     Night  NO    NO
## 49     JUL  18  39955   Wednesday   Phillies   80 Cloudy       Day  NO    NO
```

```
## 50   JUL  30   33180    Monday      Snakes  73 Clear    Night NO   NO
## 51   JUL  31   52832   Tuesday      Snakes  75 Cloudy   Night NO   NO
## 52   AUG   1   36596 Wednesday      Snakes  79 Clear      Day NO   NO
## 53   AUG   3   43537    Friday        Cubs  73 Clear    Night NO   NO
## 54   AUG   4   46588  Saturday        Cubs  73 Cloudy   Night NO   NO
## 55   AUG   5   42495    Sunday        Cubs  83 Clear      Day YES  NO
## 56   AUG   6   32659    Monday     Rockies  79 Clear    Night NO   NO
## 57   AUG   7   55024   Tuesday     Rockies  80 Clear    Night NO   NO
## 58   AUG   8   37084 Wednesday     Rockies  84 Clear    Night NO   NO
## 59   AUG  20   36878    Monday      Giants  80 Clear    Night NO   NO
## 60   AUG  21   56000   Tuesday      Giants  75 Clear    Night NO   NO
## 61   AUG  22   40173 Wednesday      Giants  75 Clear    Night NO   NO
## 62   AUG  24   39805    Friday     Marlins  71 Clear    Night NO   NO
## 63   AUG  25   40284  Saturday     Marlins  70 Clear    Night NO   NO
## 64   AUG  26   41907    Sunday     Marlins  81 Clear      Day NO   NO
## 65   AUG  30   54621  Thursday      Snakes  80 Clear    Night NO   NO
## 66   AUG  31   37622    Friday      Snakes  77 Clear    Night NO   NO
## 67   SEP   1   35992  Saturday      Snakes  81 Clear    Night NO   NO
## 68   SEP   2   31607    Sunday      Snakes  89 Clear      Day NO   NO
## 69   SEP   3   33540    Monday      Padres  84 Cloudy   Night NO   NO
## 70   SEP   4   40619   Tuesday      Padres  78 Clear    Night NO  YES
## 71   SEP   5   50560 Wednesday      Padres  77 Cloudy   Night NO   NO
## 72   SEP  13   43309  Thursday   Cardinals  80 Clear    Night NO   NO
## 73   SEP  14   40167    Friday   Cardinals  85 Clear    Night NO   NO
## 74   SEP  15   42449  Saturday   Cardinals  95 Clear    Night NO   NO
## 75   SEP  16   35754    Sunday   Cardinals  86 Clear      Day NO   NO
## 76   SEP  28   37133    Friday     Rockies  77 Clear    Night NO   NO
## 77   SEP  29   40724  Saturday     Rockies  84 Cloudy   Night NO   NO
## 78   SEP  30   35607    Sunday     Rockies  95 Clear      Day NO   NO
## 79   OCT   1   33624    Monday      Giants  86 Clear    Night NO   NO
## 80   OCT   2   42473   Tuesday      Giants  83 Clear    Night NO   NO
## 81   OCT   3   34014 Wednesday      Giants  82 Cloudy   Night NO   NO
##    fireworks bobblehead
## 1        NO         NO
## 2        NO         NO
## 3        NO         NO
## 4       YES         NO
## 5        NO         NO
## 6        NO         NO
## 7        NO         NO
## 8        NO         NO
## 9        NO         NO
## 10      YES         NO
## 11       NO        YES
## 12       NO         NO
## 13       NO         NO
## 14       NO         NO
## 15       NO         NO
## 16      YES         NO
## 17       NO         NO
## 18       NO         NO
## 19       NO         NO
## 20       NO        YES
## 21      YES         NO
```

```
## 22            NO              NO
## 23            NO              NO
## 24           YES              NO
## 25            NO              NO
## 26            NO              NO
## 27            NO              NO
## 28            NO             YES
## 29            NO              NO
## 30            NO              NO
## 31            NO              NO
## 32            NO             YES
## 33            NO              NO
## 34           YES              NO
## 35            NO              NO
## 36            NO              NO
## 37            NO             YES
## 38           YES              NO
## 39            NO              NO
## 40            NO             YES
## 41            NO              NO
## 42            NO              NO
## 43           YES              NO
## 44           YES              NO
## 45            NO             YES
## 46            NO              NO
## 47            NO              NO
## 48            NO              NO
## 49            NO              NO
## 50            NO              NO
## 51            NO             YES
## 52            NO              NO
## 53           YES              NO
## 54            NO              NO
## 55            NO              NO
## 56            NO              NO
## 57            NO             YES
## 58            NO              NO
## 59            NO              NO
## 60            NO             YES
## 61            NO              NO
## 62           YES              NO
## 63            NO              NO
## 64            NO              NO
## 65            NO             YES
## 66           YES              NO
## 67            NO              NO
## 68            NO              NO
## 69            NO              NO
## 70            NO              NO
## 71            NO              NO
## 72            NO              NO
## 73           YES              NO
## 74            NO              NO
## 75            NO              NO
```

```
## 76        YES         NO
## 77         NO         NO
## 78         NO         NO
## 79         NO         NO
## 80         NO         NO
## 81         NO         NO
```

```
unique(dodgers_df$opponent)
```

```
##  [1] "Pirates"   "Padres"    "Braves"    "Nationals" "Giants"    "Rockies"
##  [7] "Snakes"    "Cardinals" "Astros"    "Brewers"   "Angels"    "White Sox"
## [13] "Mets"      "Reds"      "Phillies"  "Cubs"      "Marlins"
```

```
unique(dodgers_df$skies)
```

```
## [1] "Clear " "Cloudy"
```

Check stats on numericals

```
library(pastecs)
stat.desc(dodgers_df, basic = FALSE, norm = TRUE)
```

```
##               month          day        attend day_of_week opponent        temp
## median           NA 15.0000000000  4.028400e+04          NA       NA 73.00000000
## mean             NA 16.1358024691  4.104007e+04          NA       NA 73.14814815
## SE.mean          NA  1.0672962677  9.219488e+02          NA       NA  0.92414644
## CI.mean          NA  2.1239872619  1.834737e+03          NA       NA  1.83911002
## var              NA 92.2688271605  6.884916e+07          NA       NA 69.17777778
## std.dev          NA  9.6056664090  8.297539e+03          NA       NA  8.31731794
## coef.var         NA  0.5953014377  2.021814e-01          NA       NA  0.11370511
## skewness         NA  0.0295514615  1.325597e-01          NA       NA  0.16594870
## skew.2SE         NA  0.0552771897  2.479582e-01          NA       NA  0.31041368
## kurtosis         NA -1.2846638132 -8.353070e-01          NA       NA -0.02321866
## kurt.2SE         NA -1.2149854963 -7.900011e-01          NA       NA -0.02195931
## normtest.W       NA  0.9324407227  9.684077e-01          NA       NA  0.98930756
## normtest.p       NA  0.0003544429  4.275964e-02          NA       NA  0.74406010
##            skies day_night cap shirt fireworks bobblehead
## median        NA        NA  NA    NA        NA         NA
## mean          NA        NA  NA    NA        NA         NA
## SE.mean       NA        NA  NA    NA        NA         NA
## CI.mean       NA        NA  NA    NA        NA         NA
## var           NA        NA  NA    NA        NA         NA
## std.dev       NA        NA  NA    NA        NA         NA
## coef.var      NA        NA  NA    NA        NA         NA
## skewness      NA        NA  NA    NA        NA         NA
## skew.2SE      NA        NA  NA    NA        NA         NA
## kurtosis      NA        NA  NA    NA        NA         NA
## kurt.2SE      NA        NA  NA    NA        NA         NA
## normtest.W    NA        NA  NA    NA        NA         NA
## normtest.p    NA        NA  NA    NA        NA         NA
```

```
stat.desc(dodgers_df)
```

```
##            month         day          attend day_of_week opponent        temp
## nbr.val       NA   81.0000000 8.100000e+01          NA       NA   81.0000000
## nbr.null      NA    0.0000000 0.000000e+00          NA       NA    0.0000000
## nbr.na        NA    0.0000000 0.000000e+00          NA       NA    0.0000000
## min           NA    1.0000000 2.431200e+04          NA       NA   54.0000000
## max           NA   31.0000000 5.600000e+04          NA       NA   95.0000000
## range         NA   30.0000000 3.168800e+04          NA       NA   41.0000000
## sum           NA 1307.0000000 3.324246e+06          NA       NA 5925.0000000
## median        NA   15.0000000 4.028400e+04          NA       NA   73.0000000
## mean          NA   16.1358025 4.104007e+04          NA       NA   73.1481481
## SE.mean       NA    1.0672963 9.219488e+02          NA       NA    0.9241464
## CI.mean       NA    2.1239873 1.834737e+03          NA       NA    1.8391100
## var           NA   92.2688272 6.884916e+07          NA       NA   69.1777778
## std.dev       NA    9.6056664 8.297539e+03          NA       NA    8.3173179
## coef.var      NA    0.5953014 2.021814e-01          NA       NA    0.1137051
##            skies day_night cap shirt fireworks bobblehead
## nbr.val       NA       NA  NA    NA        NA         NA
## nbr.null      NA       NA  NA    NA        NA         NA
## nbr.na        NA       NA  NA    NA        NA         NA
## min           NA       NA  NA    NA        NA         NA
## max           NA       NA  NA    NA        NA         NA
## range         NA       NA  NA    NA        NA         NA
## sum           NA       NA  NA    NA        NA         NA
## median        NA       NA  NA    NA        NA         NA
## mean          NA       NA  NA    NA        NA         NA
## SE.mean       NA       NA  NA    NA        NA         NA
## CI.mean       NA       NA  NA    NA        NA         NA
## var           NA       NA  NA    NA        NA         NA
## std.dev       NA       NA  NA    NA        NA         NA
## coef.var      NA       NA  NA    NA        NA         NA
```

Arrange attendance in ascending order

```
library(dplyr)
```

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

## The following objects are masked from 'package:pastecs':
##
##     first, last

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

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

```r
dodgers_df.month <- arrange(dodgers_df, attend)
dodgers_df.month
```

```
##    month day attend day_of_week  opponent temp  skies day_night cap shirt
## 1    MAY  14  24312      Monday     Snakes   67  Clear     Night  NO    NO
## 2    MAY  30  25509   Wednesday    Brewers   69  Clear     Night  NO    NO
## 3    APR  25  26345   Wednesday     Braves   64 Cloudy     Night  NO    NO
## 4    APR  23  26376      Monday     Braves   60 Cloudy     Night  NO    NO
## 5    MAY  31  26773    Thursday    Brewers   70  Clear     Night  NO    NO
## 6    APR  12  28328    Thursday    Pirates   57 Cloudy     Night  NO    NO
## 7    APR  11  29729   Wednesday    Pirates   58 Cloudy     Night  NO    NO
## 8    APR  13  31601      Friday     Padres   54 Cloudy     Night  NO    NO
## 9    SEP   2  31607      Sunday     Snakes   89  Clear       Day  NO    NO
## 10   JUL  16  32238      Monday   Phillies   67  Clear     Night  NO    NO
## 11   AUG   6  32659      Monday    Rockies   79  Clear     Night  NO    NO
## 12   MAY   8  32799     Tuesday     Giants   75  Clear     Night  NO    NO
## 13   JUL  30  33180      Monday     Snakes   73  Clear     Night  NO    NO
## 14   MAY  27  33306      Sunday     Astros   70  Clear       Day  NO    NO
## 15   SEP   3  33540      Monday     Padres   84 Cloudy     Night  NO    NO
## 16   OCT   1  33624      Monday     Giants   86  Clear     Night  NO    NO
## 17   MAY  12  33735    Saturday    Rockies   65  Clear     Night  NO    NO
## 18   JUL   3  33884     Tuesday       Reds   70 Cloudy     Night YES    NO
## 19   MAY   9  33993   Wednesday     Giants   71  Clear     Night  NO    NO
## 20   OCT   3  34014   Wednesday     Giants   82 Cloudy     Night  NO    NO
## 21   JUL   2  34493      Monday       Reds   70  Clear     Night  NO    NO
## 22   MAY  11  35591      Friday    Rockies   65  Clear     Night  NO    NO
## 23   SEP  30  35607      Sunday    Rockies   95  Clear       Day  NO    NO
## 24   SEP  16  35754      Sunday  Cardinals   86  Clear       Day  NO    NO
## 25   SEP   1  35992    Saturday     Snakes   81  Clear     Night  NO    NO
## 26   MAY  25  36283      Friday     Astros   59 Cloudy     Night  NO    NO
## 27   MAY  26  36561    Saturday     Astros   61 Cloudy     Night  NO    NO
## 28   AUG   1  36596   Wednesday     Snakes   79  Clear       Day  NO    NO
## 29   AUG  20  36878      Monday     Giants   80  Clear     Night  NO    NO
## 30   AUG   8  37084   Wednesday    Rockies   84  Clear     Night  NO    NO
## 31   SEP  28  37133      Friday    Rockies   77  Clear     Night  NO    NO
## 32   AUG  31  37622      Friday     Snakes   77  Clear     Night  NO    NO
## 33   MAY  28  38016      Monday    Brewers   73  Clear     Night  NO    NO
## 34   APR  15  38359      Sunday     Padres   65  Clear       Day  NO    NO
## 35   MAY  19  39383    Saturday  Cardinals   67  Clear     Night  NO    NO
## 36   JUL  15  39715      Sunday     Padres   77  Clear       Day  NO    NO
## 37   AUG  24  39805      Friday    Marlins   71  Clear     Night  NO    NO
## 38   JUL  18  39955   Wednesday   Phillies   80 Cloudy       Day  NO    NO
## 39   SEP  14  40167      Friday  Cardinals   85  Clear     Night  NO    NO
## 40   AUG  22  40173   Wednesday     Giants   75  Clear     Night  NO    NO
## 41   AUG  25  40284    Saturday    Marlins   70  Clear     Night  NO    NO
## 42   JUN  15  40432      Friday  White Sox   67  Clear     Night  NO    NO
## 43   SEP   4  40619     Tuesday     Padres   78  Clear     Night  NO   YES
## 44   SEP  29  40724    Saturday    Rockies   84 Cloudy     Night  NO    NO
## 45   MAY  18  40906      Friday  Cardinals   64  Clear     Night  NO    NO
## 46   AUG  26  41907      Sunday    Marlins   81  Clear       Day  NO    NO
## 47   SEP  15  42449    Saturday  Cardinals   95  Clear     Night  NO    NO
## 48   OCT   2  42473     Tuesday     Giants   83  Clear     Night  NO    NO
## 49   AUG   5  42495      Sunday       Cubs   83  Clear       Day YES    NO
```

```
## 50   SEP  13  43309    Thursday Cardinals  80 Clear    Night NO  NO
## 51   JUN  13  43494   Wednesday    Angels  67 Clear    Night NO  NO
## 52   AUG   3  43537      Friday      Cubs  73 Clear    Night NO  NO
## 53   MAY   7  43713      Monday    Giants  67 Clear    Night NO  NO
## 54   JUL  13  43873      Friday    Padres  76 Cloudy   Night NO  NO
## 55   MAY  20  44005      Sunday Cardinals  77 Clear    Night NO  NO
## 56   APR  24  44014     Tuesday    Braves  63 Cloudy   Night NO  NO
## 57   JUN  30  44217    Saturday      Mets  78 Clear      Day NO  NO
## 58   APR  27  44807      Friday Nationals  66 Clear    Night NO  NO
## 59   JUN  16  45210    Saturday White Sox  68 Clear    Night NO  NO
## 60   APR  14  46549    Saturday    Padres  57 Cloudy   Night NO  NO
## 61   AUG   4  46588    Saturday      Cubs  73 Cloudy   Night NO  NO
## 62   MAY  15  47077     Tuesday    Snakes  70 Clear    Night NO  NO
## 63   APR  29  48753      Sunday Nationals  74 Clear      Day NO  YES
## 64   JUN  28  49006    Thursday      Mets  75 Clear    Night NO  NO
## 65   MAY  13  49124      Sunday   Rockies  70 Clear      Day NO  NO
## 66   JUN  29  49763      Friday      Mets  72 Clear    Night NO  NO
## 67   JUN  11  50559      Monday    Angels  68 Clear    Night NO  YES
## 68   SEP   5  50560   Wednesday    Padres  77 Cloudy   Night NO  NO
## 69   MAY  29  51137     Tuesday   Brewers  74 Clear    Night NO  NO
## 70   JUL  31  52832     Tuesday    Snakes  75 Cloudy   Night NO  NO
## 71   JUL  17  53498     Tuesday  Phillies  70 Clear    Night NO  NO
## 72   JUN  17  53504      Sunday White Sox  74 Clear      Day NO  NO
## 73   JUL   4  53570   Wednesday      Reds  70 Clear    Night NO  NO
## 74   JUL  14  54014    Saturday    Padres  75 Clear    Night NO  NO
## 75   APR  28  54242    Saturday Nationals  71 Clear    Night NO  NO
## 76   AUG  30  54621    Thursday    Snakes  80 Clear    Night NO  NO
## 77   AUG   7  55024     Tuesday   Rockies  80 Clear    Night NO  NO
## 78   JUN  12  55279     Tuesday    Angels  66 Cloudy   Night NO  NO
## 79   JUL   1  55359      Sunday      Mets  75 Clear    Night NO  NO
## 80   APR  10  56000     Tuesday   Pirates  67 Clear      Day NO  NO
## 81   AUG  21  56000     Tuesday    Giants  75 Clear    Night NO  NO
##    fireworks bobblehead
## 1         NO         NO
## 2         NO         NO
## 3         NO         NO
## 4         NO         NO
## 5         NO         NO
## 6         NO         NO
## 7         NO         NO
## 8        YES         NO
## 9         NO         NO
## 10        NO         NO
## 11        NO         NO
## 12        NO         NO
## 13        NO         NO
## 14        NO         NO
## 15        NO         NO
## 16        NO         NO
## 17        NO         NO
## 18        NO         NO
## 19        NO         NO
## 20        NO         NO
## 21        NO         NO
```

```
## 22      YES          NO
## 23       NO          NO
## 24       NO          NO
## 25       NO          NO
## 26      YES          NO
## 27       NO          NO
## 28       NO          NO
## 29       NO          NO
## 30       NO          NO
## 31      YES          NO
## 32      YES          NO
## 33       NO          NO
## 34       NO          NO
## 35       NO          NO
## 36       NO          NO
## 37      YES          NO
## 38       NO          NO
## 39      YES          NO
## 40       NO          NO
## 41       NO          NO
## 42      YES          NO
## 43       NO          NO
## 44       NO          NO
## 45      YES          NO
## 46       NO          NO
## 47       NO          NO
## 48       NO          NO
## 49       NO          NO
## 50       NO          NO
## 51       NO          NO
## 52      YES          NO
## 53       NO          NO
## 54      YES          NO
## 55       NO          NO
## 56       NO          NO
## 57       NO          NO
## 58      YES          NO
## 59       NO          NO
## 60       NO          NO
## 61       NO          NO
## 62       NO         YES
## 63       NO          NO
## 64       NO         YES
## 65       NO          NO
## 66      YES          NO
## 67       NO          NO
## 68       NO          NO
## 69       NO         YES
## 70       NO         YES
## 71       NO          NO
## 72       NO          NO
## 73      YES          NO
## 74       NO         YES
## 75       NO         YES
```

```
## 76          NO         YES
## 77          NO         YES
## 78          NO         YES
## 79          NO         YES
## 80          NO          NO
## 81          NO         YES
```

Create variables/dfs for small attendance, medium attendance, and large attendance.

```
small_attend_df <- dodgers_df %>% filter(24000 < attend  & attend < 35000)
small_attend_df
```

```
##     month day attend day_of_week opponent temp  skies day_night cap shirt
## 1     APR  11  29729   Wednesday  Pirates   58 Cloudy     Night  NO    NO
## 2     APR  12  28328    Thursday  Pirates   57 Cloudy     Night  NO    NO
## 3     APR  13  31601      Friday   Padres   54 Cloudy     Night  NO    NO
## 4     APR  23  26376      Monday   Braves   60 Cloudy     Night  NO    NO
## 5     APR  25  26345   Wednesday   Braves   64 Cloudy     Night  NO    NO
## 6     MAY   8  32799     Tuesday   Giants   75 Clear      Night  NO    NO
## 7     MAY   9  33993   Wednesday   Giants   71 Clear      Night  NO    NO
## 8     MAY  12  33735    Saturday  Rockies   65 Clear      Night  NO    NO
## 9     MAY  14  24312      Monday   Snakes   67 Clear      Night  NO    NO
## 10    MAY  27  33306      Sunday   Astros   70 Clear        Day  NO    NO
## 11    MAY  30  25509   Wednesday  Brewers   69 Clear      Night  NO    NO
## 12    MAY  31  26773    Thursday  Brewers   70 Clear      Night  NO    NO
## 13    JUL   2  34493      Monday     Reds   70 Clear      Night  NO    NO
## 14    JUL   3  33884     Tuesday     Reds   70 Cloudy     Night YES    NO
## 15    JUL  16  32238      Monday Phillies   67 Clear      Night  NO    NO
## 16    JUL  30  33180      Monday   Snakes   73 Clear      Night  NO    NO
## 17    AUG   6  32659      Monday  Rockies   79 Clear      Night  NO    NO
## 18    SEP   2  31607      Sunday   Snakes   89 Clear        Day  NO    NO
## 19    SEP   3  33540      Monday   Padres   84 Cloudy     Night  NO    NO
## 20    OCT   1  33624      Monday   Giants   86 Clear      Night  NO    NO
## 21    OCT   3  34014   Wednesday   Giants   82 Cloudy     Night  NO    NO
##    fireworks bobblehead
## 1         NO         NO
## 2         NO         NO
## 3        YES         NO
## 4         NO         NO
## 5         NO         NO
## 6         NO         NO
## 7         NO         NO
## 8         NO         NO
## 9         NO         NO
## 10        NO         NO
## 11        NO         NO
## 12        NO         NO
## 13        NO         NO
## 14        NO         NO
## 15        NO         NO
## 16        NO         NO
## 17        NO         NO
## 18        NO         NO
```

```
## 19          NO          NO
## 20          NO          NO
## 21          NO          NO
```

```r
med_attend_df <- dodgers_df %>% filter(attend >= 35000 & attend < 45000)
med_attend_df
```

```
##    month day attend day_of_week  opponent temp  skies day_night cap shirt
## 1    APR  15  38359      Sunday    Padres   65  Clear       Day  NO    NO
## 2    APR  24  44014     Tuesday    Braves   63 Cloudy     Night  NO    NO
## 3    APR  27  44807      Friday Nationals   66  Clear     Night  NO    NO
## 4    MAY   7  43713      Monday    Giants   67  Clear     Night  NO    NO
## 5    MAY  11  35591      Friday   Rockies   65  Clear     Night  NO    NO
## 6    MAY  18  40906      Friday Cardinals   64  Clear     Night  NO    NO
## 7    MAY  19  39383    Saturday Cardinals   67  Clear     Night  NO    NO
## 8    MAY  20  44005      Sunday Cardinals   77  Clear     Night  NO    NO
## 9    MAY  25  36283      Friday    Astros   59 Cloudy     Night  NO    NO
## 10   MAY  26  36561    Saturday    Astros   61 Cloudy     Night  NO    NO
## 11   MAY  28  38016      Monday   Brewers   73  Clear     Night  NO    NO
## 12   JUN  13  43494   Wednesday    Angels   67  Clear     Night  NO    NO
## 13   JUN  15  40432      Friday White Sox   67  Clear     Night  NO    NO
## 14   JUN  30  44217    Saturday      Mets   78  Clear       Day  NO    NO
## 15   JUL  13  43873      Friday    Padres   76 Cloudy     Night  NO    NO
## 16   JUL  15  39715      Sunday    Padres   77  Clear       Day  NO    NO
## 17   JUL  18  39955   Wednesday  Phillies   80 Cloudy       Day  NO    NO
## 18   AUG   1  36596   Wednesday    Snakes   79  Clear       Day  NO    NO
## 19   AUG   3  43537      Friday      Cubs   73  Clear     Night  NO    NO
## 20   AUG   5  42495      Sunday      Cubs   83  Clear       Day YES    NO
## 21   AUG   8  37084   Wednesday   Rockies   84  Clear     Night  NO    NO
## 22   AUG  20  36878      Monday    Giants   80  Clear     Night  NO    NO
## 23   AUG  22  40173   Wednesday    Giants   75  Clear     Night  NO    NO
## 24   AUG  24  39805      Friday   Marlins   71  Clear     Night  NO    NO
## 25   AUG  25  40284    Saturday   Marlins   70  Clear     Night  NO    NO
## 26   AUG  26  41907      Sunday   Marlins   81  Clear       Day  NO    NO
## 27   AUG  31  37622      Friday    Snakes   77  Clear     Night  NO    NO
## 28   SEP   1  35992    Saturday    Snakes   81  Clear     Night  NO    NO
## 29   SEP   4  40619     Tuesday    Padres   78  Clear     Night  NO   YES
## 30   SEP  13  43309    Thursday Cardinals   80  Clear     Night  NO    NO
## 31   SEP  14  40167      Friday Cardinals   85  Clear     Night  NO    NO
## 32   SEP  15  42449    Saturday Cardinals   95  Clear     Night  NO    NO
## 33   SEP  16  35754      Sunday Cardinals   86  Clear       Day  NO    NO
## 34   SEP  28  37133      Friday   Rockies   77  Clear     Night  NO    NO
## 35   SEP  29  40724    Saturday   Rockies   84 Cloudy     Night  NO    NO
## 36   SEP  30  35607      Sunday   Rockies   95  Clear       Day  NO    NO
## 37   OCT   2  42473     Tuesday    Giants   83  Clear     Night  NO    NO
##    fireworks bobblehead
## 1         NO         NO
## 2         NO         NO
## 3        YES         NO
## 4         NO         NO
## 5        YES         NO
## 6        YES         NO
## 7         NO         NO
## 8         NO         NO
```

```
## 9       YES        NO
## 10       NO        NO
## 11       NO        NO
## 12       NO        NO
## 13      YES        NO
## 14       NO        NO
## 15      YES        NO
## 16       NO        NO
## 17       NO        NO
## 18       NO        NO
## 19      YES        NO
## 20       NO        NO
## 21       NO        NO
## 22       NO        NO
## 23       NO        NO
## 24      YES        NO
## 25       NO        NO
## 26       NO        NO
## 27      YES        NO
## 28       NO        NO
## 29       NO        NO
## 30       NO        NO
## 31      YES        NO
## 32       NO        NO
## 33       NO        NO
## 34      YES        NO
## 35       NO        NO
## 36       NO        NO
## 37       NO        NO
```

```r
large_attend_df <- dodgers_df %>% filter(attend >= 45000)
large_attend_df
```

```
##     month day attend day_of_week  opponent temp  skies day_night cap shirt
## 1     APR  10  56000     Tuesday   Pirates   67  Clear       Day  NO    NO
## 2     APR  14  46549    Saturday    Padres   57 Cloudy     Night  NO    NO
## 3     APR  28  54242    Saturday Nationals   71  Clear     Night  NO    NO
## 4     APR  29  48753      Sunday Nationals   74  Clear       Day  NO   YES
## 5     MAY  13  49124      Sunday   Rockies   70  Clear       Day  NO    NO
## 6     MAY  15  47077     Tuesday    Snakes   70  Clear     Night  NO    NO
## 7     MAY  29  51137     Tuesday   Brewers   74  Clear     Night  NO    NO
## 8     JUN  11  50559      Monday    Angels   68  Clear     Night  NO   YES
## 9     JUN  12  55279     Tuesday    Angels   66 Cloudy     Night  NO    NO
## 10    JUN  16  45210    Saturday White Sox   68  Clear     Night  NO    NO
## 11    JUN  17  53504      Sunday White Sox   74  Clear       Day  NO    NO
## 12    JUN  28  49006    Thursday      Mets   75  Clear     Night  NO    NO
## 13    JUN  29  49763      Friday      Mets   72  Clear     Night  NO    NO
## 14    JUL   1  55359      Sunday      Mets   75  Clear     Night  NO    NO
## 15    JUL   4  53570   Wednesday      Reds   70  Clear     Night  NO    NO
## 16    JUL  14  54014    Saturday    Padres   75  Clear     Night  NO    NO
## 17    JUL  17  53498     Tuesday  Phillies   70  Clear     Night  NO    NO
## 18    JUL  31  52832     Tuesday    Snakes   75 Cloudy     Night  NO    NO
## 19    AUG   4  46588    Saturday      Cubs   73 Cloudy     Night  NO    NO
## 20    AUG   7  55024     Tuesday   Rockies   80  Clear     Night  NO    NO
```

```
## 21   AUG  21   56000     Tuesday   Giants   75 Clear    Night  NO    NO
## 22   AUG  30   54621    Thursday   Snakes   80 Clear    Night  NO    NO
## 23   SEP   5   50560   Wednesday   Padres   77 Cloudy   Night  NO    NO
##    fireworks bobblehead
## 1        NO        NO
## 2        NO        NO
## 3        NO       YES
## 4        NO        NO
## 5        NO        NO
## 6        NO       YES
## 7        NO       YES
## 8        NO        NO
## 9        NO       YES
## 10       NO        NO
## 11       NO        NO
## 12       NO       YES
## 13      YES        NO
## 14       NO       YES
## 15      YES        NO
## 16       NO       YES
## 17       NO        NO
## 18       NO       YES
## 19       NO        NO
## 20       NO       YES
## 21       NO       YES
## 22       NO       YES
## 23       NO        NO
```

Check value counts for different size audiences

```
library(vctrs)
```

```
##
## Attaching package: 'vctrs'
```

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

```
vec_count(small_attend_df$skies)
```

```
##     key count
## 1 Clear    13
## 2 Cloudy    8
```

```
vec_count(med_attend_df$skies)
```

```
##     key count
## 1 Clear    31
## 2 Cloudy    6
```

```
vec_count(large_attend_df$skies)
```

```
##      key count
## 1 Clear     18
## 2 Cloudy     5
```

The preponderance of days provided clear skies, across small, medium, and large attendance.

```
vec_count(small_attend_df$day_night)
```

```
##     key count
## 1 Night    19
## 2   Day     2
```

```
vec_count(med_attend_df$day_night)
```

```
##     key count
## 1 Night    28
## 2   Day     9
```

```
vec_count(large_attend_df$day_night)
```

```
##     key count
## 1 Night    19
## 2   Day     4
```

The vast majority of games across different sized attendance were night games... no noticeable affect on attendance.

```
vec_count(small_attend_df$cap)
```

```
##   key count
## 1  NO    20
## 2 YES     1
```

```
vec_count(med_attend_df$cap)
```

```
##   key count
## 1  NO    36
## 2 YES     1
```

```
vec_count(large_attend_df$cap)
```

```
##   key count
## 1  NO    23
```

Cap giveaways were clearly not a driver of attendance. There are 0 cap giveaway games in the large attendance group.

```
vec_count(small_attend_df$shirt)
```

```
##   key count
## 1  NO    21
```

```
vec_count(med_attend_df$shirt)
```

```
##   key count
## 1  NO    36
## 2 YES     1
```

```
vec_count(large_attend_df$shirt)
```

```
##   key count
## 1  NO    21
## 2 YES     2
```

Only 2 out of the 23 largest attendances had shirt giveaways, an insignificant number.

```
vec_count(small_attend_df$fireworks)
```

```
##   key count
## 1  NO    20
## 2 YES     1
```

```
vec_count(med_attend_df$fireworks)
```

```
##   key count
## 1  NO    26
## 2 YES    11
```

```
vec_count(large_attend_df$fireworks)
```

```
##   key count
## 1  NO    21
## 2 YES     2
```

The medium-sized crowds has the greatest number of fireworks presentations for games. One can posit that while fireworks shows do not equate with large crowds, they may boost otherwise small crowds into larger crowds.

```
vec_count(small_attend_df$bobblehead)
```

```
##   key count
## 1  NO    21
```

```
vec_count(med_attend_df$bobblehead)
```

```
##   key count
## 1  NO    37
```

```
vec_count(large_attend_df$bobblehead)
```

```
##   key count
## 1  NO    12
## 2 YES    11
```

Every bobblehead giveaway game produced a large attendance. It would most definitely be appropriate to offer more bobblehead giveaways.

```
library(ggplot2)
```

```
hist(dodgers_df$attend)
```

Histogram of dodgers_df$attend
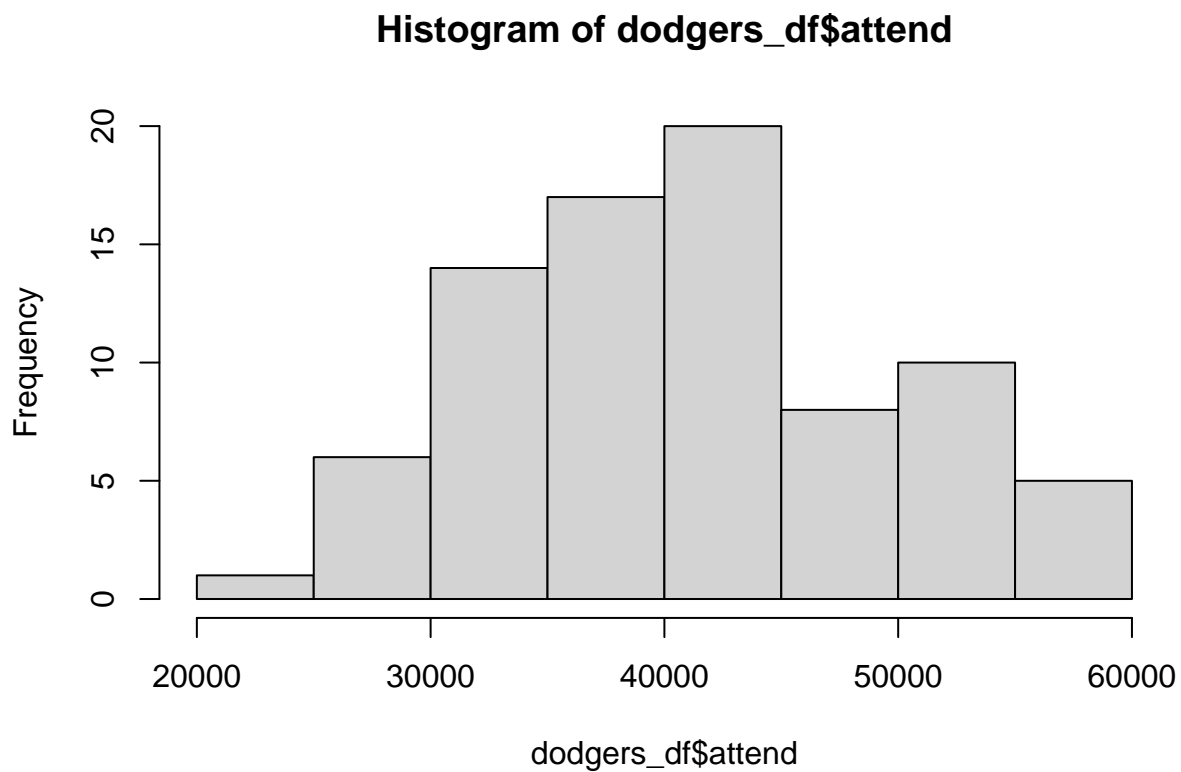
Attendance is normally distributed, and the Dodgers lead the league in attendance.

```
mean(dodgers_df$attend)
```

```
## [1] 41040.07
```

Any decreases in attendance reflect the pandemic. MLB has yet to bounce back(https://www.baseballamerica.com/stories/mlb-attendance-dipped-significantly-from-pre-pandemic-numbers/).

```
hist(dodgers_df$temp)
```

Histogram of dodgers_df$temp
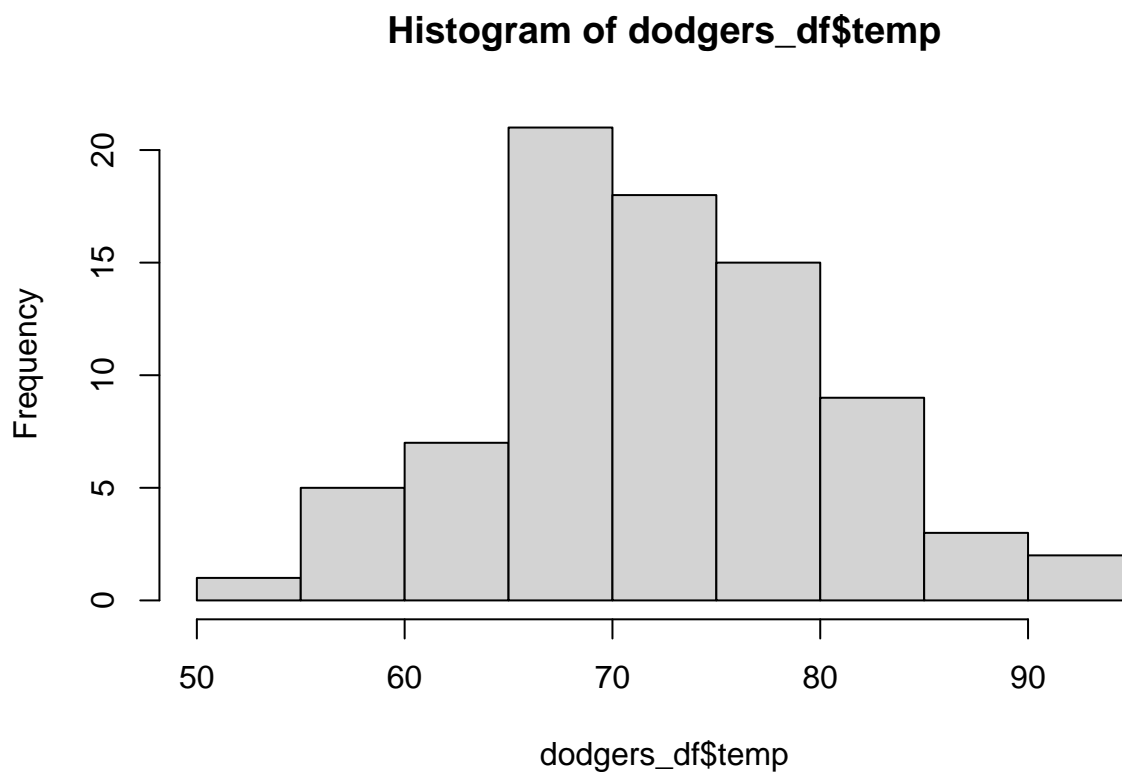
Temperatures are normally distributed, and beautiful.

Display the value counts for the variables

```
# install.packages('vctrs')
library(vctrs)
vec_count(dodgers_df$month)
```

```
##   key count
## 1 MAY    18
## 2 AUG    15
## 3 JUL    12
## 4 APR    12
## 5 SEP    12
## 6 JUN     9
## 7 OCT     3
```

```
vec_count(dodgers_df$day)
```

```
##   key count
## 1  30     5
```

```
## 2     13      5
## 3     15      5
## 4     28      4
## 5     14      4
## 6     29      4
## 7      3      4
## 8      1      4
## 9     31      3
## 10    12      3
## 11    11      3
## 12     4      3
## 13     2      3
## 14    25      3
## 15    16      3
## 16     5      2
## 17    17      2
## 18    24      2
## 19     8      2
## 20    18      2
## 21    26      2
## 22    20      2
## 23    27      2
## 24     7      2
## 25    21      1
## 26     6      1
## 27    23      1
## 28    10      1
## 29     9      1
## 30    19      1
## 31    22      1
```

```
vec_count(dodgers_df$day_of_week)
```

```
##          key count
## 1  Saturday    13
## 2    Sunday    13
## 3    Friday    13
## 4   Tuesday    13
## 5 Wednesday    12
## 6    Monday    12
## 7  Thursday     5
```

```
vec_count(dodgers_df$opponent)
```

```
##          key count
## 1     Giants     9
## 2    Rockies     9
## 3     Padres     9
## 4     Snakes     9
## 5  Cardinals     7
## 6       Mets     4
## 7    Brewers     4
## 8   Phillies     3
```

```
## 9   White Sox      3
## 10 Nationals      3
## 11      Reds       3
## 12    Braves       3
## 13     Cubs        3
## 14   Pirates       3
## 15    Angels       3
## 16   Marlins       3
## 17    Astros       3
```

```
vec_count(dodgers_df$temp)
```

```
##    key count
## 1   70     9
## 2   67     7
## 3   75     7
## 4   77     5
## 5   80     5
## 6   73     4
## 7   71     3
## 8   74     3
## 9   84     3
## 10  65     3
## 11  95     2
## 12  68     2
## 13  57     2
## 14  86     2
## 15  64     2
## 16  78     2
## 17  83     2
## 18  66     2
## 19  79     2
## 20  81     2
## 21  54     1
## 22  59     1
## 23  76     1
## 24  72     1
## 25  89     1
## 26  85     1
## 27  63     1
## 28  60     1
## 29  69     1
## 30  82     1
## 31  58     1
## 32  61     1
```

```
vec_count(dodgers_df$skies)
```

```
##       key count
## 1 Clear     62
## 2 Cloudy    19
```

```
vec_count(dodgers_df$day_night)
```

```
##      key count
## 1 Night    66
## 2   Day    15
```

```
vec_count(dodgers_df$cap)
```

```
##   key count
## 1  NO    79
## 2 YES     2
```

```
vec_count(dodgers_df$shirt)
```

```
##   key count
## 1  NO    78
## 2 YES     3
```

```
vec_count(dodgers_df$fireworks)
```

```
##   key count
## 1  NO    67
## 2 YES    14
```

```
vec_count(dodgers_df$bobblehead)
```

```
##   key count
## 1  NO    70
## 2 YES    11
```

Create dummy variables

```
# install.packages('fastDummies')
library(fastDummies)
```

```
## Warning: package 'fastDummies' was built under R version 4.2.3
```

```
dodgers_dummies <- dummy_cols(dodgers_df)
head(dodgers_dummies)
```

```
##   month day attend day_of_week opponent temp  skies day_night cap shirt
## 1   APR  10  56000     Tuesday  Pirates   67  Clear       Day  NO    NO
## 2   APR  11  29729   Wednesday  Pirates   58 Cloudy     Night  NO    NO
## 3   APR  12  28328    Thursday  Pirates   57 Cloudy     Night  NO    NO
## 4   APR  13  31601      Friday   Padres   54 Cloudy     Night  NO    NO
## 5   APR  14  46549    Saturday   Padres   57 Cloudy     Night  NO    NO
## 6   APR  15  38359      Sunday   Padres   65  Clear       Day  NO    NO
##   fireworks bobblehead month_APR month_AUG month_JUL month_JUN month_MAY
```

```
## 1         NO         NO          1          0          0          0          0
## 2         NO         NO          1          0          0          0          0
## 3         NO         NO          1          0          0          0          0
## 4        YES         NO          1          0          0          0          0
## 5         NO         NO          1          0          0          0          0
## 6         NO         NO          1          0          0          0          0
##   month_OCT month_SEP day_of_week_Friday day_of_week_Monday
## 1         0         0                  0                  0
## 2         0         0                  0                  0
## 3         0         0                  0                  0
## 4         0         0                  1                  0
## 5         0         0                  0                  0
## 6         0         0                  0                  0
##   day_of_week_Saturday day_of_week_Sunday day_of_week_Thursday
## 1                    0                  0                    0
## 2                    0                  0                    0
## 3                    0                  0                    1
## 4                    0                  0                    0
## 5                    1                  0                    0
## 6                    0                  1                    0
##   day_of_week_Tuesday day_of_week_Wednesday opponent_Angels opponent_Astros
## 1                   1                     0               0               0
## 2                   0                     1               0               0
## 3                   0                     0               0               0
## 4                   0                     0               0               0
## 5                   0                     0               0               0
## 6                   0                     0               0               0
##   opponent_Braves opponent_Brewers opponent_Cardinals opponent_Cubs
## 1               0                0                  0             0
## 2               0                0                  0             0
## 3               0                0                  0             0
## 4               0                0                  0             0
## 5               0                0                  0             0
## 6               0                0                  0             0
##   opponent_Giants opponent_Marlins opponent_Mets opponent_Nationals
## 1               0                0             0                  0
## 2               0                0             0                  0
## 3               0                0             0                  0
## 4               0                0             0                  0
## 5               0                0             0                  0
## 6               0                0             0                  0
##   opponent_Padres opponent_Phillies opponent_Pirates opponent_Reds
## 1               0                 0                1             0
## 2               0                 0                1             0
## 3               0                 0                1             0
## 4               1                 0                0             0
## 5               1                 0                0             0
## 6               1                 0                0             0
##   opponent_Rockies opponent_Snakes opponent_White Sox skies_Clear skies_Cloudy
## 1                0               0                  0           1            0
## 2                0               0                  0           0            1
## 3                0               0                  0           0            1
## 4                0               0                  0           0            1
## 5                0               0                  0           0            1
```

```
## 6               0               0                    0          1          0
##   day_night_Day day_night_Night cap_NO cap_YES shirt_NO shirt_YES fireworks_NO
## 1             1               0      1       0        1         0            1
## 2             0               1      1       0        1         0            1
## 3             0               1      1       0        1         0            1
## 4             0               1      1       0        1         0            0
## 5             0               1      1       0        1         0            1
## 6             1               0      1       0        1         0            1
##   fireworks_YES bobblehead_NO bobblehead_YES
## 1             0             1              0
## 2             0             1              0
## 3             0             1              0
## 4             1             1              0
## 5             0             1              0
## 6             0             1              0
```

```
dodgers_dummies <- subset(dodgers_dummies, select = -c(month, day_of_week, opponent,
                                                       skies, day_night, cap, shirt,
                                                       fireworks, bobblehead))
head(dodgers_dummies)
```

```
##   day attend temp month_APR month_AUG month_JUL month_JUN month_MAY month_OCT
## 1  10  56000   67         1         0         0         0         0         0
## 2  11  29729   58         1         0         0         0         0         0
## 3  12  28328   57         1         0         0         0         0         0
## 4  13  31601   54         1         0         0         0         0         0
## 5  14  46549   57         1         0         0         0         0         0
## 6  15  38359   65         1         0         0         0         0         0
##   month_SEP day_of_week_Friday day_of_week_Monday day_of_week_Saturday
## 1         0                  0                  0                    0
## 2         0                  0                  0                    0
## 3         0                  0                  0                    0
## 4         0                  1                  0                    0
## 5         0                  0                  0                    1
## 6         0                  0                  0                    0
##   day_of_week_Sunday day_of_week_Thursday day_of_week_Tuesday
## 1                  0                    0                   1
## 2                  0                    0                   0
## 3                  0                    1                   0
## 4                  0                    0                   0
## 5                  0                    0                   0
## 6                  1                    0                   0
##   day_of_week_Wednesday opponent_Angels opponent_Astros opponent_Braves
## 1                     0               0               0               0
## 2                     0               1               0               0
## 3                     0               0               0               0
## 4                     0               0               0               0
## 5                     0               0               0               0
## 6                     0               0               0               0
##   opponent_Brewers opponent_Cardinals opponent_Cubs opponent_Giants
## 1                0                  0             0               0
## 2                0                  0             0               0
## 3                0                  0             0               0
## 4                0                  0             0               0
```

```
## 5                0               0            0            0
## 6                0               0            0            0
##   opponent_Marlins opponent_Mets opponent_Nationals opponent_Padres
## 1                0             0                  0               0
## 2                0             0                  0               0
## 3                0             0                  0               0
## 4                0             0                  0               1
## 5                0             0                  0               1
## 6                0             0                  0               1
##   opponent_Phillies opponent_Pirates opponent_Reds opponent_Rockies
## 1                 0                1             0                0
## 2                 0                1             0                0
## 3                 0                1             0                0
## 4                 0                0             0                0
## 5                 0                0             0                0
## 6                 0                0             0                0
##   opponent_Snakes opponent_White Sox skies_Clear  skies_Cloudy day_night_Day
## 1               0                  0           1             0             1
## 2               0                  0           0             1             0
## 3               0                  0           0             1             0
## 4               0                  0           0             1             0
## 5               0                  0           0             1             0
## 6               0                  0           1             0             1
##   day_night_Night cap_NO cap_YES shirt_NO shirt_YES fireworks_NO fireworks_YES
## 1               0      1       0        1         0            1             0
## 2               1      1       0        1         0            1             0
## 3               1      1       0        1         0            1             0
## 4               1      1       0        1         0            0             1
## 5               1      1       0        1         0            1             0
## 6               0      1       0        1         0            1             0
##   bobblehead_NO bobblehead_YES
## 1             1              0
## 2             1              0
## 3             1              0
## 4             1              0
## 5             1              0
## 6             1              0
```

Scale data

```
dodgers_scaled <- scale(dodgers_dummies)
head(dodgers_scaled)
```

```
##          day     attend        temp month_APR  month_AUG  month_JUL  month_JUN
## 1 -0.6387691  1.8029352 -0.7391984  2.383068 -0.4737794 -0.4144466 -0.3513642
## 2 -0.5346638 -1.3631841 -1.8212780  2.383068 -0.4737794 -0.4144466 -0.3513642
## 3 -0.4305586 -1.5320294 -1.9415091  2.383068 -0.4737794 -0.4144466 -0.3513642
## 4 -0.3264534 -1.1375751 -2.3022023  2.383068 -0.4737794 -0.4144466 -0.3513642
## 5 -0.2223482  0.6639228 -1.9415091  2.383068 -0.4737794 -0.4144466 -0.3513642
## 6 -0.1182430 -0.3231168 -0.9796605  2.383068 -0.4737794 -0.4144466 -0.3513642
##    month_MAY  month_OCT  month_SEP day_of_week_Friday day_of_week_Monday
## 1 -0.5312127 -0.1949018 -0.4144466         -0.4345299         -0.4144466
## 2 -0.5312127 -0.1949018 -0.4144466         -0.4345299         -0.4144466
```

```
## 3 -0.5312127 -0.1949018 -0.4144466          -0.4345299          -0.4144466
## 4 -0.5312127 -0.1949018 -0.4144466           2.2729258          -0.4144466
## 5 -0.5312127 -0.1949018 -0.4144466          -0.4345299          -0.4144466
## 6 -0.5312127 -0.1949018 -0.4144466          -0.4345299          -0.4144466
##   day_of_week_Saturday day_of_week_Sunday day_of_week_Thursday
## 1           -0.4345299         -0.4345299           -0.2549064
## 2           -0.4345299         -0.4345299           -0.2549064
## 3           -0.4345299         -0.4345299            3.8745768
## 4           -0.4345299         -0.4345299           -0.2549064
## 5            2.2729258         -0.4345299           -0.2549064
## 6           -0.4345299          2.2729258           -0.2549064
##   day_of_week_Tuesday day_of_week_Wednesday opponent_Angels opponent_Astros
## 1           2.2729258            -0.4144466      -0.1949018      -0.1949018
## 2          -0.4345299             2.3830678      -0.1949018      -0.1949018
## 3          -0.4345299            -0.4144466      -0.1949018      -0.1949018
## 4          -0.4345299            -0.4144466      -0.1949018      -0.1949018
## 5          -0.4345299            -0.4144466      -0.1949018      -0.1949018
## 6          -0.4345299            -0.4144466      -0.1949018      -0.1949018
##   opponent_Braves opponent_Brewers opponent_Cardinals opponent_Cubs
## 1      -0.1949018       -0.2265099         -0.3056579    -0.1949018
## 2      -0.1949018       -0.2265099         -0.3056579    -0.1949018
## 3      -0.1949018       -0.2265099         -0.3056579    -0.1949018
## 4      -0.1949018       -0.2265099         -0.3056579    -0.1949018
## 5      -0.1949018       -0.2265099         -0.3056579    -0.1949018
## 6      -0.1949018       -0.2265099         -0.3056579    -0.1949018
##   opponent_Giants opponent_Marlins opponent_Mets opponent_Nationals
## 1      -0.3513642       -0.1949018    -0.2265099         -0.1949018
## 2      -0.3513642       -0.1949018    -0.2265099         -0.1949018
## 3      -0.3513642       -0.1949018    -0.2265099         -0.1949018
## 4      -0.3513642       -0.1949018    -0.2265099         -0.1949018
## 5      -0.3513642       -0.1949018    -0.2265099         -0.1949018
## 6      -0.3513642       -0.1949018    -0.2265099         -0.1949018
##   opponent_Padres opponent_Phillies opponent_Pirates opponent_Reds
## 1      -0.3513642        -0.1949018        5.0674463    -0.1949018
## 2      -0.3513642        -0.1949018        5.0674463    -0.1949018
## 3      -0.3513642        -0.1949018        5.0674463    -0.1949018
## 4       2.8109135        -0.1949018       -0.1949018    -0.1949018
## 5       2.8109135        -0.1949018       -0.1949018    -0.1949018
## 6       2.8109135        -0.1949018       -0.1949018    -0.1949018
##   opponent_Rockies opponent_Snakes opponent_White Sox skies_Clear skies_Cloudy
## 1       -0.3513642      -0.3513642         -0.1949018   0.5501529   -0.5501529
## 2       -0.3513642      -0.3513642         -0.1949018  -1.7952359    1.7952359
## 3       -0.3513642      -0.3513642         -0.1949018  -1.7952359    1.7952359
## 4       -0.3513642      -0.3513642         -0.1949018  -1.7952359    1.7952359
## 5       -0.3513642      -0.3513642         -0.1949018  -1.7952359    1.7952359
## 6       -0.3513642      -0.3513642         -0.1949018   0.5501529   -0.5501529
##   day_night_Day day_night_Night    cap_NO    cap_YES   shirt_NO   shirt_YES
## 1     2.0846292     -2.0846292 0.1581262 -0.1581262 0.1949018 -0.1949018
## 2    -0.4737794      0.4737794 0.1581262 -0.1581262 0.1949018 -0.1949018
## 3    -0.4737794      0.4737794 0.1581262 -0.1581262 0.1949018 -0.1949018
## 4    -0.4737794      0.4737794 0.1581262 -0.1581262 0.1949018 -0.1949018
## 5    -0.4737794      0.4737794 0.1581262 -0.1581262 0.1949018 -0.1949018
## 6     2.0846292     -2.0846292 0.1581262 -0.1581262 0.1949018 -0.1949018
##   fireworks_NO fireworks_YES bobblehead_NO bobblehead_YES
```

```
## 1     0.4542857    -0.4542857     0.3939579    -0.3939579
## 2     0.4542857    -0.4542857     0.3939579    -0.3939579
## 3     0.4542857    -0.4542857     0.3939579    -0.3939579
## 4    -2.1740817     2.1740817     0.3939579    -0.3939579
## 5     0.4542857    -0.4542857     0.3939579    -0.3939579
## 6     0.4542857    -0.4542857     0.3939579    -0.3939579
```

Perform PCA on data

```r
#install.packages("corrr")
library('corrr')
# install.packages("ggcorrplot")
library(ggcorrplot)
```

```r
corr_matrix <- cor(dodgers_scaled)
ggcorrplot(corr_matrix)
```
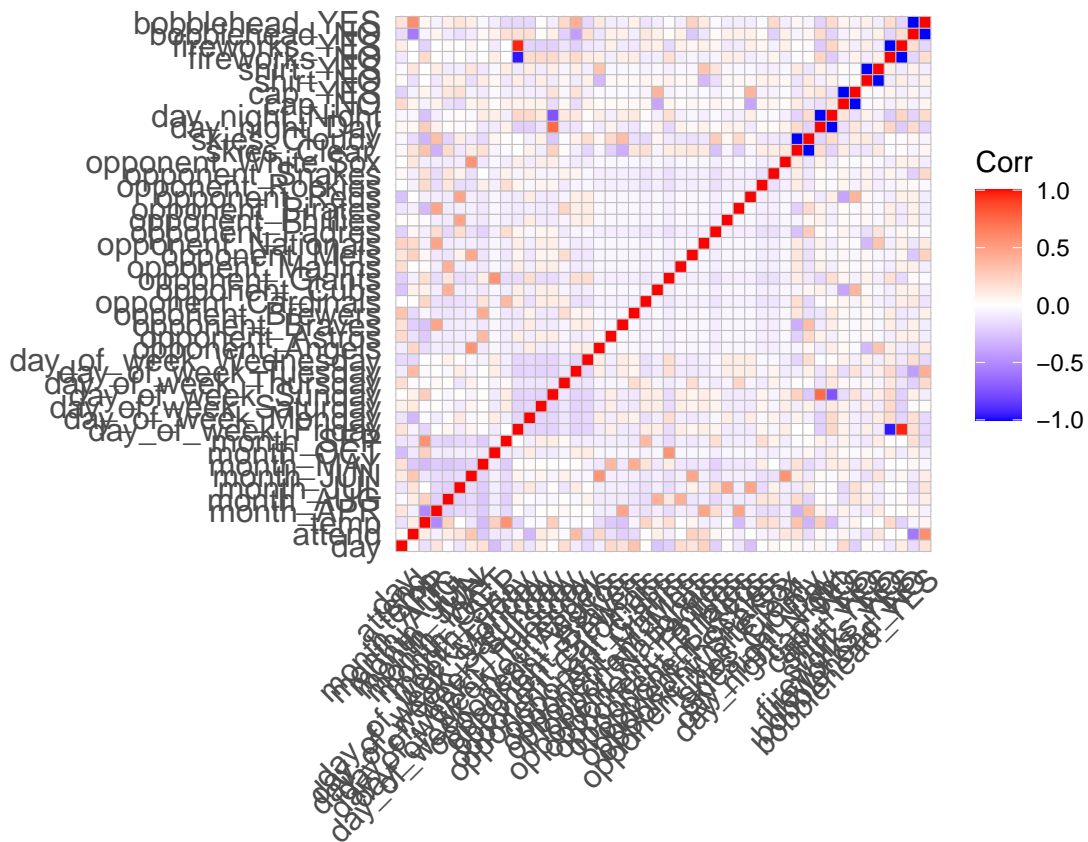


```r
data.pca <- princomp(corr_matrix)
summary(data.pca)
```

```
## Importance of components:
##                         Comp.1    Comp.2    Comp.3     Comp.4     Comp.5
## Standard deviation     0.5837329 0.5261162 0.5098603 0.44367439 0.42113540
## Proportion of Variance 0.1585492 0.1287951 0.1209590 0.09159348 0.08252382
```

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```
## Cumulative Proportion  0.1585492 0.2873443 0.4083033 0.49989679 0.58242062
##                            Comp.6      Comp.7      Comp.8      Comp.9     Comp.10
## Standard deviation      0.36832979 0.31379804 0.29153900 0.28733921 0.26887119
## Proportion of Variance 0.06312618 0.04581802 0.03954842 0.03841719 0.03363755
## Cumulative Proportion  0.64554680 0.69136482 0.73091324 0.76933043 0.80296798
##                           Comp.11     Comp.12     Comp.13     Comp.14     Comp.15
## Standard deviation      0.23251858 0.22717673 0.20436535 0.18510014 0.17872645
## Proportion of Variance 0.02515655 0.02401395 0.01943347 0.01594224 0.01486324
## Cumulative Proportion  0.82812453 0.85213848 0.87157195 0.88751419 0.90237743
##                           Comp.16     Comp.17     Comp.18    Comp.19     Comp.20
## Standard deviation      0.17418371 0.16535098 0.15816513 0.1551718 0.15445764
## Proportion of Variance 0.01411728 0.01272182 0.01164012 0.0112037 0.01110081
## Cumulative Proportion  0.91649471 0.92921653 0.94085665 0.9520603 0.96316115
##                            Comp.21     Comp.22     Comp.23     Comp.24
## Standard deviation      0.141762165 0.115012942 0.109984922 0.092048156
## Proportion of Variance 0.009350967 0.006155017 0.005628623 0.003942448
## Cumulative Proportion  0.972512121 0.978667138 0.984295760 0.988238209
##                            Comp.25     Comp.26     Comp.27    Comp.28
## Standard deviation      0.083748493 0.069986449 0.062542063 0.05627143
## Proportion of Variance 0.003263547 0.002279102 0.001820037 0.00147337
## Cumulative Proportion  0.991501756 0.993780857 0.995600895 0.99707426
##                            Comp.29     Comp.30      Comp.31       Comp.32
## Standard deviation      0.047852371 0.0362686669 0.0342694853 0.0270850945
## Proportion of Variance 0.001065474 0.0006120671 0.0005464507 0.0003413474
## Cumulative Proportion  0.998139738 0.9987518052 0.9992982559 0.9996396033
##                             Comp.33       Comp.34      Comp.35      Comp.36
## Standard deviation      0.0234457979 1.262211e-02 6.541408e-03 4.044036e-03
## Proportion of Variance 0.0002557796 7.413099e-05 1.991033e-05 7.609669e-06
## Cumulative Proportion  0.9998953829 9.999695e-01 9.999894e-01 9.999970e-01
##                             Comp.37      Comp.38      Comp.39      Comp.40
## Standard deviation      2.524808e-03 3.568815e-09 3.153573e-09 2.824237e-09
## Proportion of Variance 2.966146e-06 5.926303e-18 4.627450e-18 3.711403e-18
## Cumulative Proportion  1.000000e+00 1.000000e+00 1.000000e+00 1.000000e+00
##                             Comp.41      Comp.42 Comp.43 Comp.44 Comp.45
## Standard deviation      1.235366e-09 1.009724e-09       0       0       0
## Proportion of Variance 7.101128e-19 4.743966e-19       0       0       0
## Cumulative Proportion  1.000000e+00 1.000000e+00       1       1       1
##                         Comp.46
## Standard deviation            0
## Proportion of Variance        0
## Cumulative Proportion         1
```

The components do not reach 80% explainability until the 10th component. It may be advisable to use multiple features because there does not exist features that appropriately predict using a deminimus number of features.

```
data.pca$loadings[, 1:2]
```

```
##                        Comp.1       Comp.2
## day             0.0563830453  0.037946148
## attend         -0.1490702246 -0.130388664
## temp           -0.3070175563  0.124381448
## month_APR       0.1558581508 -0.107166167
```

```
## month_AUG             -0.0868739685  0.078374783
## month_JUL             -0.0145268101 -0.121044719
## month_JUN             -0.0369180363 -0.016208709
## month_MAY              0.0631491462  0.041130538
## month_OCT             -0.0115919702 -0.064254820
## month_SEP             -0.0814186784  0.142874405
## day_of_week_Friday     0.3053947852  0.311171092
## day_of_week_Monday     0.0146878713 -0.068313240
## day_of_week_Saturday  -0.0007725603 -0.036614857
## day_of_week_Sunday    -0.3090720234  0.197109636
## day_of_week_Thursday  -0.0035888759 -0.091157872
## day_of_week_Tuesday   -0.0602873949 -0.279768955
## day_of_week_Wednesday  0.0546339691 -0.068211970
## opponent_Angels       -0.0240209425 -0.127500295
## opponent_Astros        0.0923625546  0.056259285
## opponent_Braves        0.1448844046 -0.129197568
## opponent_Brewers       0.0113051436 -0.054765879
## opponent_Cardinals    -0.0171504503  0.160714142
## opponent_Cubs         -0.0386349310  0.086780538
## opponent_Giants       -0.0284491636 -0.092036993
## opponent_Marlins      -0.0197941792  0.121523572
## opponent_Mets         -0.0544504507 -0.019123739
## opponent_Nationals    -0.0152359456  0.019181300
## opponent_Padres        0.0531943063 -0.023923801
## opponent_Phillies     -0.0168794329 -0.057044328
## opponent_Pirates       0.0718371420 -0.095480635
## opponent_Reds          0.0305784358 -0.047408725
## opponent_Rockies      -0.0357803004  0.110061511
## opponent_Snakes       -0.0716298532 -0.035240582
## opponent_White Sox    -0.0125175236  0.087002094
## skies_Clear           -0.2558261083  0.211039998
## skies_Cloudy           0.2558261083 -0.211039998
## day_night_Day         -0.3169123524  0.194618021
## day_night_Night        0.3169123524 -0.194618021
## cap_NO                 0.0934523905  0.002334413
## cap_YES               -0.0934523905 -0.002334413
## shirt_NO               0.1112340857  0.011914199
## shirt_YES             -0.1112340857 -0.011914199
## fireworks_NO          -0.3099630341 -0.307161478
## fireworks_YES          0.3099630341  0.307161478
## bobblehead_NO          0.1053975806  0.306604743
## bobblehead_YES        -0.1053975806 -0.306604743
```

```
library(factoextra)
```

```
## Welcome! Want to learn more? See two factoextra-related books at https://goo.gl/ve3WBa
```

```
fviz_eig(data.pca, addlabels = TRUE)
```

Scree plot
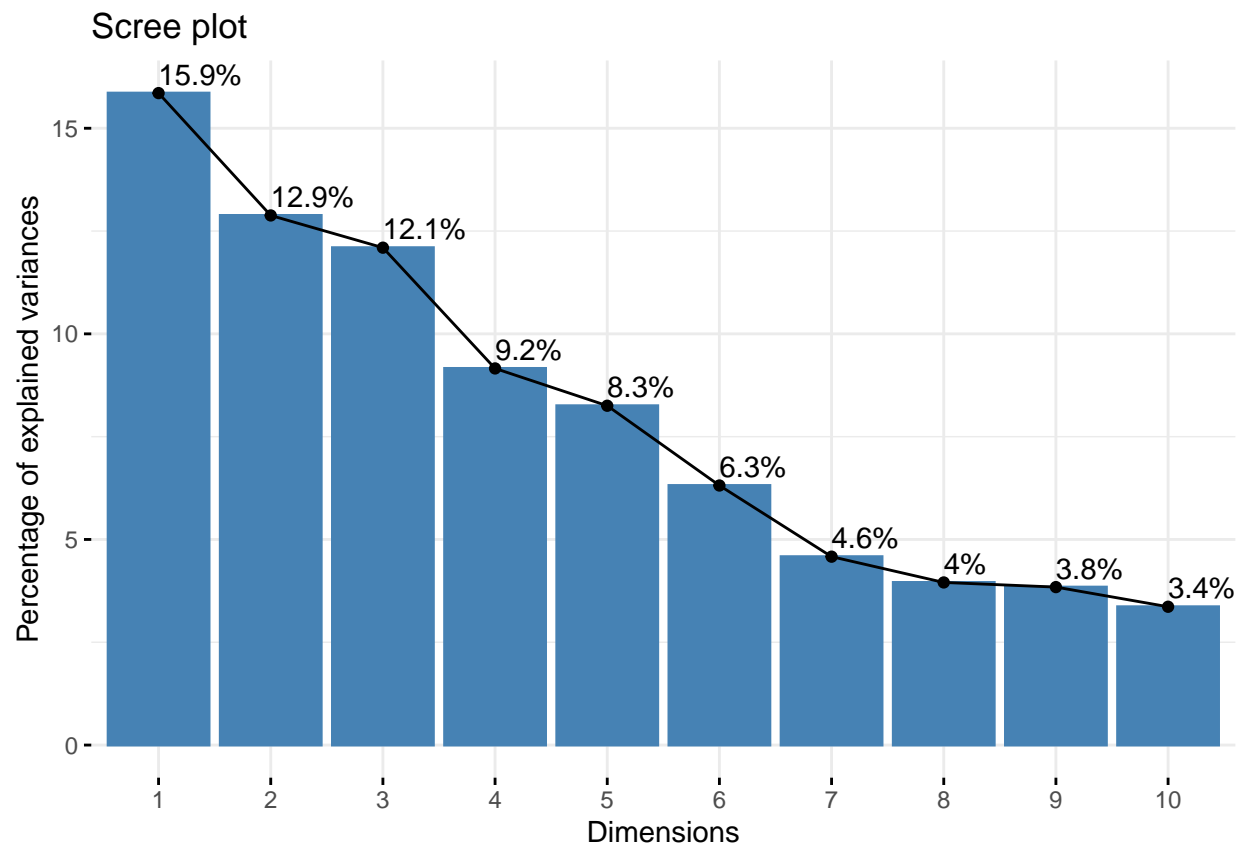

```
# Graph of the variables
fviz_pca_var(data.pca, col.var = "black")
```

Variables – PCA
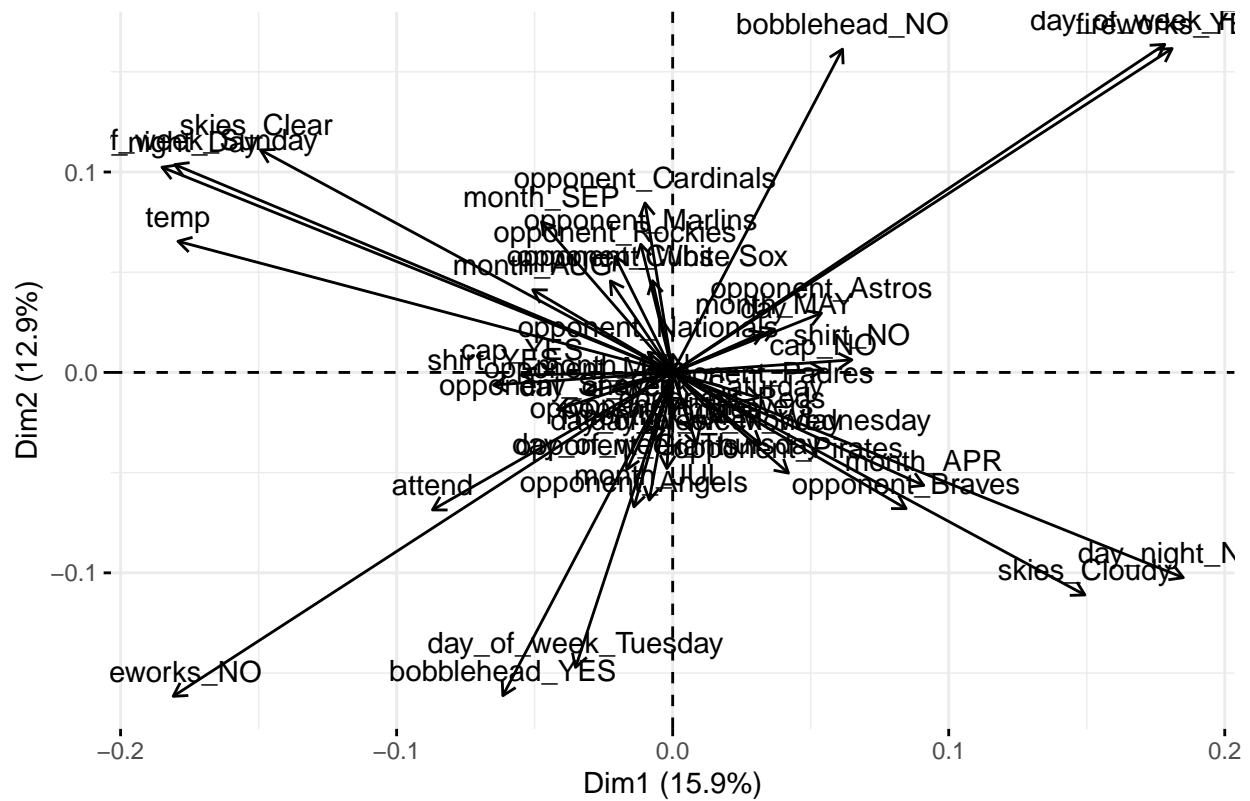

```
fviz_cos2(data.pca, choice = "var", axes = 1:2)
```

Cos2 of variables to Dim−1−2
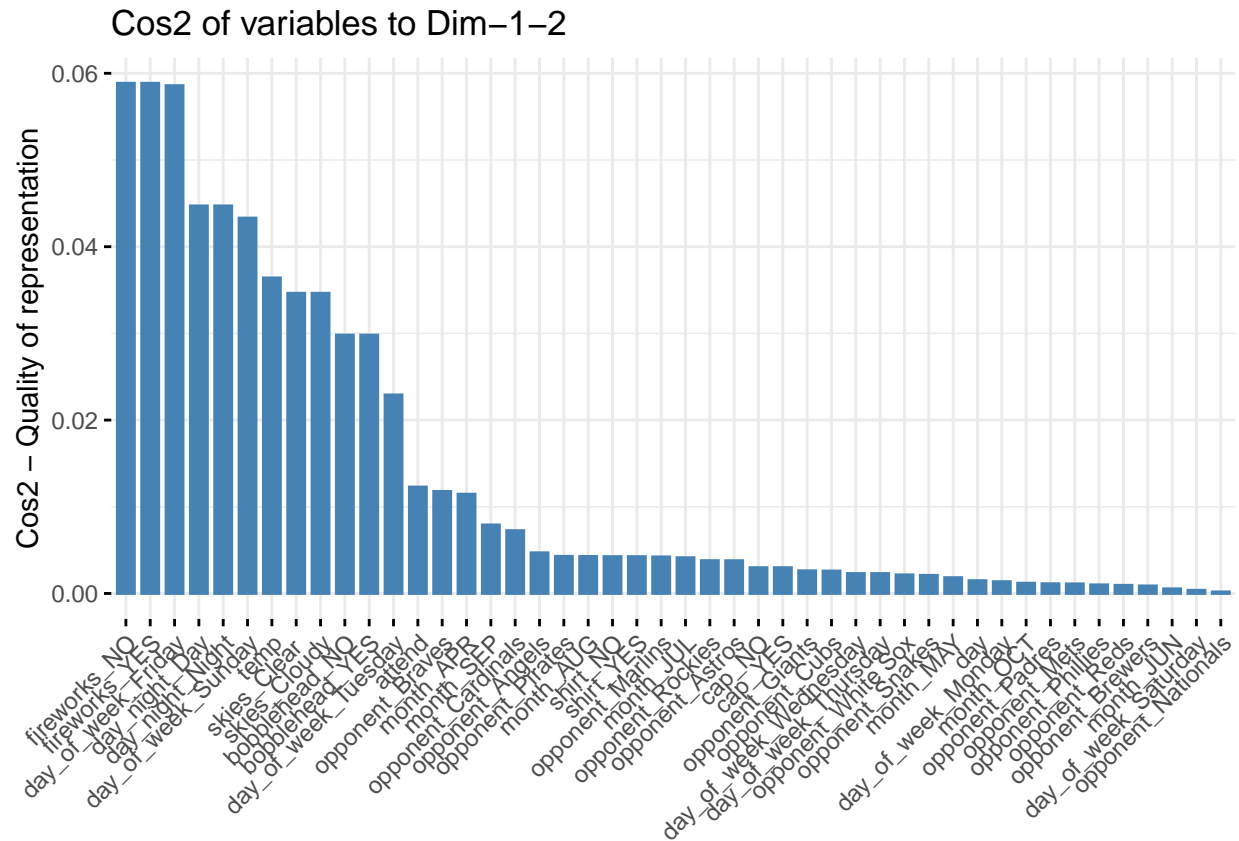

```
fviz_pca_var(data.pca, col.var = "cos2",
             gradient.cols = c("black", "orange", "green"),
             repel = TRUE)
```

```
## Warning: ggrepel: 14 unlabeled data points (too many overlaps). Consider
## increasing max.overlaps
```

Variables – PCA
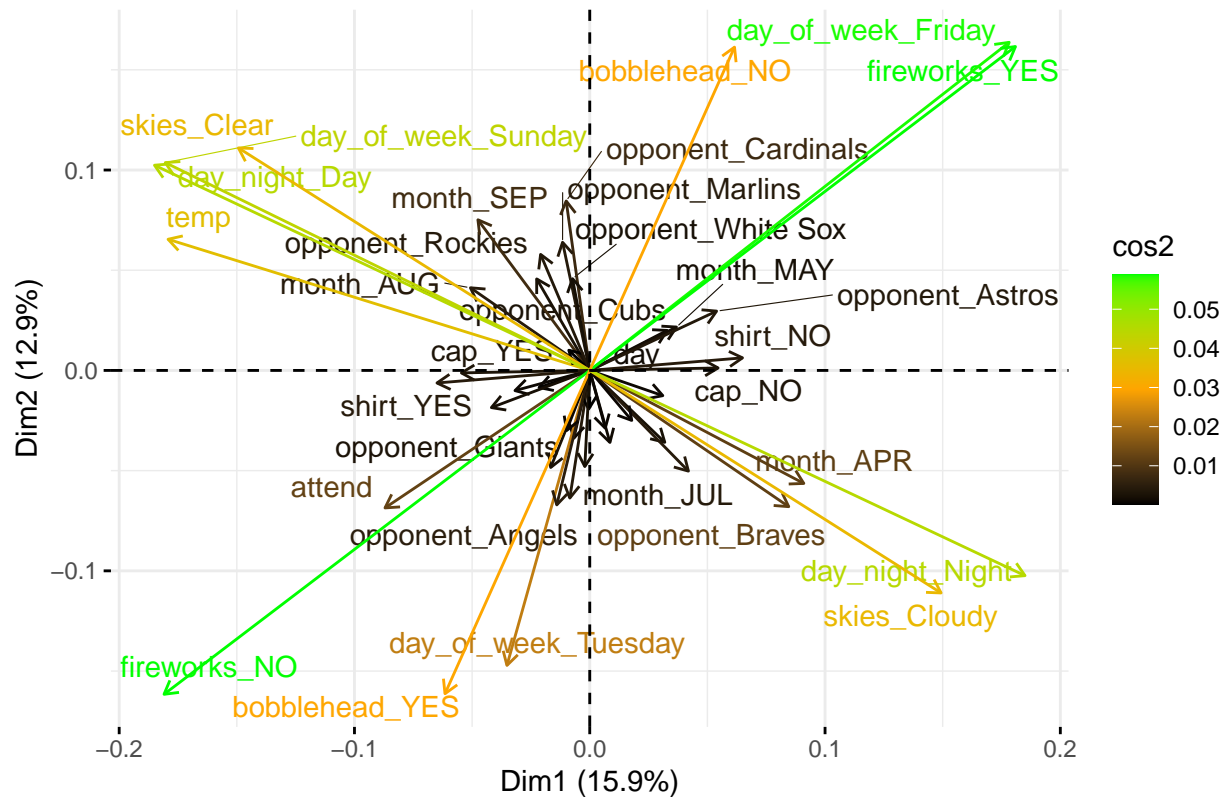

```
options(warn = -1)
```

Suggest scheduling more Friday night games, with fireworks displays, and give off day on Thursday.

```
data.pca$loadings
```

```
##
## Loadings:
##                     Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7 Comp.8
## day                                0.194  0.182  0.119  0.283  0.121
## attend              -0.149 -0.130  0.286  0.115 -0.256        -0.114
## temp                -0.307  0.124        -0.215               -0.309
## month_APR            0.156 -0.107 -0.156  0.359         0.113         0.248
## month_AUG                                -0.203 -0.121                0.423
## month_JUL                  -0.121               -0.242               -0.358
## month_JUN                          0.205  0.191        -0.160  0.176 -0.284
## month_MAY                                        0.256  0.170  0.331
## month_OCT                                -0.180  0.112 -0.199
## month_SEP                   0.143                              -0.447
## day_of_week_Friday   0.305  0.311  0.172        -0.170
## day_of_week_Monday                       -0.113  0.176 -0.236  0.163
## day_of_week_Saturday                                    0.109 -0.165
## day_of_week_Sunday  -0.309  0.197 -0.109  0.167         0.157
## day_of_week_Thursday               0.105               0.146
## day_of_week_Tuesday        -0.280               -0.131                0.109
```

```
## day_of_week_Wednesday                     -0.159
## opponent_Angels              -0.128          0.143          -0.280  0.136
## opponent_Astros                                              0.177  0.147
## opponent_Braves        0.145 -0.129 -0.152  0.122
## opponent_Brewers                                      0.185  0.125  0.270
## opponent_Cardinals            0.161                                -0.169
## opponent_Cubs                               -0.102 -0.255                 0.238
## opponent_Giants                             -0.249  0.167 -0.189          0.179
## opponent_Marlins              0.122                                        0.202
## opponent_Mets                        0.197                               -0.203
## opponent_Nationals                   0.263                                0.261
## opponent_Padres                     -0.101  0.142          -0.289
## opponent_Phillies                                                        -0.253
## opponent_Pirates                    -0.130  0.141          0.111
## opponent_Reds                       -0.127 -0.140 -0.249 -0.101  0.145 -0.177
## opponent_Rockies              0.110                        -0.119
## opponent_Snakes
## opponent_White Sox                                                0.115 -0.221
## skies_Clear           -0.256  0.211  0.252 -0.100          0.182
## skies_Cloudy           0.256 -0.211 -0.252  0.100         -0.182
## day_night_Day         -0.317  0.195 -0.170  0.205          0.176
## day_night_Night        0.317 -0.195  0.170 -0.205         -0.176
## cap_NO                               0.218  0.134  0.379         -0.212
## cap_YES                             -0.218 -0.134 -0.379          0.212
## shirt_NO               0.111               -0.304          0.401         -0.150
## shirt_YES             -0.111                0.304         -0.401          0.150
## fireworks_NO          -0.310 -0.307 -0.166         0.197
## fireworks_YES          0.310  0.307  0.166        -0.197
## bobblehead_NO          0.105  0.307 -0.326         0.137 -0.147
## bobblehead_YES        -0.105 -0.307  0.326        -0.137  0.147
##                       Comp.9 Comp.10 Comp.11 Comp.12 Comp.13 Comp.14 Comp.15
## day                                   0.171                   0.205
## attend                               -0.126   0.101          -0.172
## temp                                                          0.160
## month_APR                     0.122          -0.217 -0.197           0.110
## month_AUG             -0.201          0.303   0.124   0.127
## month_JUL              0.219  0.343   0.139          -0.108
## month_JUN             -0.388 -0.194
## month_MAY              0.248 -0.136  -0.240   0.175          -0.112
## month_OCT             -0.199  0.102  -0.364          -0.150   0.222 -0.121
## month_SEP              0.176 -0.251          -0.122   0.126           0.102
## day_of_week_Friday
## day_of_week_Monday                    0.293                   0.309
## day_of_week_Saturday  -0.345  0.180   0.273  -0.477 -0.177
## day_of_week_Sunday                   -0.156                   0.131
## day_of_week_Thursday          -0.146   0.102  -0.475  0.124          -0.323
## day_of_week_Tuesday    0.134         -0.276           0.140           0.262
## day_of_week_Wednesday -0.222  0.156                   0.230  -0.285
## opponent_Angels       -0.138 -0.165                   0.323
## opponent_Astros               -0.107  -0.195   0.389                 -0.237
## opponent_Braves                        0.123                   0.363  0.406
## opponent_Brewers       0.198                  -0.110   0.123
## opponent_Cardinals     0.166 -0.247  -0.109  -0.227  -0.130  -0.103
## opponent_Cubs                 -0.207                                 -0.180
```

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```
## opponent_Giants       -0.197  0.141 -0.330         -0.146  0.116
## opponent_Marlins      -0.125         0.296  0.165                -0.145
## opponent_Mets         -0.174               -0.172          0.272 -0.206
## opponent_Nationals     0.164  0.125                -0.372
## opponent_Padres        0.124                0.141                -0.301
## opponent_Phillies             0.325  0.171                -0.171
## opponent_Pirates      -0.126               -0.363         -0.380 -0.117
## opponent_Reds          0.173               -0.139 -0.138 -0.108  0.102
## opponent_Rockies                            0.136  0.131 -0.182  0.479
## opponent_Snakes        0.105  0.115  0.190          0.248  0.230
## opponent_White Sox    -0.309                      -0.163         0.227
## skies_Clear                   0.115        -0.148 -0.148 -0.113
## skies_Cloudy                 -0.115         0.148  0.148  0.113
## day_night_Day                 0.156 -0.100         0.106
## day_night_Night              -0.156  0.100        -0.106
## cap_NO                -0.105  0.228
## cap_YES                0.105 -0.228
## shirt_NO              -0.214                                     0.101
## shirt_YES              0.214                                    -0.101
## fireworks_NO                 -0.111
## fireworks_YES                 0.111
## bobblehead_NO
## bobblehead_YES
##                       Comp.16 Comp.17 Comp.18 Comp.19 Comp.20 Comp.21 Comp.22
## day                    0.305                                   0.226
## attend
## temp                   0.198                                   0.153
## month_APR
## month_AUG
## month_JUL
## month_JUN
## month_MAY                                             -0.135 -0.112
## month_OCT                                              0.209  0.150
## month_SEP                                              0.138
## day_of_week_Friday
## day_of_week_Monday    -0.267                 -0.237          -0.129  0.266
## day_of_week_Saturday                 -0.122                         -0.161
## day_of_week_Sunday                                            -0.194  0.162
## day_of_week_Thursday                         -0.121           0.210  0.153
## day_of_week_Tuesday           0.314  0.178  -0.122           0.163 -0.261
## day_of_week_Wednesday  0.372 -0.200 -0.163   0.428 -0.114 -0.119 -0.128
## opponent_Angels                     -0.125                 -0.271  0.400
## opponent_Astros                     -0.336          0.157  0.122
## opponent_Braves        0.145  0.137  0.103               -0.263 -0.261
## opponent_Brewers       0.207 -0.159  0.435   0.163 -0.225  0.138
## opponent_Cardinals     0.145  0.431                        -0.378
## opponent_Cubs                                -0.167 -0.467 -0.182
## opponent_Giants
## opponent_Marlins       0.153  0.292  0.269          0.494
## opponent_Mets          0.217 -0.270         -0.243  0.150        -0.449
## opponent_Nationals     0.149 -0.128 -0.271   0.178 -0.156         0.289
## opponent_Padres       -0.162 -0.239  0.486   0.112        -0.120
## opponent_Phillies      0.226  0.264         -0.354 -0.379  0.181
## opponent_Pirates      -0.265                 -0.214  0.129  0.136
```

```
## opponent_Reds                        -0.104  -0.104   0.233   0.389
## opponent_Rockies                      -0.476          -0.352   0.136   0.172
## opponent_Snakes          -0.424   0.128  -0.330   0.380  -0.112   0.107  -0.183
## opponent_White Sox       -0.274   0.125   0.224   0.228  -0.178   0.325
## skies_Clear                                                          -0.105  -0.115
## skies_Cloudy                                                          0.105   0.115
## day_night_Day
## day_night_Night
## cap_NO
## cap_YES
## shirt_NO                                                             -0.123   0.197
## shirt_YES                                                             0.123  -0.197
## fireworks_NO
## fireworks_YES
## bobblehead_NO                                                                -0.124
## bobblehead_YES                                                                0.124
##                        Comp.23 Comp.24 Comp.25 Comp.26 Comp.27 Comp.28 Comp.29
## day                                     0.196           0.420   0.131   0.280
## attend                          -0.156                  0.207
## temp                            -0.168   0.130
## month_APR                                       0.117
## month_AUG               -0.230           0.170           0.161   0.125  -0.223
## month_JUL                               -0.122  -0.110   0.164   0.147   0.383
## month_JUN
## month_MAY                        0.114  -0.128  -0.155          -0.295
## month_OCT                0.146  -0.178  -0.475                   0.310  -0.139
## month_SEP                                0.267          -0.342  -0.154   0.151
## day_of_week_Friday
## day_of_week_Monday              -0.138   0.293  -0.146                  -0.246
## day_of_week_Saturday     0.215          -0.103   0.127   0.130   0.104
## day_of_week_Sunday      -0.143          -0.159  -0.224  -0.106           0.314
## day_of_week_Thursday    -0.384   0.150  -0.266   0.323          -0.165
## day_of_week_Tuesday      0.131                   0.213
## day_of_week_Wednesday            0.103          -0.146  -0.103   0.119
## opponent_Angels          0.276                   0.230                   0.196
## opponent_Astros         -0.279  -0.129   0.240   0.189  -0.268   0.347
## opponent_Braves         -0.209          -0.140   0.135  -0.107   0.149
## opponent_Brewers         0.189  -0.377
## opponent_Cardinals                              -0.225   0.254   0.164  -0.257
## opponent_Cubs                   -0.363  -0.112                  -0.142   0.242
## opponent_Giants                  0.224   0.283           0.207  -0.272   0.312
## opponent_Marlins         0.148          -0.172  -0.174  -0.273  -0.185
## opponent_Mets            0.175                  -0.160  -0.102          -0.110
## opponent_Nationals                                      -0.179  -0.231
## opponent_Padres                  0.312           0.200           0.159
## opponent_Phillies                0.194                  -0.224          -0.173
## opponent_Pirates         0.163  -0.176   0.203  -0.265           0.216   0.189
## opponent_Reds           -0.191  -0.336           0.225   0.102  -0.185  -0.130
## opponent_Rockies                 0.108  -0.216           0.130
## opponent_Snakes          0.229          -0.191
## opponent_White Sox      -0.357                  -0.243
## skies_Clear                                      0.208  -0.165   0.232   0.109
## skies_Cloudy                                    -0.208   0.165  -0.232  -0.109
## day_night_Day                                    0.121   0.146          -0.195
```

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## day_night_Night				-0.121	-0.146		0.195
## cap_NO	-0.112	-0.265				-0.124	
## cap_YES	0.112	0.265				0.124	
## shirt_NO	0.134			0.158			
## shirt_YES	-0.134			-0.158			
## fireworks_NO							
## fireworks_YES							
## bobblehead_NO				0.159	0.145		
## bobblehead_YES				-0.159	-0.145		

##	Comp.30	Comp.31	Comp.32	Comp.33	Comp.34	Comp.35	Comp.36
## day			0.150	0.424			
## attend		0.731		-0.173			0.112
## temp			-0.273		0.513	-0.462	0.117
## month_APR			0.259			-0.563	0.132
## month_AUG	0.217	-0.170		-0.187		0.262	
## month_JUL			-0.327	-0.146	-0.244		
## month_JUN					0.183	0.133	
## month_MAY	-0.147	0.152	-0.154		0.291		
## month_OCT		0.133	0.115	0.172		0.201	
## month_SEP	-0.151	0.109	0.169		-0.213	0.244	
## day_of_week_Friday		-0.102				0.139	0.689
## day_of_week_Monday	-0.135	0.182		0.102			-0.131
## day_of_week_Saturday	-0.239	-0.107		-0.202			-0.129
## day_of_week_Sunday	0.291		0.343		0.213		-0.149
## day_of_week_Thursday			-0.143				
## day_of_week_Tuesday	0.272	-0.146	-0.179	0.157			-0.179
## day_of_week_Wednesday		0.149		0.195	-0.106		
## opponent_Angels				-0.174			
## opponent_Astros						-0.150	
## opponent_Braves	-0.238	0.143	-0.196	-0.174	0.199	0.202	
## opponent_Brewers			0.115	-0.342	-0.122		
## opponent_Cardinals		-0.138			-0.174		
## opponent_Cubs				0.407	-0.102	-0.100	
## opponent_Giants	-0.241	-0.112	0.122	-0.180	-0.103		
## opponent_Marlins	-0.113	0.115	-0.119	0.103	-0.103	-0.170	
## opponent_Mets	0.205						
## opponent_Nationals	0.215		-0.372			0.244	-0.104
## opponent_Padres				0.215	0.187		
## opponent_Phillies			0.301		0.237		
## opponent_Pirates	-0.114				0.283	0.197	
## opponent_Reds		-0.143	0.262	0.189	0.220		0.176
## opponent_Rockies					-0.157		
## opponent_Snakes	0.100	0.146	0.122				
## opponent_White Sox							
## skies_Clear							
## skies_Cloudy							
## day_night_Day	-0.269				-0.129		
## day_night_Night	0.269				0.129		
## cap_NO		-0.126					
## cap_YES		0.126					
## shirt_NO	0.104						
## shirt_YES	-0.104						
## fireworks_NO	0.145						0.399
## fireworks_YES	-0.145						-0.399

```
## bobblehead_NO            0.282   0.184
## bobblehead_YES          -0.282  -0.184
##                         Comp.37 Comp.38 Comp.39 Comp.40 Comp.41 Comp.42 Comp.43
## day                      0.170
## attend
## temp
## month_APR                        0.297           0.125
## month_AUG                0.107   0.324           0.137
## month_JUL                        0.297           0.125
## month_JUN               -0.589   0.262           0.111
## month_MAY                0.196   0.347           0.146
## month_OCT                        0.158
## month_SEP                        0.297           0.125
## day_of_week_Friday              -0.209   0.153
## day_of_week_Monday              -0.202   0.148
## day_of_week_Saturday            -0.209   0.153
## day_of_week_Sunday      -0.123  -0.209   0.153
## day_of_week_Thursday            -0.137   0.100
## day_of_week_Tuesday             -0.209   0.153
## day_of_week_Wednesday           -0.202   0.148
## opponent_Angels          0.398          -0.129
## opponent_Astros                         -0.129
## opponent_Braves                         -0.129
## opponent_Brewers        -0.173          -0.148
## opponent_Cardinals                      -0.192   0.128          -0.106
## opponent_Cubs                           -0.129
## opponent_Giants         -0.132  -0.103  -0.215   0.143          -0.119
## opponent_Marlins                        -0.129
## opponent_Mets            0.311          -0.148
## opponent_Nationals                      -0.129
## opponent_Padres                 -0.103  -0.215   0.143          -0.119
## opponent_Phillies                       -0.129
## opponent_Pirates                        -0.129
## opponent_Reds                           -0.129
## opponent_Rockies        -0.105  -0.103  -0.215   0.143          -0.119
## opponent_Snakes         -0.104  -0.103  -0.215   0.143          -0.119
## opponent_White Sox       0.385          -0.129
## skies_Clear                             -0.121   0.128   0.124          -0.556
## skies_Cloudy                            -0.121   0.128   0.124          -0.556
## day_night_Day                                    0.171   0.567           0.132
## day_night_Night                                  0.171   0.567           0.132
## cap_NO                                  -0.215           0.268   0.390   0.177
## cap_YES                                 -0.215           0.268   0.390   0.177
## shirt_NO                                         -0.397          -0.229   0.243
## shirt_YES                                        -0.397          -0.229   0.243
## fireworks_NO                            -0.156  -0.118  -0.140   0.437
## fireworks_YES                           -0.156  -0.118  -0.140   0.437
## bobblehead_NO                            0.327   0.330  -0.221           0.186
## bobblehead_YES                           0.327   0.330  -0.221           0.186
##                         Comp.44 Comp.45 Comp.46
## day
## attend
## temp
## month_APR                        0.179
```

```
## month_AUG                              0.100    0.196
## month_JUL                                       0.179
## month_JUN                                       0.158
## month_MAY                              0.107    0.209
## month_OCT
## month_SEP                                       0.179
## day_of_week_Friday                     0.104    0.258
## day_of_week_Monday                     0.101    0.250
## day_of_week_Saturday                   0.104    0.258
## day_of_week_Sunday                     0.104    0.258
## day_of_week_Thursday                            0.169
## day_of_week_Tuesday                    0.104    0.258
## day_of_week_Wednesday                  0.101    0.250
## opponent_Angels
## opponent_Astros
## opponent_Braves
## opponent_Brewers
## opponent_Cardinals
## opponent_Cubs
## opponent_Giants
## opponent_Marlins
## opponent_Mets
## opponent_Nationals
## opponent_Padres
## opponent_Phillies
## opponent_Pirates
## opponent_Reds
## opponent_Rockies
## opponent_Snakes
## opponent_White Sox
## skies_Clear                            0.348   -0.118
## skies_Cloudy                           0.348   -0.118
## day_night_Day            -0.318
## day_night_Night          -0.318
## cap_NO                    0.413                 -0.122
## cap_YES                   0.413                 -0.122
## shirt_NO                               0.469
## shirt_YES                              0.469
## fireworks_NO             -0.457        0.179
## fireworks_YES            -0.457        0.179
## bobblehead_NO                          0.245   -0.368
## bobblehead_YES                         0.245   -0.368
##
##                 Comp.1 Comp.2 Comp.3 Comp.4 Comp.5 Comp.6 Comp.7 Comp.8 Comp.9
## SS loadings      1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000  1.000
## Proportion Var   0.022  0.022  0.022  0.022  0.022  0.022  0.022  0.022  0.022
## Cumulative Var   0.022  0.043  0.065  0.087  0.109  0.130  0.152  0.174  0.196
##                 Comp.10 Comp.11 Comp.12 Comp.13 Comp.14 Comp.15 Comp.16 Comp.17
## SS loadings       1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000
## Proportion Var    0.022   0.022   0.022   0.022   0.022   0.022   0.022   0.022
## Cumulative Var    0.217   0.239   0.261   0.283   0.304   0.326   0.348   0.370
##                 Comp.18 Comp.19 Comp.20 Comp.21 Comp.22 Comp.23 Comp.24 Comp.25
## SS loadings       1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000
## Proportion Var    0.022   0.022   0.022   0.022   0.022   0.022   0.022   0.022
```

```
## Cumulative Var     0.391   0.413   0.435   0.457   0.478   0.500   0.522   0.543
##               Comp.26 Comp.27 Comp.28 Comp.29 Comp.30 Comp.31 Comp.32 Comp.33
## SS loadings        1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000
## Proportion Var     0.022   0.022   0.022   0.022   0.022   0.022   0.022   0.022
## Cumulative Var     0.565   0.587   0.609   0.630   0.652   0.674   0.696   0.717
##               Comp.34 Comp.35 Comp.36 Comp.37 Comp.38 Comp.39 Comp.40 Comp.41
## SS loadings        1.000   1.000   1.000   1.000   1.000   1.000   1.000   1.000
## Proportion Var     0.022   0.022   0.022   0.022   0.022   0.022   0.022   0.022
## Cumulative Var     0.739   0.761   0.783   0.804   0.826   0.848   0.870   0.891
##               Comp.42 Comp.43 Comp.44 Comp.45 Comp.46
## SS loadings        1.000   1.000   1.000   1.000   1.000
## Proportion Var     0.022   0.022   0.022   0.022   0.022
## Cumulative Var     0.913   0.935   0.957   0.978   1.000
```

```
str(data.pca$loadings)
```

```
##  'loadings' num [1:46, 1:46] 0.0564 -0.1491 -0.307 0.1559 -0.0869 ...
##  - attr(*, "dimnames")=List of 2
##   ..$ : chr [1:46] "day" "attend" "temp" "month_APR" ...
##   ..$ : chr [1:46] "Comp.1" "Comp.2" "Comp.3" "Comp.4" ...
```

```
data.pca$center
```

```
##                   day               attend                 temp
##          0.0214226187         0.0265598530         0.0149877281
##             month_APR            month_AUG            month_JUL
##         -0.0038021744         0.0032333188         0.0021145605
##             month_JUN            month_MAY            month_OCT
##          0.0168082299        -0.0156173209         0.0031440225
##             month_SEP    day_of_week_Friday   day_of_week_Monday
##         -0.0001120045        -0.0036060558        -0.0101480685
##   day_of_week_Saturday   day_of_week_Sunday day_of_week_Thursday
##          0.0020483154         0.0058314571         0.0106360107
##   day_of_week_Tuesday day_of_week_Wednesday      opponent_Angels
##          0.0046820327        -0.0063109329         0.0057729461
##        opponent_Astros       opponent_Braves     opponent_Brewers
##         -0.0008763376        -0.0019040818         0.0043077706
##     opponent_Cardinals         opponent_Cubs       opponent_Giants
##          0.0004683290         0.0012858348        -0.0056759080
##       opponent_Marlins         opponent_Mets    opponent_Nationals
##          0.0076301557         0.0142306920         0.0125518831
##        opponent_Padres      opponent_Phillies     opponent_Pirates
##         -0.0130687027         0.0051177662        -0.0036796713
##          opponent_Reds       opponent_Rockies       opponent_Snakes
##         -0.0029834682        -0.0069485306        -0.0054361876
##      opponent_White Sox           skies_Clear          skies_Cloudy
##          0.0069217982         0.0067008678        -0.0067008678
##          day_night_Day        day_night_Night                cap_NO
##          0.0076879076        -0.0076879076         0.0009949069
##                cap_YES              shirt_NO             shirt_YES
##         -0.0009949069        -0.0044353229         0.0044353229
##           fireworks_NO         fireworks_YES         bobblehead_NO
##          0.0027894310        -0.0027894310        -0.0159647616
```

```
##     bobblehead_YES
##        0.0159647616
```

```
data.pca$n.obs
```

```
## [1] 46
```

```
str(data.pca)
```

```
## List of 7
##  $ sdev    : Named num [1:46] 0.584 0.526 0.51 0.444 0.421 ...
##   ..- attr(*, "names")= chr [1:46] "Comp.1" "Comp.2" "Comp.3" "Comp.4" ...
##  $ loadings: 'loadings' num [1:46, 1:46] 0.0564 -0.1491 -0.307 0.1559 -0.0869 ...
##   ..- attr(*, "dimnames")=List of 2
##   .. ..$ : chr [1:46] "day" "attend" "temp" "month_APR" ...
##   .. ..$ : chr [1:46] "Comp.1" "Comp.2" "Comp.3" "Comp.4" ...
##  $ center  : Named num [1:46] 0.02142 0.02656 0.01499 -0.0038 0.00323 ...
##   ..- attr(*, "names")= chr [1:46] "day" "attend" "temp" "month_APR" ...
##  $ scale   : Named num [1:46] 1 1 1 1 1 1 1 1 1 1 ...
##   ..- attr(*, "names")= chr [1:46] "day" "attend" "temp" "month_APR" ...
##  $ n.obs   : int 46
##  $ scores  : num [1:46, 1:46] 0.248 -0.566 -1.189 0.648 -0.315 ...
##   ..- attr(*, "dimnames")=List of 2
##   .. ..$ : chr [1:46] "day" "attend" "temp" "month_APR" ...
##   .. ..$ : chr [1:46] "Comp.1" "Comp.2" "Comp.3" "Comp.4" ...
##  $ call    : language princomp(x = corr_matrix)
##  - attr(*, "class")= chr "princomp"
```

```
# install.packages('ggfortify')
library(ggfortify)
```

```
dim(dodgers_scaled)
```

```
## [1] 81 46
```

```
data.pca$scores
```

```
##                         Comp.1       Comp.2       Comp.3       Comp.4
## day                  0.24777454  0.141165863  0.64212670  0.532693227
## attend              -0.56593090 -0.459566340  0.96227828  0.333550799
## temp                -1.18926159  0.450027818  0.03810115 -0.660640212
## month_APR            0.64764959 -0.375082208 -0.57539926  1.061703433
## month_AUG           -0.31460918  0.286663194  0.15694318 -0.627939041
## month_JUL           -0.02823007 -0.424942358 -0.24326572 -0.283310456
## month_JUN           -0.11966411 -0.051559138  0.67926984  0.558852127
## month_MAY            0.28357943  0.154847268  0.17915484 -0.310135410
## month_OCT           -0.01750068 -0.222539386 -0.31022729 -0.556953787
## month_SEP           -0.29269186  0.516889904 -0.23042261 -0.044921425
## day_of_week_Friday   1.23954216  1.117632559  0.55968441  0.021956098
## day_of_week_Monday   0.08993421 -0.236147084 -0.32985223 -0.359101759
```

```
## day_of_week_Saturday    0.02646664 -0.123605210   0.10287640   0.091444970
## day_of_week_Sunday     -1.19459523  0.710274560  -0.41143933   0.485737410
## day_of_week_Thursday     0.01318304 -0.318780157   0.33196450   0.006301077
## day_of_week_Tuesday     -0.20955754 -0.991350306   0.18836041  -0.160783769
## day_of_week_Wednesday    0.24718923 -0.236012885  -0.58548308  -0.218196788
## opponent_Angels         -0.06628636 -0.448091393   0.25583031   0.414442922
## opponent_Astros          0.39522907  0.207793567  -0.16657241   0.173098605
## opponent_Braves          0.60335330 -0.453922553  -0.55976902   0.349748888
## opponent_Brewers         0.07327963 -0.188640039   0.21860715  -0.207985680
## opponent_Cardinals      -0.03820184  0.580563871   0.12350263  -0.162352832
## opponent_Cubs           -0.12358925  0.316659130  -0.35128647  -0.323072698
## opponent_Giants         -0.08162644 -0.320993396  -0.14241244  -0.766701324
## opponent_Marlins        -0.05034862  0.440289533   0.10474562  -0.075219349
## opponent_Mets           -0.18833449 -0.061767239   0.64983026   0.187563123
## opponent_Nationals      -0.03325769  0.074860298   0.22189782   0.776114072
## opponent_Padres          0.24373093 -0.077394189  -0.38706791   0.406453992
## opponent_Phillies       -0.03840543 -0.196792580  -0.28400109  -0.093872985
## opponent_Pirates         0.31482718 -0.333435072  -0.48593358   0.406104390
## opponent_Reds            0.15119438 -0.161975878  -0.47507538  -0.439896978
## opponent_Rockies        -0.11001540  0.400321188   0.06353203  -0.253194308
## opponent_Snakes         -0.25196803 -0.118159369   0.22621567  -0.319471191
## opponent_White Sox      -0.02109688  0.317224767   0.24972430   0.269588824
## skies_Clear             -0.98371434  0.760005718   0.83682020  -0.318185426
## skies_Cloudy             1.04342072 -0.745748508  -0.90622648   0.282918099
## day_night_Day           -1.22620349  0.701236061  -0.62072402   0.599875280
## day_night_Night          1.28590987 -0.686978851   0.55131774  -0.635142607
## cap_NO                   0.39969857  0.015424013   0.71868449   0.386012481
## cap_YES                 -0.33999219 -0.001166803  -0.78809078  -0.421279808
## shirt_NO                 0.47094316  0.049818079  -0.05190111  -0.932789123
## shirt_YES               -0.41123678 -0.035560869  -0.01750517   0.897521796
## fireworks_NO            -1.19760773 -1.088984606  -0.60723222  -0.006346615
## fireworks_YES            1.25731411  1.103241817   0.53782594  -0.028920712
## bobblehead_NO            0.44977463  1.101844286  -1.16447859   0.033517406
## bobblehead_YES          -0.39006825 -1.087587075   1.09507231  -0.068784733
##                             Comp.5      Comp.6        Comp.7       Comp.8
## day                      0.35274386  0.70308362   0.2587835540   0.05908077
## attend                  -0.71925213 -0.08373538  -0.2419842019   0.01746665
## temp                     0.08886141 -0.23531379  -0.6570674599   0.02213630
## month_APR                0.02248899  0.27426655  -0.0731487633   0.49052311
## month_AUG               -0.33019104  0.11302168  -0.0140932139   0.83728073
## month_JUL               -0.67471160 -0.05899729  -0.0583139626  -0.70724099
## month_JUN               -0.24858795 -0.40535816   0.3764361081  -0.56185913
## month_MAY                0.74973104  0.41593264   0.7066027331  -0.09016754
## month_OCT                0.33489435 -0.50210512  -0.1028891845   0.17241989
## month_SEP                0.28192906 -0.24471407  -0.9508689069  -0.18327127
## day_of_week_Friday      -0.46925782 -0.11482502  -0.0672299249   0.10724610
## day_of_week_Monday       0.52007143 -0.59617340   0.3486440322  -0.12098922
## day_of_week_Saturday     0.13944902  0.26465220  -0.3501388901  -0.08350154
## day_of_week_Sunday      -0.10211354  0.38467185   0.0566764666  -0.07531037
## day_of_week_Thursday     0.20964803  0.35893723  -0.0004465317   0.01577785
## day_of_week_Tuesday     -0.35875634 -0.09782826   0.0282694590   0.21680459
## day_of_week_Wednesday    0.26109082 -0.14368140   0.0027874179  -0.05571254
## opponent_Angels         -0.08332455 -0.70508729   0.2907464661  -0.15273660
## opponent_Astros          0.18231555  0.43467114   0.3138743080  -0.15278780
```

```
## opponent_Braves              0.18242351   0.20452994   0.0053380157   0.19018026
## opponent_Brewers             0.54333800   0.30591687   0.5754070750  -0.01441988
## opponent_Cardinals           0.29749051   0.03146417  -0.3586645281  -0.19702083
## opponent_Cubs               -0.71293454   0.05584924   0.1198530841   0.47137184
## opponent_Giants              0.49356031  -0.47874899   0.1241568403   0.35417375
## opponent_Marlins            -0.05049275   0.18855507   0.0358183942   0.39959132
## opponent_Mets               -0.26887272   0.15532411   0.0369853361  -0.40110099
## opponent_Nationals          -0.08775544  -0.09320138   0.0577837027   0.51759502
## opponent_Padres             -0.20046961  -0.21369111  -0.6143337746  -0.17083793
## opponent_Phillies           -0.06362185  -0.03353910   0.0196332312  -0.49964743
## opponent_Pirates             0.07971908   0.27079671   0.0015326098   0.19212083
## opponent_Reds               -0.69488716  -0.25877946   0.3090731743  -0.34866710
## opponent_Rockies             0.19387405   0.09198234  -0.2518234331   0.12088511
## opponent_Snakes              0.08277753   0.19667712  -0.1867274218   0.05790156
## opponent_White Sox          -0.13831598  -0.10438770   0.2458514596  -0.43560474
## skies_Clear                  0.29904361  -0.22806801   0.3893308863   0.07662150
## skies_Cloudy                -0.26785386   0.21470709  -0.3870847647  -0.07523479
## day_night_Day               -0.10390916   0.43404605   0.0505047039  -0.10018214
## day_night_Night              0.13509890  -0.44740697  -0.0482585823   0.10156884
## cap_NO                       1.09725328  -0.08068943  -0.4494553806  -0.13405061
## cap_YES                     -1.06606353   0.06732850   0.4517015022   0.13543732
## shirt_NO                    -0.03885050   0.99546152  -0.1562187930  -0.29650380
## shirt_YES                    0.07004025  -1.00882245   0.1584649146   0.29789051
## fireworks_NO                 0.57797369   0.15198927   0.0499307769  -0.03660521
## fireworks_YES               -0.54678394  -0.16535019  -0.0476846554   0.03799192
## bobblehead_NO                0.40787962  -0.37564955   0.1982307911  -0.13485672
## bobblehead_YES              -0.37668987   0.36228862  -0.1959846696   0.13624342
##                                 Comp.9      Comp.10      Comp.11       Comp.12
## day                          0.19577158   0.05486402   0.266885533   0.066384684
## attend                      -0.09619903   0.06733203  -0.201152887   0.158525934
## temp                         0.02874137  -0.05208056  -0.015021017  -0.077399920
## month_APR                   -0.02078498   0.22160984  -0.056154579  -0.328107237
## month_AUG                   -0.38221562   0.10383325   0.475357481   0.196764445
## month_JUL                    0.43600765   0.62499364   0.216174260   0.073476941
## month_JUN                   -0.74750529  -0.35447710   0.051141460  -0.066690828
## month_MAY                    0.49573301  -0.25009381  -0.381648854   0.276318484
## month_OCT                   -0.37768301   0.18442984  -0.576020441  -0.012428845
## month_SEP                    0.35314226  -0.45853686   0.007292308  -0.182562993
## day_of_week_Friday           0.06452635   0.13214326  -0.156271924  -0.013013856
## day_of_week_Monday           0.16940946   0.17946353   0.459359323   0.004851701
## day_of_week_Saturday        -0.10756126  -0.63006914   0.280524261   0.426135671
## day_of_week_Sunday           0.06949115   0.11362924  -0.249754917   0.077792637
## day_of_week_Thursday         0.02421488  -0.26627985   0.157767104  -0.727564021
## day_of_week_Tuesday          0.27029639   0.10482980  -0.438746222   0.090679688
## day_of_week_Wednesday       -0.42258422   0.28293997  -0.004139192  -0.076479802
## opponent_Angels             -0.25862080  -0.30177299   0.100298997   0.150307203
## opponent_Astros              0.16878271  -0.19689753  -0.310220698   0.604437531
## opponent_Braves             -0.11656311   0.02737638   0.191369558  -0.066929594
## opponent_Brewers             0.39565457  -0.13203403   0.020880895  -0.165401655
## opponent_Cardinals           0.33362447  -0.45056745  -0.175166210  -0.343890801
## opponent_Cubs               -0.18251857  -0.37801068   0.117251334   0.115769862
## opponent_Giants             -0.37297755   0.25678193  -0.523379894   0.064590212
## opponent_Marlins            -0.23513034   0.17749963   0.464533201   0.258962102
## opponent_Mets               -0.33047109  -0.04050431  -0.004131070  -0.259967991
```

```
## opponent_Nationals      0.32799624  0.22680671 -0.067165108 -0.075566135
## opponent_Padres         0.25413010  0.06411093 -0.087212303  0.224263189
## opponent_Phillies       0.13024815  0.59166070  0.267219326  0.143226168
## opponent_Pirates       -0.23515400  0.09310458 -0.138388776 -0.554021107
## opponent_Reds           0.34816781  0.09326972  0.069102915 -0.208589705
## opponent_Rockies        0.07392004 -0.12085834  0.041196746  0.214769282
## opponent_Snakes         0.21532187  0.20893280  0.296761676 -0.066062782
## opponent_White Sox     -0.59229139 -0.16553519 -0.061684703  0.013242692
## skies_Clear             0.12249314  0.20849003  0.047880561 -0.223029149
## skies_Cloudy           -0.10197978 -0.21047236 -0.054023492  0.233725624
## day_night_Day          -0.14462319  0.28346278 -0.160905608  0.055417240
## day_night_Night         0.16513655 -0.28544510  0.154762677 -0.044720765
## cap_NO                 -0.19414887  0.41502433  0.042104780  0.151808363
## cap_YES                 0.21466224 -0.41700665 -0.048247711 -0.141111889
## shirt_NO               -0.40652696  0.10872517 -0.082571393 -0.071798426
## shirt_YES               0.42704033 -0.11070750  0.076428462  0.082494901
## fireworks_NO           -0.06916983 -0.20341280  0.145516220  0.056499167
## fireworks_YES           0.08968320  0.20143047 -0.151659151 -0.045802693
## bobblehead_NO          -0.13029224 -0.06120100  0.120699375 -0.037043849
## bobblehead_YES          0.15080561  0.05921868 -0.126842306  0.047740323
##                             Comp.13       Comp.14       Comp.15       Comp.16
## day                   0.0104636873  0.2529616052  0.080582082  0.346049873
## attend               -0.1145822686 -0.2202040100  0.013470733  0.048267710
## temp                  0.0841394566  0.1959050969  0.048485586  0.217043215
## month_APR            -0.2683984934 -0.0015830040  0.135020408 -0.110129569
## month_AUG             0.1803224221 -0.0991526085 -0.096984797 -0.022944092
## month_JUL            -0.1455053350 -0.0518328487 -0.103232300  0.020657301
## month_JUN             0.0960902973  0.1086359869  0.076022182 -0.004889185
## month_MAY             0.0797342512 -0.1496788078 -0.027432605 -0.105622420
## month_OCT            -0.2037831981  0.2730046207 -0.145025826  0.097223458
## month_SEP             0.1788054180  0.0492185493  0.125513759  0.041845024
## day_of_week_Friday    0.1296119799  0.0993879363 -0.003321038 -0.038469178
## day_of_week_Monday   -0.1179892681  0.3803702003  0.009787742 -0.339580504
## day_of_week_Saturday -0.6566345492 -0.2294224355 -0.066481310 -0.055871353
## day_of_week_Sunday    0.0452532479  0.1580700190 -0.007326845 -0.053211593
## day_of_week_Thursday  0.1762790795  0.0274038966 -0.390066980  0.015681090
## day_of_week_Tuesday   0.1987354944 -0.1061534586  0.318452289 -0.084026112
## day_of_week_Wednesday 0.3237057867 -0.3656743368  0.014599347  0.416364309
## opponent_Angels       0.4520007796 -0.1243993606  0.058673710  0.059619293
## opponent_Astros       0.1368779508  0.1149705052 -0.286410938 -0.041190964
## opponent_Braves       0.0162819793  0.4487974478  0.493058027  0.149676050
## opponent_Brewers      0.1754145874 -0.0804162277 -0.071582251  0.224613589
## opponent_Cardinals   -0.1754190538 -0.1357310905  0.022453341  0.149618509
## opponent_Cubs        -0.0007718499 -0.0228926032 -0.216701088 -0.075077229
## opponent_Giants      -0.1966246352  0.1384104981 -0.110500940  0.056450400
## opponent_Marlins     -0.0569149589 -0.1150887294 -0.174470402  0.161531411
## opponent_Mets        -0.1014868266  0.3351453854 -0.248129999  0.236967587
## opponent_Nationals   -0.5118190265  0.0241905097  0.079897161  0.158213824
## opponent_Padres       0.0010994053  0.0038043213 -0.363603650 -0.218349434
## opponent_Phillies    -0.0356339813 -0.2215497009 -0.012333088  0.246474133
## opponent_Pirates      0.1139301965 -0.4843756721 -0.140522165 -0.335816737
## opponent_Reds        -0.1867163537 -0.1429574375  0.124886640  0.005833278
## opponent_Rockies      0.1874582489 -0.2364685074  0.581601283 -0.028869291
## opponent_Snakes       0.3493296506  0.2808551084 -0.012058251 -0.525941300
```

```
## opponent_White Sox     -0.2208501795 -0.0199344812   0.276964475 -0.344540856
## skies_Clear            -0.2010292006 -0.1492136949   0.071524539 -0.127568060
## skies_Cloudy            0.2106285438  0.1352776338  -0.068738588  0.082968021
## day_night_Day           0.1515918292  0.0226152622  -0.005863256 -0.045989337
## day_night_Night        -0.1419924861 -0.0365513233   0.008649207  0.001389298
## cap_NO                   0.0462969456 -0.1180444238  -0.052167028 -0.104036820
## cap_YES                 -0.0366976025  0.1041083627   0.054952979  0.059436781
## shirt_NO                -0.1135003890 -0.0004070584   0.123766280 -0.089126552
## shirt_YES                0.1230997322 -0.0135290027  -0.120980328  0.044526512
## fireworks_NO            -0.0979201374 -0.0396331080  -0.005473458 -0.034463121
## fireworks_YES            0.1075194805  0.0256970469   0.008259410 -0.010136919
## bobblehead_NO           -0.0728689633 -0.0897812085  -0.003827897  0.007272885
## bobblehead_YES           0.0824683064  0.0758451474   0.006613849 -0.051872924
##                              Comp.17        Comp.18       Comp.19       Comp.20
## day                     1.003195e-01  0.019707861  0.0409532972  0.010285205
## attend                  7.176518e-02  0.026008112 -0.0353844278 -0.044871913
## temp                   -1.981689e-02 -0.017563321  0.0429183761 -0.052409831
## month_APR              -5.866129e-02  0.010181363 -0.0022772966 -0.019752683
## month_AUG               1.088652e-02  0.015706311 -0.0156123293  0.006422332
## month_JUL              -1.295429e-02 -0.016647387 -0.0137196902  0.013179981
## month_JUN              -4.552099e-03  0.007253555  0.0182637203 -0.001025726
## month_MAY              -5.176379e-02 -0.003867204  0.0005322987 -0.029291599
## month_OCT               2.476190e-02 -0.027697770 -0.0163324189  0.038831839
## month_SEP               4.703125e-02  0.013603547  0.0349670171  0.024276289
## day_of_week_Friday      1.681362e-02  0.023562130 -0.0591958846 -0.060096962
## day_of_week_Monday     -9.755795e-02  0.017664347 -0.2482196359  0.012496387
## day_of_week_Saturday   -5.170838e-02 -0.129202273  0.0911465107 -0.006448120
## day_of_week_Sunday     -4.030427e-02  0.087773451 -0.0097748342  0.084146950
## day_of_week_Thursday   -1.473993e-02 -0.020049355 -0.1265939520  0.038511022
## day_of_week_Tuesday     3.426558e-01  0.192907320 -0.1264769852  0.068686919
## day_of_week_Wednesday  -2.341844e-01 -0.173242263  0.4519425456 -0.117363137
## opponent_Angels         9.039607e-02 -0.132422858  0.0090200186  0.059778830
## opponent_Astros         8.175368e-02 -0.358815751 -0.0466354768  0.165658426
## opponent_Braves         1.447993e-01  0.112485015 -0.0194210094 -0.003846818
## opponent_Brewers       -1.869058e-01  0.467707332  0.1726782484 -0.234421773
## opponent_Cardinals      4.736631e-01 -0.074813688 -0.0188916775 -0.009638952
## opponent_Cubs          -5.072944e-02 -0.012856024 -0.1747189521 -0.487569239
## opponent_Giants         2.746101e-02  0.003035850 -0.0074169531  0.032403145
## opponent_Marlins        3.186003e-01  0.289622737  0.0586906725  0.519156456
## opponent_Mets          -3.114228e-01 -0.097554078 -0.2546591048  0.158192762
## opponent_Nationals     -1.514743e-01 -0.289112807  0.1889079297 -0.162557799
## opponent_Padres        -2.801359e-01  0.522997525  0.1200404043 -0.014223529
## opponent_Phillies       2.870879e-01 -0.079164762 -0.3709985152 -0.395840024
## opponent_Pirates        5.118302e-02 -0.100205458 -0.2234118651  0.136559215
## opponent_Reds          -1.266690e-01 -0.109979777  0.2466044431  0.409105122
## opponent_Rockies       -5.443144e-01 -0.078251671 -0.3683835620  0.144111225
## opponent_Snakes         1.328208e-01 -0.351678572  0.4017745181 -0.115680932
## opponent_White Sox      1.310855e-01  0.242288565  0.2417275263 -0.185055173
## skies_Clear            -3.055405e-02  0.024686924  0.0081985911  0.010250159
## skies_Cloudy            1.135584e-02 -0.021250258 -0.0052057505 -0.007201475
## day_night_Day          -5.310930e-03 -0.012470405  0.0050793869 -0.006852065
## day_night_Night        -1.388728e-02  0.015907071 -0.0020865462  0.009900749
## cap_NO                 -1.198984e-02 -0.002872743 -0.0186364176 -0.003825765
## cap_YES                -7.208372e-03  0.006309409  0.0216292583  0.006874449
```

```
## shirt_NO             -1.929214e-02  0.031298492  0.0175594282 -0.015774795
## shirt_YES             9.393247e-05 -0.027861826 -0.0145665875  0.018823479
## fireworks_NO          2.011945e-03  0.014461494 -0.0153444204  0.005607182
## fireworks_YES        -2.121016e-02 -0.011024829  0.0183372611 -0.002558498
## bobblehead_NO         7.171847e-02  0.014827867 -0.0374184964  0.001446428
## bobblehead_YES       -9.091668e-02 -0.011391201  0.0404113370  0.001602256
##                          Comp.21        Comp.22       Comp.23       Comp.24
## day                   0.210361342  0.0574697662  0.042465512  0.045174135
## attend               -0.103014783  0.0132331232 -0.072078414 -0.091578601
## temp                  0.139005106  0.0425442446  0.019760997 -0.098007859
## month_APR            -0.106598453  0.0190393095  0.058732462  0.038086300
## month_AUG            -0.041939693 -0.0248664873 -0.169447344  0.029781728
## month_JUL            -0.018136980  0.0068486629 -0.046854630 -0.032228219
## month_JUN             0.044934509  0.0086026629  0.070999443  0.038031232
## month_MAY            -0.144872071 -0.0965091900  0.020873963  0.085604238
## month_OCT             0.190845034  0.1115327016  0.110704138 -0.102828046
## month_SEP             0.121736483  0.0002622591  0.040855552 -0.044980402
## day_of_week_Friday    0.027225731  0.0127258959  0.072350213  0.044787812
## day_of_week_Monday   -0.136234641  0.1999029046  0.033902421 -0.074034243
## day_of_week_Saturday  0.076618698 -0.1323641203  0.162024107 -0.011126096
## day_of_week_Sunday   -0.197773266  0.1191152637 -0.104610876 -0.002311022
## day_of_week_Thursday  0.192549559  0.1140099130 -0.285059913  0.102126806
## day_of_week_Tuesday   0.145637356 -0.2106193710  0.099902382 -0.028259037
## day_of_week_Wednesday -0.126337747 -0.1069741901 -0.064290289  0.075676490
## opponent_Angels      -0.271410944  0.3053814808  0.208045055  0.029283623
## opponent_Astros       0.106745045  0.0119935985 -0.206447590 -0.070864938
## opponent_Braves      -0.264102072 -0.2104041993 -0.153959474 -0.043898059
## opponent_Brewers      0.122721515  0.0451188398  0.142665012 -0.226347231
## opponent_Cardinals   -0.374734966  0.0590671674 -0.066576422  0.049143550
## opponent_Cubs        -0.185968763 -0.0658195008 -0.037387756 -0.216599409
## opponent_Giants       0.004428774 -0.0241039175 -0.056233619  0.151476527
## opponent_Marlins      0.061602096  0.0536981074  0.112428730  0.004761441
## opponent_Mets        -0.090022058 -0.3560365351  0.132181714  0.003740660
## opponent_Nationals    0.086753818  0.2198685218  0.052739571  0.020177165
## opponent_Padres      -0.129955875 -0.0061870094  0.006354220  0.208627400
## opponent_Phillies     0.163732309  0.0047614593  0.011221964  0.130718696
## opponent_Pirates      0.118645403 -0.0255569587  0.123438747 -0.099103840
## opponent_Reds        -0.027548555 -0.0110210611 -0.140641690 -0.198917142
## opponent_Rockies      0.152435857  0.0641699811 -0.051103163  0.080254758
## opponent_Snakes       0.089253008 -0.1508840952  0.173228978  0.064532042
## opponent_White Sox    0.302089821  0.0365777681 -0.264506113  0.008673113
## skies_Clear          -0.112599940 -0.0967426039  0.013603898  0.062184410
## skies_Cloudy          0.089488173  0.0826464380 -0.009550213 -0.040446673
## day_night_Day        -0.009314348 -0.0033353875  0.064099550 -0.030625584
## day_night_Night      -0.013797419 -0.0107607785 -0.060045865  0.052363321
## cap_NO               -0.107057895 -0.0366688259 -0.081740295 -0.154849047
## cap_YES               0.083946129  0.0225726600  0.085793981  0.176586784
## shirt_NO             -0.130562219  0.1462812257  0.101927000  0.018682467
## shirt_YES             0.107450453 -0.1603773916 -0.097873315  0.003055270
## fireworks_NO         -0.015102199 -0.0075823469 -0.014629404  0.048101910
## fireworks_YES        -0.008009567 -0.0065138190  0.018683090 -0.026364173
## bobblehead_NO         0.059434897 -0.1046855223  0.047647013  0.008533356
## bobblehead_YES       -0.082546663  0.0905893564 -0.043593327  0.013204381
##                          Comp.25        Comp.26       Comp.27       Comp.28
```

```
## day                      0.110528569  0.0061016050  1.772336e-01  0.0492394882
## attend                   0.050760921  0.0246169980  8.654322e-02 -0.0386091644
## temp                     0.072284119 -0.0281141076  2.204202e-02  0.0278836818
## month_APR                0.010954716  0.0533725664 -2.871997e-02  0.0304457306
## month_AUG                0.094500349  0.0093475336  6.586974e-02  0.0453792590
## month_JUL               -0.070984063 -0.0538742669  6.718453e-02  0.0542569399
## month_JUN                0.028858401  0.0290643363  1.247510e-02 -0.0169352646
## month_MAY               -0.075608155 -0.0760071346  3.987995e-03 -0.1153370325
## month_OCT               -0.271164376  0.0078009128  7.356448e-03  0.1167671048
## month_SEP                0.149842265  0.0373078138 -1.474133e-01 -0.0606971895
## day_of_week_Friday      -0.001622688 -0.0238596820 -2.521217e-03  0.0114573680
## day_of_week_Monday       0.164371776 -0.0710364960  1.367040e-02 -0.0004442082
## day_of_week_Saturday    -0.060408310  0.0585513960  5.252627e-02  0.0375423620
## day_of_week_Sunday      -0.092562817 -0.1078872974 -4.758597e-02 -0.0308543536
## day_of_week_Thursday    -0.152480493  0.1519406973  1.871722e-02 -0.0646540659
## day_of_week_Tuesday      0.043626521  0.0993090386 -6.486812e-05 -0.0312227482
## day_of_week_Wednesday    0.039349849 -0.0711771700 -4.642997e-02  0.0432192749
## opponent_Angels         -0.045596429  0.1074462437 -4.068926e-03  0.0142015579
## opponent_Astros          0.134611191  0.0883238134 -1.159249e-01  0.1304191423
## opponent_Braves         -0.081198939  0.0622611035 -4.781878e-02  0.0550892920
## opponent_Brewers         0.018389992  0.0019537294 -3.127219e-03  0.0357390895
## opponent_Cardinals      -0.016004442 -0.1085061448  1.051527e-01  0.0602528738
## opponent_Cubs           -0.065314146  0.0209229094 -2.091050e-02 -0.0562984273
## opponent_Giants          0.158711919  0.0216785693  8.482778e-02 -0.1061076276
## opponent_Marlins        -0.099245916 -0.0843377108 -1.177669e-01 -0.0723050450
## opponent_Mets            0.039381713 -0.0777358194 -4.561758e-02 -0.0357651086
## opponent_Nationals       0.039932366  0.0007965005 -7.780286e-02 -0.0897561642
## opponent_Padres          0.034434848  0.0926527905  1.726638e-02  0.0578758352
## opponent_Phillies       -0.028877400  0.0280741152 -9.740895e-02 -0.0237199703
## opponent_Pirates         0.113488599 -0.1276093682  8.207457e-03  0.0801805107
## opponent_Reds            0.009198078  0.1049742149  4.082232e-02 -0.0728067808
## opponent_Rockies        -0.124921838 -0.0258981539  5.190085e-02  0.0137502276
## opponent_Snakes         -0.110769784 -0.0116855359  3.678657e-02 -0.0275482991
## opponent_White Sox       0.008614677 -0.1170964435 -3.829477e-02  0.0049759211
## skies_Clear              0.004672746  0.0968367118 -7.244283e-02  0.0863420737
## skies_Cloudy            -0.008852925 -0.1004486378  6.726051e-02 -0.0906111086
## day_night_Day            0.008206379  0.0559943446  5.966947e-02 -0.0220291995
## day_night_Night         -0.012386558 -0.0596062707 -6.485179e-02  0.0177601646
## cap_NO                  -0.032500622  0.0299190586  1.285859e-02 -0.0493690320
## cap_YES                  0.028320443 -0.0335309846 -1.804090e-02  0.0450999971
## shirt_NO                 0.047709738  0.0732721324 -3.316321e-02 -0.0192768229
## shirt_YES               -0.051889917 -0.0768840585  2.798089e-02  0.0150077880
## fireworks_NO             0.005590499 -0.0129055960 -1.394457e-02 -0.0032413548
## fireworks_YES           -0.009770678  0.0092936699  8.762254e-03 -0.0010276801
## bobblehead_NO           -0.001246872  0.0733433625  5.868863e-02 -0.0360205491
## bobblehead_YES          -0.002933307 -0.0769552886 -6.387095e-02  0.0317515142
##                             Comp.29       Comp.30       Comp.31       Comp.32
## day                      0.090464817  0.0011580150  0.018899743  0.0276616228
## attend                  -0.031215792  0.0053149254  0.168340330  0.0172415517
## temp                     0.002387145  0.0043890418 -0.006162136 -0.0499307717
## month_APR               -0.017661593  0.0115691814 -0.013326878  0.0481112508
## month_AUG               -0.073694688  0.0535626348 -0.044202528  0.0156355306
## month_JUL                0.123295621  0.0033742860 -0.019351063 -0.0596058935
## month_JUN               -0.023580692  0.0068161576 -0.022336951 -0.0142832362
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## month_MAY             -0.030632085 -0.0361017868  0.028900162 -0.0276300399
## month_OCT             -0.046055398  0.0009189250  0.027670067  0.0215053187
## month_SEP              0.047818875 -0.0369979644  0.021037771  0.0315093356
## day_of_week_Friday    -0.006267844 -0.0181005232 -0.028748306 -0.0108137210
## day_of_week_Monday    -0.081121947 -0.0330253721  0.037239340 -0.0062754234
## day_of_week_Saturday   0.013292794 -0.0587559076 -0.029629981  0.0136678999
## day_of_week_Sunday     0.100821817  0.0717204333 -0.007437164  0.0635091328
## day_of_week_Thursday  -0.003020998 -0.0191068092  0.013332178 -0.0259555296
## day_of_week_Tuesday   -0.018450410  0.0670816098 -0.038480804 -0.0323887837
## day_of_week_Wednesday -0.017685653 -0.0172384411  0.029681540 -0.0076026085
## opponent_Angels        0.062516212  0.0045432421 -0.021952758 -0.0008201591
## opponent_Astros       -0.011407228  0.0224533882  0.010839476 -0.0105349315
## opponent_Braves        0.025339245 -0.0583876718  0.029027147 -0.0354712449
## opponent_Brewers      -0.029019032  0.0131308775 -0.015257352  0.0216154960
## opponent_Cardinals    -0.084809752  0.0207439979 -0.036751510 -0.0036952569
## opponent_Cubs          0.077462720 -0.0131007032 -0.010167697 -0.0092318685
## opponent_Giants        0.099799974 -0.0590930416 -0.031480224  0.0230718453
## opponent_Marlins      -0.002914973 -0.0278123103  0.022930924 -0.0214328633
## opponent_Mets         -0.036883492  0.0504129750 -0.011411145  0.0052586556
## opponent_Nationals    -0.028271589  0.0530033362 -0.010657975 -0.0680132078
## opponent_Padres       -0.028230317  0.0132979164  0.007828046 -0.0155711428
## opponent_Phillies     -0.057072183 -0.0196448005 -0.009668400  0.0556847239
## opponent_Pirates       0.060043731 -0.0279251652  0.014694834 -0.0176513285
## opponent_Reds         -0.043343707 -0.0125730788 -0.037471284  0.0486201182
## opponent_Rockies      -0.006971826  0.0072668891  0.004168429 -0.0010784728
## opponent_Snakes       -0.005325475  0.0248301814  0.028151224  0.0230198448
## opponent_White Sox    -0.004657236  0.0008687589 -0.012193506 -0.0045448404
## skies_Clear            0.034165312 -0.0095922448  0.006624421 -0.0003910942
## skies_Cloudy          -0.036656819  0.0098267119 -0.015966679  0.0014609270
## day_night_Day         -0.064363548 -0.0660800300 -0.025331135 -0.0173214015
## day_night_Night        0.061872041  0.0663144971  0.015988877  0.0183912343
## cap_NO                 0.004573812  0.0177398458 -0.033807315 -0.0024629076
## cap_YES               -0.007065319 -0.0175053787  0.024465058  0.0035327404
## shirt_NO               0.001033245  0.0256246886  0.006814546 -0.0091322237
## shirt_YES             -0.003524752 -0.0253902216 -0.016156804  0.0102020565
## fireworks_NO           0.001304338  0.0357062163 -0.007815529 -0.0087159192
## fireworks_YES         -0.003795845 -0.0354717492 -0.001526729  0.0097857521
## bobblehead_NO          0.016532069  0.0695661316  0.037633700 -0.0122694194
## bobblehead_YES        -0.019023575 -0.0693316645 -0.046975958  0.0133392523
##                          Comp.33       Comp.34       Comp.35       Comp.36
## day                   0.0672472949  3.503978e-03  3.678425e-03  4.440936e-04
## attend               -0.0278141975 -4.308911e-03 -3.556489e-04  3.049138e-03
## temp                 -0.0121749106  4.351538e-02 -2.042154e-02  3.191756e-03
## month_APR            -0.0041571917 -8.668662e-03 -2.467630e-02  3.451405e-03
## month_AUG            -0.0307732848  6.079577e-03  1.188358e-02 -2.017295e-03
## month_JUL            -0.0241288744 -2.207124e-02 -1.236604e-03 -6.398717e-04
## month_JUN             0.0282965999  1.046739e-02 -1.071376e-03 -2.119740e-03
## month_MAY             0.0076949389  2.321258e-02 -2.524289e-04  1.161831e-03
## month_OCT             0.0267192482 -2.375404e-03  9.049283e-03 -4.404307e-04
## month_SEP             0.0072065104 -1.942859e-02  1.108110e-02 -9.581482e-04
## day_of_week_Friday   -0.0166312365 -3.630432e-03  6.448077e-03  1.872144e-02
## day_of_week_Monday    0.0152176233 -8.321762e-03 -2.289764e-03 -3.756112e-03
## day_of_week_Saturday -0.0330345551  6.721365e-03  6.246452e-04 -3.698371e-03
## day_of_week_Sunday   -0.0160245729  1.701731e-02  3.296697e-03 -4.258068e-03
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## day_of_week_Thursday   -0.0127323285 -3.596800e-03 -2.597075e-03 -1.953904e-03
## day_of_week_Tuesday     0.0239296123 -7.920886e-03 -1.995169e-03 -5.083476e-03
## day_of_week_Wednesday   0.0299442403 -1.035581e-02 -2.839994e-03 -1.914402e-03
## opponent_Angels        -0.0285333492  2.650183e-03  3.180291e-05  7.538031e-04
## opponent_Astros        -0.0070742790 -8.091417e-03 -6.469382e-03  3.325695e-04
## opponent_Braves        -0.0285293474  1.600557e-02  9.185222e-03 -5.202990e-04
## opponent_Brewers       -0.0551035663 -1.144501e-02 -3.203637e-04 -7.988630e-04
## opponent_Cardinals      0.0108360133 -1.624165e-02 -1.258954e-03 -1.486480e-03
## opponent_Cubs           0.0638531859 -9.805359e-03 -4.225573e-03  8.724982e-04
## opponent_Giants        -0.0297313564 -1.030707e-02 -2.383790e-03 -4.463999e-04
## opponent_Marlins        0.0156418904 -9.845462e-03 -7.344193e-03  3.532182e-04
## opponent_Mets          -0.0125910958 -8.883782e-03  8.699640e-04 -2.576687e-04
## opponent_Nationals     -0.0016492106  2.949998e-03  1.103566e-02 -2.968716e-03
## opponent_Padres         0.0329337069  1.431408e-02  3.855624e-03 -8.240463e-04
## opponent_Phillies      -0.0011851703  1.927281e-02  9.101947e-04  6.818627e-05
## opponent_Pirates        0.0001442232  2.316270e-02  8.969233e-03 -9.382792e-04
## opponent_Reds           0.0291675903  1.773014e-02  3.326219e-03  4.684447e-03
## opponent_Rockies        0.0069584171 -1.502454e-02 -3.488786e-03 -5.916469e-04
## opponent_Snakes        -0.0071974330 -3.787264e-03 -2.109616e-03 -8.263817e-05
## opponent_White Sox     -0.0050722694 -7.478305e-03 -2.016702e-03  6.503617e-04
## skies_Clear             0.0106029045 -2.626136e-03  3.228309e-04  4.248428e-04
## skies_Cloudy           -0.0125450488  1.236845e-04  1.950931e-04 -7.548250e-04
## day_night_Day         -0.0046060237 -1.223583e-02  2.346036e-03 -4.432272e-04
## day_night_Night        0.0026638794  9.733384e-03 -1.828112e-03  1.132450e-04
## cap_NO                  0.0070894346 -7.314532e-05  6.546510e-04  5.291447e-04
## cap_YES                -0.0090315789 -2.429306e-03 -1.367270e-04 -8.591269e-04
## shirt_NO                0.0021054309 -8.877107e-04  1.294722e-03 -3.882901e-04
## shirt_YES              -0.0040475752 -1.614740e-03 -7.767977e-04  5.830797e-05
## fireworks_NO            0.0084947094 -7.209696e-03  4.451046e-03  1.076938e-02
## fireworks_YES          -0.0104368537  4.707245e-03 -3.933122e-03 -1.109937e-02
## bobblehead_NO          -0.0129497720 -2.194068e-03 -1.028010e-04  7.996483e-05
## bobblehead_YES          0.0110076277 -3.083836e-04  6.207250e-04 -4.099470e-04
##                              Comp.37       Comp.38       Comp.39       Comp.40
## day                     2.906800e-03 -1.692223e-15  2.706169e-16 -6.869505e-16
## attend                 -8.521785e-04  1.083855e-14 -2.969847e-15  7.216450e-16
## temp                    1.229834e-03  8.758185e-16  4.203235e-15 -5.637851e-15
## month_APR               1.042671e-03  8.845355e-15  4.413137e-15 -5.551115e-17
## month_AUG               1.655589e-03  3.031429e-16 -3.132911e-15  2.539635e-15
## month_JUL              -4.607623e-04  1.131907e-15  5.134781e-16  1.526557e-15
## month_JUN              -1.021645e-02 -6.593684e-15  4.475587e-16 -1.634110e-15
## month_MAY               3.156139e-03 -3.096048e-15  8.812395e-16 -2.785966e-15
## month_OCT               1.551796e-03 -3.773457e-15 -2.733924e-15 -1.630640e-16
## month_SEP               1.097071e-03  9.367507e-17 -1.450229e-15  1.644518e-15
## day_of_week_Friday     -1.483868e-03  3.121461e-14 -9.110768e-15 -9.249546e-15
## day_of_week_Monday      6.447095e-04 -5.607494e-15  1.873501e-15  1.339207e-15
## day_of_week_Saturday    1.785838e-04 -6.416634e-15  1.819725e-15  1.511378e-15
## day_of_week_Sunday     -2.264551e-03 -6.210310e-15  1.630640e-16  3.792106e-15
## day_of_week_Thursday    6.306942e-04 -3.972517e-15  2.588207e-15  1.589007e-15
## day_of_week_Tuesday     1.210220e-03 -7.532169e-15  2.303713e-15  2.470246e-15
## day_of_week_Wednesday   3.158340e-04 -3.743533e-15  1.165734e-15  3.400058e-16
## opponent_Angels         6.673634e-03  2.926479e-15  2.220446e-16  1.706968e-15
## opponent_Astros        -1.778137e-03  3.337174e-15  4.232725e-16 -1.804112e-16
## opponent_Braves        -1.202440e-03 -2.775991e-15 -2.265549e-15 -1.911665e-15
## opponent_Brewers       -3.094702e-03  4.051013e-15 -1.443290e-15  2.310652e-15
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## opponent_Cardinals       -1.632340e-03  8.534840e-16 -2.220446e-16  1.207368e-15
## opponent_Cubs            -5.343823e-05 -2.634611e-15  2.092077e-15 -1.811051e-15
## opponent_Giants          -2.461508e-03  1.813653e-15  2.022688e-15  1.863093e-15
## opponent_Marlins         -1.358299e-03 -1.729953e-15  1.977585e-15 -8.465451e-16
## opponent_Mets             5.187449e-03  1.929013e-15 -6.938894e-17  1.651457e-15
## opponent_Nationals       -7.716444e-04 -6.136584e-15 -1.838807e-15  7.910339e-16
## opponent_Padres           1.533517e-04 -3.386397e-15 -1.752071e-16 -9.575674e-16
## opponent_Phillies        -4.504559e-04 -2.204400e-15 -1.526557e-16 -9.263423e-16
## opponent_Pirates         -6.684679e-04 -4.378008e-15 -1.353084e-15 -1.467576e-15
## opponent_Reds             4.740687e-04  3.804682e-15 -1.807582e-15 -3.629042e-15
## opponent_Rockies         -1.993575e-03  1.533062e-16  8.517492e-16  1.363493e-15
## opponent_Snakes          -1.981023e-03  1.847481e-15 -3.122502e-16  7.147061e-16
## opponent_White Sox        6.466008e-03  1.090707e-15  1.058181e-15  3.087808e-16
## skies_Clear              -2.504825e-05  1.104151e-15 -2.046974e-16 -3.573530e-16
## skies_Cloudy             -2.833866e-04 -1.356120e-15  2.151057e-16  7.389922e-16
## day_night_Day            7.493247e-04 -9.835882e-16  8.326673e-17 -1.387779e-16
## day_night_Night         -1.057760e-03  6.765422e-16 -9.020562e-17  5.967449e-16
## cap_NO                   -1.126107e-04 -6.657001e-17 -3.035766e-16 -3.729655e-16
## cap_YES                  -1.958242e-04 -1.543904e-16  3.087808e-16  7.389922e-16
## shirt_NO                  5.557531e-05  3.079134e-17 -5.377643e-16  4.718448e-16
## shirt_YES                -3.640102e-04 -2.792905e-16  5.169476e-16 -5.898060e-17
## fireworks_NO             -9.460920e-04  1.838980e-14 -5.544176e-15 -4.662937e-15
## fireworks_YES            6.376572e-04 -1.863006e-14  5.481726e-15  5.037637e-15
## bobblehead_NO            8.572086e-05  3.434752e-15 -7.771561e-16  1.609823e-15
## bobblehead_YES          -3.941557e-04 -3.691492e-15  7.216450e-16 -1.221245e-15
##                              Comp.41       Comp.42       Comp.43       Comp.44
## day                      5.898060e-16  2.400424e-16 -2.810252e-16 -6.245005e-17
## attend                  -1.110223e-16  2.027892e-15 -1.748601e-15 -8.743006e-16
## temp                     1.110223e-16  1.836584e-15  3.885781e-16  2.417337e-15
## month_APR               -1.547373e-15  4.642445e-15  2.461573e-15  3.415671e-15
## month_AUG                6.140921e-16 -2.317699e-15  9.558326e-16 -1.017415e-15
## month_JUL               -1.512679e-15 -1.114560e-16 -1.734723e-17 -2.003606e-16
## month_JUN                1.113692e-15 -9.210297e-16 -9.714451e-17 -3.295975e-16
## month_MAY                9.974660e-16 -3.947580e-16 -1.360023e-15  2.480655e-16
## month_OCT                9.298118e-16 -7.049483e-16 -4.753142e-16 -1.118029e-15
## month_SEP               -4.232725e-16 -8.595555e-16 -1.131040e-15 -1.594211e-15
## day_of_week_Friday       2.962908e-15  6.037488e-15 -1.145611e-14 -1.446759e-15
## day_of_week_Monday      -8.326673e-16 -3.191891e-16  3.060052e-15  6.071532e-17
## day_of_week_Saturday    -2.146720e-16 -2.820444e-15  1.805413e-15  5.615083e-16
## day_of_week_Sunday       5.238865e-16 -2.686436e-15  1.356554e-15 -5.811324e-16
## day_of_week_Thursday    -8.396062e-16 -4.093947e-16  1.054712e-15  8.430756e-16
## day_of_week_Tuesday     -1.262879e-15 -9.827208e-16  3.275158e-15  7.979728e-17
## day_of_week_Wednesday   -8.326673e-16  4.996004e-16  1.824929e-15  6.297046e-16
## opponent_Angels         -1.002670e-15 -6.689527e-16  4.475587e-16  3.027092e-16
## opponent_Astros         -1.078998e-15  1.439170e-15  1.720846e-15  9.220055e-16
## opponent_Braves          1.068590e-15 -1.766599e-15 -2.230854e-15 -1.381707e-15
## opponent_Brewers        -1.151856e-15 -6.448835e-16  3.903128e-16 -6.683022e-16
## opponent_Cardinals      -4.579670e-16 -2.333203e-16  2.192690e-15  4.857226e-16
## opponent_Cubs           -4.683753e-16  1.342025e-15 -3.469447e-16  3.530162e-16
## opponent_Giants         -3.556183e-16 -8.912142e-17 -5.464379e-17  6.288373e-16
## opponent_Marlins        -5.793976e-16  1.307331e-15  1.179612e-16  4.224052e-16
## opponent_Mets           -5.620504e-16  3.747003e-16  6.869505e-16 -2.619432e-16
## opponent_Nationals       5.342948e-16 -2.001220e-15 -4.163336e-16 -1.820592e-15
## opponent_Padres          9.315465e-16 -3.146355e-16 -1.457168e-16 -1.066855e-16
```

```
## opponent_Phillies          1.193490e-15 -8.229094e-16 -2.081668e-17  4.085274e-16
## opponent_Pirates           1.242062e-15 -2.078849e-15 -1.505740e-15 -1.166602e-15
## opponent_Reds              2.126771e-15  5.926249e-16 -2.678413e-15 -3.686287e-16
## opponent_Rockies          -5.412337e-16  8.372209e-16  6.730727e-16  3.790371e-16
## opponent_Snakes           -9.020562e-17  3.632077e-16  4.163336e-17  1.422473e-16
## opponent_White Sox        -6.279699e-16  6.203805e-16  7.702172e-16  7.138387e-16
## skies_Clear               -5.984796e-17  5.643272e-16 -6.505213e-16  2.623769e-16
## skies_Cloudy              -1.214306e-17 -7.126461e-16  8.066464e-16 -3.009745e-16
## day_night_Day              4.857226e-17 -4.594849e-16 -2.775558e-17 -2.949030e-17
## day_night_Night           -4.163336e-17  2.818926e-16  1.387779e-16  4.510281e-17
## cap_NO                     1.075529e-16 -1.536857e-16 -4.198031e-16 -1.587272e-16
## cap_YES                   -1.283695e-16  3.469447e-17  5.481726e-16  1.717376e-16
## shirt_NO                  -1.110223e-16 -1.320558e-16 -1.040834e-16 -5.204170e-16
## shirt_YES                  7.285839e-17 -6.657001e-17  2.498002e-16  4.779163e-16
## fireworks_NO               1.457168e-15  4.082455e-15 -6.425416e-15 -1.072059e-15
## fireworks_YES             -1.491862e-15 -4.191092e-15  6.557255e-15  1.042569e-15
## bobblehead_NO             -3.885781e-16  4.649059e-16 -3.330669e-16 -3.330669e-16
## bobblehead_YES             3.608225e-16 -6.019490e-16  4.718448e-16  3.053113e-16
##                                 Comp.45       Comp.46
## day                       -7.077672e-16  1.033201e-14
## attend                     4.440892e-15  8.326673e-16
## temp                      -1.403391e-15  1.462372e-15
## month_APR                  6.626644e-16  8.094220e-15
## month_AUG                 -8.049117e-16  3.989864e-15
## month_JUL                  2.560452e-15 -5.551115e-16
## month_JUN                 -2.546574e-15 -3.937822e-14
## month_MAY                 -8.690965e-16  9.946904e-15
## month_OCT                 -4.649059e-16  4.107825e-15
## month_SEP                  7.910339e-16  5.662137e-15
## day_of_week_Friday         1.774969e-14 -2.733924e-15
## day_of_week_Monday        -2.976785e-15  2.914335e-15
## day_of_week_Saturday      -3.262364e-15 -1.631507e-15
## day_of_week_Sunday        -4.409667e-15 -9.665879e-15
## day_of_week_Thursday      -9.020562e-16  2.206568e-15
## day_of_week_Tuesday       -4.871104e-15  3.969047e-15
## day_of_week_Wednesday     -2.123302e-15  2.511880e-15
## opponent_Angels            9.055257e-16  2.510492e-14
## opponent_Astros            3.955170e-16 -5.627443e-15
## opponent_Braves            3.851086e-16 -7.230327e-15
## opponent_Brewers           9.384854e-16 -1.063039e-14
## opponent_Cardinals        -6.453171e-16 -5.467848e-15
## opponent_Cubs             -1.422473e-16  3.191891e-16
## opponent_Giants            6.904199e-16 -7.521761e-15
## opponent_Marlins           1.734723e-16 -3.108624e-15
## opponent_Mets              0.000000e+00  1.997014e-14
## opponent_Nationals        -1.172673e-15 -4.649059e-15
## opponent_Padres           -1.269818e-15 -2.671474e-16
## opponent_Phillies         -2.078199e-15 -3.226586e-15
## opponent_Pirates          -1.120631e-15 -5.648260e-15
## opponent_Reds              1.929013e-15  2.081668e-16
## opponent_Rockies           1.734723e-16 -5.662137e-15
## opponent_Snakes           -6.938894e-17 -6.383782e-15
## opponent_White Sox         4.302114e-16  2.398776e-14
## skies_Clear                7.858297e-16  7.251144e-16
```

```
## skies_Cloudy      -7.840950e-16 -1.717376e-15
## day_night_Day      5.481726e-16  2.761680e-15
## day_night_Night   -5.967449e-16 -3.705369e-15
## cap_NO             1.873501e-16 -8.708312e-16
## cap_YES           -2.775558e-16 -1.387779e-16
## shirt_NO           7.806256e-17  7.389922e-16
## shirt_YES         -2.116363e-16 -1.741662e-15
## fireworks_NO       1.033201e-14 -8.257284e-16
## fireworks_YES     -1.041528e-14 -1.942890e-16
## bobblehead_NO      9.159340e-16  1.554312e-15
## bobblehead_YES    -9.992007e-16 -2.609024e-15
```

```
data.pca$call
```

```
## princomp(x = corr_matrix)
```

```
library(factoextra)
variables <- get_pca_var(data.pca)
variables
```

```
## Principal Component Analysis Results for variables
##  ===================================================
##   Name        Description
## 1 "$coord"    "Coordinates for the variables"
## 2 "$cor"      "Correlations between variables and dimensions"
## 3 "$cos2"     "Cos2 for the variables"
## 4 "$contrib"  "contributions of the variables"
```

```
# install.packages('gridExtra')
# install.packages('grid')
library(gridExtra)
```

```
##
## Attaching package: 'gridExtra'
```

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

```
library(grid)
library(factoextra)
```

```
# Contributions of variables to PC1
a<-fviz_contrib(data.pca, choice = "var", axes = 1)
# Contributions of variables to PC2
b<-fviz_contrib(data.pca, choice = "var", axes = 2)
grid.arrange(a,b, ncol=2, top='Contribution of the variables to the first two PCs')
```

Contribution of the variables to the first two PCs


```
biplot(data.pca, main = 'Biplot', scale = 0)
```

Biplot
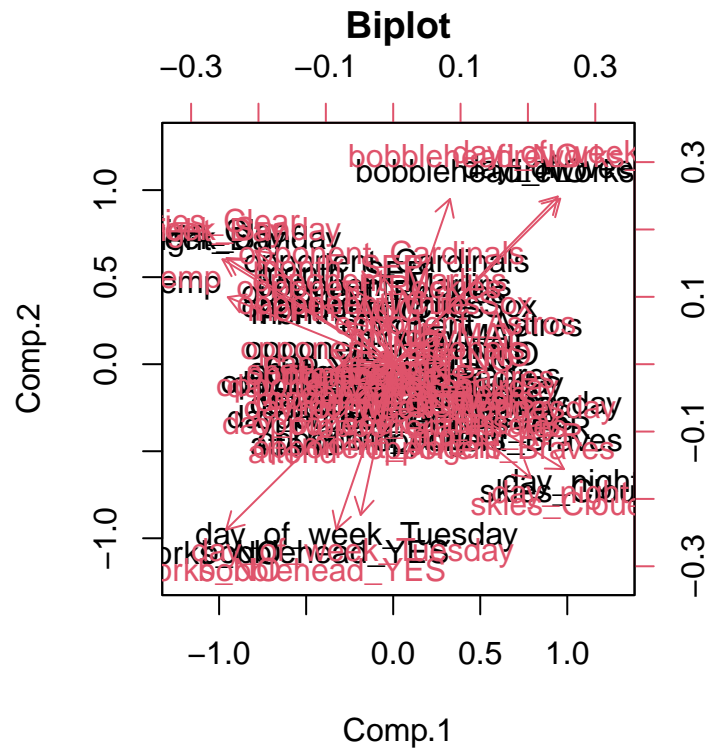
Create linear regression on all features

```
linear_model <- lm(dodgers_df$attend ~ dodgers_scaled[, -2])
summary(linear_model)
```

```
##
## Call:
## lm(formula = dodgers_df$attend ~ dodgers_scaled[, -2])
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -9300.2 -3166.2   -60.2  1387.1 12599.9
##
## Coefficients: (9 not defined because of singularities)
##                                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         41040.074    664.347  61.775  < 2e-16
## dodgers_scaled[, -2]day              1283.674   1357.103   0.946  0.34937
## dodgers_scaled[, -2]temp               75.547   2045.502   0.037  0.97071
## dodgers_scaled[, -2]month_APR       -1253.207   2766.851  -0.453  0.65282
## dodgers_scaled[, -2]month_AUG        1757.892   1442.663   1.219  0.22953
## dodgers_scaled[, -2]month_JUL         246.577   1628.585   0.151  0.88035
## dodgers_scaled[, -2]month_JUN       -2184.410   3593.474  -0.608  0.54639
## dodgers_scaled[, -2]month_MAY         328.934   1999.769   0.164  0.87010
## dodgers_scaled[, -2]month_OCT         366.423   1014.498   0.361  0.71969
## dodgers_scaled[, -2]month_SEP              NA         NA      NA       NA
## dodgers_scaled[, -2]day_of_week_Friday -6746.851   3134.345  -2.153  0.03688
```

```
## dodgers_scaled[, -2]day_of_week_Monday         -4.731    988.528   -0.005   0.99620
## dodgers_scaled[, -2]day_of_week_Saturday     1357.605   1293.177    1.050   0.29953
## dodgers_scaled[, -2]day_of_week_Sunday        301.704   1749.476    0.172   0.86387
## dodgers_scaled[, -2]day_of_week_Thursday      124.025    958.781    0.129   0.89767
## dodgers_scaled[, -2]day_of_week_Tuesday      3198.896   1131.630    2.827   0.00705
## dodgers_scaled[, -2]day_of_week_Wednesday         NA         NA       NA       NA
## dodgers_scaled[, -2]opponent_Angels           184.682   1089.750    0.169   0.86620
## dodgers_scaled[, -2]opponent_Astros         -3781.477   2593.886   -1.458   0.15199
## dodgers_scaled[, -2]opponent_Braves         -3421.641   2647.795   -1.292   0.20301
## dodgers_scaled[, -2]opponent_Brewers        -4764.816   3245.182   -1.468   0.14914
## dodgers_scaled[, -2]opponent_Cardinals      -3396.807   3534.100   -0.961   0.34173
## dodgers_scaled[, -2]opponent_Cubs           -1866.685   2252.374   -0.829   0.41171
## dodgers_scaled[, -2]opponent_Giants         -5156.771   4098.180   -1.258   0.21492
## dodgers_scaled[, -2]opponent_Marlins        -3489.674   2492.732   -1.400   0.16854
## dodgers_scaled[, -2]opponent_Mets            -767.539   1270.415   -0.604   0.54884
## dodgers_scaled[, -2]opponent_Nationals      -1058.815   2628.889   -0.403   0.68907
## dodgers_scaled[, -2]opponent_Padres         -3323.000   3509.395   -0.947   0.34887
## dodgers_scaled[, -2]opponent_Phillies       -2460.967   2381.373   -1.033   0.30705
## dodgers_scaled[, -2]opponent_Pirates        -2254.525   2558.202   -0.881   0.38295
## dodgers_scaled[, -2]opponent_Reds           -2980.141   2260.077   -1.319   0.19412
## dodgers_scaled[, -2]opponent_Rockies        -5178.776   3919.295   -1.321   0.19321
## dodgers_scaled[, -2]opponent_Snakes         -6102.218   3905.314   -1.563   0.12532
## dodgers_scaled[, -2]opponent_White Sox            NA         NA       NA       NA
## dodgers_scaled[, -2]skies_Clear                46.097   1017.832    0.045   0.96408
## dodgers_scaled[, -2]skies_Cloudy                  NA         NA       NA       NA
## dodgers_scaled[, -2]day_night_Day           1376.029   1400.398    0.983   0.33118
## dodgers_scaled[, -2]day_night_Night               NA         NA       NA       NA
## dodgers_scaled[, -2]cap_NO                   1020.363    917.119    1.113   0.27193
## dodgers_scaled[, -2]cap_YES                       NA         NA       NA       NA
## dodgers_scaled[, -2]shirt_NO                 -187.690    874.134   -0.215   0.83098
## dodgers_scaled[, -2]shirt_YES                     NA         NA       NA       NA
## dodgers_scaled[, -2]fireworks_NO            -7679.117   3178.842   -2.416   0.01992
## dodgers_scaled[, -2]fireworks_YES                 NA         NA       NA       NA
## dodgers_scaled[, -2]bobblehead_NO           -3222.797   1102.503   -2.923   0.00545
## dodgers_scaled[, -2]bobblehead_YES                NA         NA       NA       NA
##
## (Intercept)                                 ***
## dodgers_scaled[, -2]day
## dodgers_scaled[, -2]temp
## dodgers_scaled[, -2]month_APR
## dodgers_scaled[, -2]month_AUG
## dodgers_scaled[, -2]month_JUL
## dodgers_scaled[, -2]month_JUN
## dodgers_scaled[, -2]month_MAY
## dodgers_scaled[, -2]month_OCT
## dodgers_scaled[, -2]month_SEP
## dodgers_scaled[, -2]day_of_week_Friday      *
## dodgers_scaled[, -2]day_of_week_Monday
## dodgers_scaled[, -2]day_of_week_Saturday
## dodgers_scaled[, -2]day_of_week_Sunday
## dodgers_scaled[, -2]day_of_week_Thursday
## dodgers_scaled[, -2]day_of_week_Tuesday     **
## dodgers_scaled[, -2]day_of_week_Wednesday
## dodgers_scaled[, -2]opponent_Angels
```

```
## dodgers_scaled[, -2]opponent_Astros
## dodgers_scaled[, -2]opponent_Braves
## dodgers_scaled[, -2]opponent_Brewers
## dodgers_scaled[, -2]opponent_Cardinals
## dodgers_scaled[, -2]opponent_Cubs
## dodgers_scaled[, -2]opponent_Giants
## dodgers_scaled[, -2]opponent_Marlins
## dodgers_scaled[, -2]opponent_Mets
## dodgers_scaled[, -2]opponent_Nationals
## dodgers_scaled[, -2]opponent_Padres
## dodgers_scaled[, -2]opponent_Phillies
## dodgers_scaled[, -2]opponent_Pirates
## dodgers_scaled[, -2]opponent_Reds
## dodgers_scaled[, -2]opponent_Rockies
## dodgers_scaled[, -2]opponent_Snakes
## dodgers_scaled[, -2]opponent_White Sox
## dodgers_scaled[, -2]skies_Clear
## dodgers_scaled[, -2]skies_Cloudy
## dodgers_scaled[, -2]day_night_Day
## dodgers_scaled[, -2]day_night_Night
## dodgers_scaled[, -2]cap_NO
## dodgers_scaled[, -2]cap_YES
## dodgers_scaled[, -2]shirt_NO
## dodgers_scaled[, -2]shirt_YES
## dodgers_scaled[, -2]fireworks_NO          *
## dodgers_scaled[, -2]fireworks_YES
## dodgers_scaled[, -2]bobblehead_NO         **
## dodgers_scaled[, -2]bobblehead_YES
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 5979 on 44 degrees of freedom
## Multiple R-squared:  0.7144, Adjusted R-squared:  0.4808
## F-statistic: 3.057 on 36 and 44 DF,  p-value: 0.0002493
```

```r
kmeans <- eclust(dodgers_scaled, k=7)
```

KMEANS Clustering
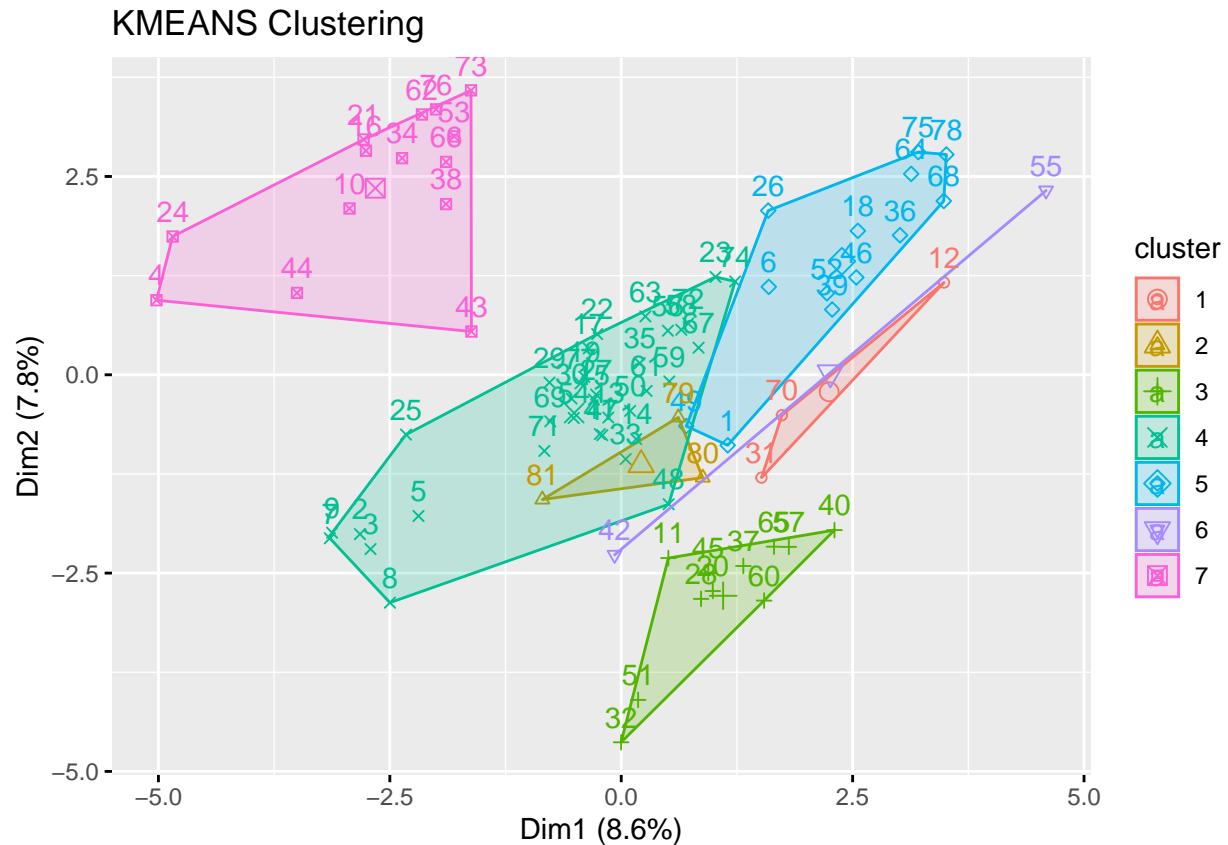
Compute partial correlations

```
library(ppcor)
```

```
## Loading required package: MASS
```

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

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

```
pcor(dodgers_scaled)
```

```
## $estimate
##              [,1]         [,2]         [,3]         [,4]         [,5]
## [1,]  1.000000000  0.141170601  0.010297033  0.038667203 -0.28489891
## [2,]  0.141170601  1.000000000  0.005567808 -0.090331339  0.21640759
## [3,]  0.010297033  0.005567808  1.000000000 -0.633843273  0.33836446
## [4,]  0.038667203 -0.090331339 -0.633843273  1.000000000  0.54312783
## [5,] -0.284898910  0.216407586  0.338364465  0.543127834  1.00000000
## [6,]  0.180007440  0.046110046  0.136917117  0.009401267  0.22515550
## [7,]  0.579109745 -0.104088057  0.118131541  0.195340964  0.42012154
```

```
##  [8,] -0.455511189  0.044508080 -0.457164349 -0.083268906 -0.20555206
##  [9,] -0.510234299  0.053431437  0.388650242  0.399036025 -0.46429247
## [10,] -0.329091790  0.008167967  0.677509819  0.473655130 -0.36673326
## [11,]  0.048517776 -0.339824400 -0.088582635 -0.094480782  0.15611575
## [12,] -0.148299254  0.043179561  0.041244062 -0.068757885 -0.01813981
## [13,]  0.059895976  0.269270520  0.004867802  0.147809183 -0.26066315
## [14,]  0.239498067  0.065813848  0.171948576  0.308271351 -0.10806935
## [15,]  0.028995033  0.055848037 -0.120365706 -0.121364016  0.01487279
## [16,] -0.210140322  0.455346571  0.028426004 -0.004689272 -0.18872209
## [17,] -0.193652685  0.051090523  0.016296903 -0.182951898  0.20759479
## [18,] -0.551643899  0.190077870 -0.220148275 -0.193737607 -0.40704211
## [19,]  0.462083008 -0.183172157 -0.190082947 -0.356751983  0.47128489
## [20,]  0.202295454 -0.115470016  0.172561884  0.631602100 -0.24529600
## [21,]  0.669690952 -0.224407276  0.220073522  0.058449676  0.18783160
## [22,]  0.292097104  0.056114014  0.262518170 -0.010592293  0.16506525
## [23,] -0.252169657  0.096611216 -0.103869695 -0.297538588  0.49051001
## [24,]  0.416357018 -0.128266496  0.128244548 -0.071227273  0.38627759
## [25,]  0.361698351 -0.143417882 -0.201243438 -0.388714198  0.71520244
## [26,] -0.503299170  0.184190190 -0.079941092 -0.158671384 -0.43824407
## [27,]  0.123957192  0.176346884  0.400923471  0.746743823 -0.39932954
## [28,] -0.344419755  0.148547924 -0.056321727  0.314994538 -0.27729640
## [29,]  0.034425908  0.009851887 -0.153690330  0.012344738 -0.10609170
## [30,] -0.093818199  0.035124425  0.078760665  0.623746085 -0.32363089
## [31,] -0.319590606 -0.055762118 -0.177704654 -0.040663689 -0.12671778
## [32,]  0.379066439 -0.158952978  0.131132034 -0.170821295  0.49400448
## [33,]  0.403008913 -0.327483431  0.050381848 -0.115724536  0.39461299
## [34,] -0.552920040  0.183557915 -0.199862268 -0.252744293 -0.34123653
## [35,] -0.167246735  0.006827459  0.033632012 -0.107548151  0.14462412
## [36,]  0.167246735 -0.006827459 -0.033632012  0.107548151 -0.14462412
## [37,] -0.156011647  0.146533326  0.282220331  0.137329420 -0.22795375
## [38,]  0.156011647 -0.146533326 -0.282220331 -0.137329420  0.22795375
## [39,] -0.041237950  0.165416369 -0.056910891  0.015578930 -0.06509343
## [40,]  0.041237950 -0.165416369  0.056910891 -0.015578930  0.06509343
## [41,] -0.107639346 -0.032352684  0.073652280  0.138351084 -0.14604603
## [42,]  0.107639346  0.032352684 -0.073652280 -0.138351084  0.14604603
## [43,] -0.004759825 -0.342194170 -0.019446682 -0.074071495  0.15137134
## [44,]  0.004759825  0.342194170  0.019446682  0.074071495 -0.15137134
## [45,] -0.053437001 -0.403262569 -0.085377513 -0.049867087 -0.08934922
## [46,]  0.053437001  0.403262569  0.085377513  0.049867087  0.08934922
##              [,6]        [,7]        [,8]        [,9]       [,10]
##  [1,]  0.180007440  0.57910974 -0.455511189 -0.510234299 -0.329091790
##  [2,]  0.046110046 -0.10408806  0.044508080  0.053431437  0.008167967
##  [3,]  0.136917117  0.11813154 -0.457164349  0.388650242  0.677509819
##  [4,]  0.009401267  0.19534096 -0.083268906  0.399036025  0.473655130
##  [5,]  0.225155505  0.42012154 -0.205552057 -0.464292466 -0.366733260
##  [6,]  1.000000000 -0.01944477  0.342339848  0.212646820  0.051851304
##  [7,] -0.019444771  1.00000000  0.669217524  0.426963711  0.359055805
##  [8,]  0.342339848  0.66921752  1.000000000 -0.227304496  0.020805573
##  [9,]  0.212646820  0.42696371 -0.227304496  1.000000000 -0.456713324
## [10,]  0.051851304  0.35905581  0.020805573 -0.456713324  1.000000000
## [11,]  0.027348723 -0.03320388 -0.025571730  0.034768870  0.042999821
## [12,]  0.003636156  0.18706059 -0.093674329 -0.082693318 -0.124233314
## [13,]  0.008439093  0.06859408 -0.058082438 -0.048368686 -0.001957605
## [14,]  0.174328243 -0.48907546  0.332448846  0.095550169  0.083252255
```

```
## [15,] -0.187559641   0.22982364 -0.185500273   0.039554201   0.049390352
## [16,] -0.123249496   0.25048050 -0.091511026 -0.080823080 -0.072373215
## [17,] -0.099151110   0.12955062 -0.034117320 -0.045571694 -0.078980154
## [18,]   0.043467170   0.92750364 -0.676884143 -0.362585605 -0.256244434
## [19,] -0.213242833 -0.44411568   0.501115673   0.419917642   0.343599548
## [20,]   0.039120667 -0.26586777 -0.005285726 -0.128601935 -0.114499914
## [21,] -0.211574335 -0.62492824   0.714100437   0.342138865   0.152335171
## [22,] -0.252356037 -0.44271919   0.553685525   0.162816060   0.218123986
## [23,] -0.121317579 -0.00924372 -0.007114210   0.053831796   0.027925313
## [24,] -0.255784858 -0.54165366   0.531364729   0.569285414   0.116191104
## [25,] -0.200312368 -0.35160656   0.214985120   0.403717686   0.284800368
## [26,]   0.051582386   0.90042680 -0.594547656 -0.378781763 -0.324702608
## [27,] -0.074801477 -0.19438360   0.069979518 -0.182791349 -0.262657770
## [28,]   0.349152205   0.02268456 -0.312004741 -0.293503109   0.018764498
## [29,]   0.635864279 -0.13559214 -0.145713982 -0.034550593   0.080924174
## [30,]   0.172249083 -0.17681026 -0.132542454 -0.215191095 -0.111930156
## [31,]   0.537799309   0.13989308 -0.329847424 -0.189761235 -0.023115024
## [32,] -0.301331383 -0.54297947   0.570292837   0.306343693   0.274791927
## [33,] -0.008658791 -0.56981046   0.447469124   0.289336139   0.284148304
## [34,]   0.017457447   0.93415654 -0.655466887 -0.348543267 -0.263879255
## [35,] -0.044083487   0.09128486   0.039315974 -0.149451041 -0.135936472
## [36,]   0.044083487 -0.09128486 -0.039315974   0.149451041   0.135936472
## [37,] -0.164468893   0.39214742 -0.164194749 -0.266113038 -0.353372764
## [38,]   0.164468893 -0.39214742   0.164194749   0.266113038   0.353372764
## [39,]   0.007686382   0.01689485 -0.046448864   0.016128210   0.058386621
## [40,] -0.007686382 -0.01689485   0.046448864 -0.016128210 -0.058386621
## [41,]   0.056808075   0.10603776 -0.078132251 -0.116407916 -0.182095851
## [42,] -0.056808075 -0.10603776   0.078132251   0.116407916   0.182095851
## [43,]   0.011645685 -0.04100252   0.014721201   0.005466069   0.007044720
## [44,] -0.011645685   0.04100252 -0.014721201 -0.005466069 -0.007044720
## [45,] -0.152916559   0.13300365 -0.072425130   0.036850293   0.091772897
## [46,]   0.152916559 -0.13300365   0.072425130 -0.036850293 -0.091772897
##                  [,11]          [,12]          [,13]          [,14]          [,15]
##  [1,]   0.0485177764 -0.148299254   0.059895976   0.239498067   0.028995033
##  [2,] -0.3398244000   0.043179561   0.269270520   0.065813848   0.055848037
##  [3,] -0.0885826354   0.041244062   0.004867802   0.171948576 -0.120365706
##  [4,] -0.0944807819 -0.068757885   0.147809183   0.308271351 -0.121364016
##  [5,]   0.1561157467 -0.018139813 -0.260663149 -0.108069345   0.014872794
##  [6,]   0.0273487232   0.003636156   0.008439093   0.174328243 -0.187559641
##  [7,] -0.0332038811   0.187060587   0.068594077 -0.489075460   0.229823638
##  [8,] -0.0255717304 -0.093674329 -0.058082438   0.332448846 -0.185500273
##  [9,]   0.0347688703 -0.082693318 -0.048368686   0.095550169   0.039554201
## [10,]   0.0429998209 -0.124233314 -0.001957605   0.083252255   0.049390352
## [11,]   1.0000000000   0.607844268   0.536408638   0.369676655   0.378918942
## [12,]   0.6078442682   1.000000000 -0.141086558   0.141092011 -0.214896979
## [13,]   0.5364086381 -0.141086558   1.000000000 -0.211981570 -0.171764852
## [14,]   0.3696766552   0.141092011 -0.211981570   1.000000000   0.182074442
## [15,]   0.3789189424 -0.214896979 -0.171764852   0.182074442   1.000000000
## [16,]   0.6812367322 -0.390768180 -0.155170128   0.063477292 -0.291068535
## [17,]   0.3965405808 -0.388079045   0.093721133   0.227971017 -0.107905504
## [18,]   0.0622539760 -0.130308320 -0.140884596   0.411379017 -0.250734927
## [19,] -0.0581914995   0.012861208   0.183500659 -0.023261826   0.015597196
## [20,] -0.0847032721   0.219076998 -0.217808804 -0.254474984   0.064508061
## [21,] -0.0445991756   0.155444251 -0.086010068 -0.364631968   0.175900043
```

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## [22,]   0.1352452410 -0.162221822   0.098789451 -0.084431656   0.100547113
## [23,]  -0.0573937035 -0.083123093   0.330110383   0.243938393 -0.008713563
## [24,]  -0.0527262627   0.162623305 -0.110631718 -0.268961363   0.026810875
## [25,]  -0.0336538973 -0.096628156   0.243524428   0.096900134 -0.070570172
## [26,]   0.1262727675 -0.229387951 -0.051890859   0.411063121 -0.179327187
## [27,]   0.1997859866 -0.027712020 -0.058343890 -0.232901145 -0.019997054
## [28,]   0.0998919391 -0.030548313 -0.015100373 -0.060175277   0.010751064
## [29,]  -0.0357940652   0.166508571 -0.161415570 -0.334676093   0.143061772
## [30,]   0.0002649196   0.113844099 -0.204320820 -0.341864028   0.259738389
## [31,]  -0.5231617737   0.370335146   0.209227071   0.109135308   0.265788717
## [32,]   0.0227589661 -0.029999114   0.164123570 -0.110725139 -0.009849363
## [33,]  -0.0620760479   0.153318178   0.081556855 -0.321299122   0.145484041
## [34,]   0.0837517658 -0.236650060 -0.033595513   0.491659959 -0.248101736
## [35,]  -0.1385747400   0.109313146   0.087179894   0.208349875   0.049744027
## [36,]   0.1385747400 -0.109313146 -0.087179894 -0.208349875 -0.049744027
## [37,]   0.0303644889 -0.300656868 -0.182389290   0.589371814 -0.242834066
## [38,]  -0.0303644889   0.300656868   0.182389290 -0.589371814   0.242834066
## [39,]  -0.1999928335   0.237973522   0.189500547   0.024072601   0.082854301
## [40,]   0.1999928335 -0.237973522 -0.189500547 -0.024072601 -0.082854301
## [41,]   0.0848410602 -0.096124937   0.113239784   0.005588387 -0.051964038
## [42,]  -0.0848410602   0.096124937 -0.113239784 -0.005588387   0.051964038
## [43,]  -0.9586541765   0.581816036   0.621437020   0.351804660   0.383694066
## [44,]   0.9586541765 -0.581816036 -0.621437020 -0.351804660 -0.383694066
## [45,]  -0.0059027176   0.098453569   0.154627419   0.028392060 -0.173989894
## [46,]   0.0059027176 -0.098453569 -0.154627419 -0.028392060   0.173989894
##                  [,16]        [,17]        [,18]        [,19]        [,20]        [,21]
##  [1,] -0.210140322 -0.19365268 -0.55164390   0.46208301   0.202295454   0.66969095
##  [2,]  0.455346571   0.05109052   0.19007787 -0.18317216 -0.115470016 -0.22440728
##  [3,]  0.028426004   0.01629690 -0.22014828 -0.19008295   0.172561884   0.22007352
##  [4,] -0.004689272 -0.18295190 -0.19373761 -0.35675198   0.631602100   0.05844968
##  [5,] -0.188722087   0.20759479 -0.40704211   0.47128489 -0.245296001   0.18783160
##  [6,] -0.123249496 -0.09915111   0.04346717 -0.21324283   0.039120667 -0.21157434
##  [7,]  0.250480502   0.12955062   0.92750364 -0.44411568 -0.265867774 -0.62492824
##  [8,] -0.091511026 -0.03411732 -0.67688414   0.50111567 -0.005285726   0.71410044
##  [9,] -0.080823080 -0.04557169 -0.36258560   0.41991764 -0.128601935   0.34213887
## [10,] -0.072373215 -0.07898015 -0.25624443   0.34359955 -0.114499914   0.15233517
## [11,]  0.681236732   0.39654058   0.06225398 -0.05819150 -0.084703272 -0.04459918
## [12,] -0.390768180 -0.38807904 -0.13030832   0.01286121   0.219076998   0.15544425
## [13,] -0.155170128   0.09372113 -0.14088460   0.18350066 -0.217808804 -0.08601007
## [14,]  0.063477292   0.22797102   0.41137902 -0.02326183 -0.254474984 -0.36463197
## [15,] -0.291068535 -0.10790550 -0.25073493   0.01559720   0.064508061   0.17590004
## [16,]  1.000000000 -0.27508038 -0.26532940   0.08862374   0.278283770   0.25313745
## [17,] -0.275080384   1.00000000 -0.04842448 -0.11789673   0.286256945   0.20894075
## [18,] -0.265329404 -0.04842448   1.00000000   0.44270662   0.223728207   0.62062571
## [19,]  0.088623736 -0.11789673   0.44270662   1.00000000   0.120001171 -0.39650789
## [20,]  0.278283770   0.28625694   0.22372821   0.12000117   1.000000000 -0.13451521
## [21,]  0.253137453   0.20894075   0.62062571 -0.39650789 -0.134515210   1.00000000
## [22,] -0.109027321 -0.18182118   0.49008952 -0.27612390   0.181883360 -0.36168377
## [23,] -0.131798225 -0.29581478   0.04456111 -0.09354571   0.352496086   0.23845479
## [24,]  0.280560960   0.15987830   0.52545903 -0.26371823 -0.020282853 -0.51057572
## [25,]  0.050648693 -0.23759460   0.37586057 -0.39777357   0.238027926 -0.19059553
## [26,] -0.373407635 -0.15940805 -0.82987295   0.42516593   0.314294917   0.57653816
## [27,] -0.210856639   0.09515579   0.16240835   0.20712378 -0.417718542 -0.04380819
## [28,] -0.126706127 -0.02843943 -0.07058797   0.24698219 -0.222977278   0.37719024
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## [29,]   0.250791924   0.22711049   0.08901381   0.10690237  -0.151201945   0.01338935
## [30,]   0.184789098   0.23492394   0.12419039   0.24447476  -0.578351795   0.04803344
## [31,]   0.365596405   0.31210506  -0.14782189   0.24920479  -0.025703211   0.28058787
## [32,]   0.062989311  -0.13402943   0.57750665  -0.40500940   0.174452053  -0.41474545
## [33,]   0.237266662   0.05081992   0.57483599  -0.30893081   0.034854273  -0.44834814
## [34,]  -0.313214828  -0.19528599  -0.86715785   0.39284759   0.330497352   0.63884799
## [35,]   0.037480774  -0.17138799  -0.09261308  -0.19769706  -0.105321381   0.18257955
## [36,]  -0.037480774   0.17138799   0.09261308   0.19769706   0.105321381  -0.18257955
## [37,]  -0.181521898  -0.11676590  -0.33445845   0.28608647   0.018511434   0.16153124
## [38,]   0.181521898   0.11676590   0.33445845  -0.28608647  -0.018511434  -0.16153124
## [39,]  -0.061506212   0.21566013  -0.03355698   0.09434343   0.072302794   0.08000550
## [40,]   0.061506212  -0.21566013   0.03355698  -0.09434343  -0.072302794  -0.08000550
## [41,]  -0.227537331   0.03177694  -0.19909288   0.08101524  -0.023252402   0.14709697
## [42,]   0.227537331  -0.03177694   0.19909288  -0.08101524   0.023252402  -0.14709697
## [43,]   0.598530146   0.32631089   0.08606037  -0.07773332  -0.018307650  -0.00672410
## [44,]  -0.598530146  -0.32631089  -0.08606037   0.07773332   0.018307650   0.00672410
## [45,]  -0.211579693   0.10780629  -0.14678827  -0.01410232   0.080308130   0.01121891
## [46,]   0.211579693  -0.10780629   0.14678827   0.01410232  -0.080308130  -0.01121891
##                  [,22]        [,23]        [,24]        [,25]        [,26]
##  [1,]   0.29209710  -0.252169657   0.416357018   0.36169835  -0.503299170
##  [2,]   0.05611401   0.096611216  -0.128266496  -0.14341788   0.184190190
##  [3,]   0.26251817  -0.103869695   0.128244548  -0.20124344  -0.079941092
##  [4,]  -0.01059229  -0.297538588  -0.071227273  -0.38871420  -0.158671384
##  [5,]   0.16506525   0.490510012   0.386277594   0.71520244  -0.438244073
##  [6,]  -0.25235604  -0.121317579  -0.255784858  -0.20031237   0.051582386
##  [7,]  -0.44271919  -0.009243720  -0.541653663  -0.35160656   0.900426796
##  [8,]   0.55368552  -0.007114210   0.531364729   0.21498512  -0.594547656
##  [9,]   0.16281606   0.053831796   0.569285414   0.40371769  -0.378781763
## [10,]   0.21812399   0.027925313   0.116191104   0.28480037  -0.324702608
## [11,]   0.13524524  -0.057393704  -0.052726263  -0.03365390   0.126272768
## [12,]  -0.16222182  -0.083123093   0.162623305  -0.09662816  -0.229387951
## [13,]   0.09878945   0.330110383  -0.110631718   0.24352443  -0.051890859
## [14,]  -0.08443166   0.243938393  -0.268961363   0.09690013   0.411063121
## [15,]   0.10054711  -0.008713563   0.026810875  -0.07057017  -0.179327187
## [16,]  -0.10902732  -0.131798225   0.280560960   0.05064869  -0.373407635
## [17,]  -0.18182118  -0.295814782   0.159878297  -0.23759460  -0.159408051
## [18,]   0.49008952   0.044561113   0.525459029   0.37586057  -0.829872949
## [19,]  -0.27612390  -0.093545710  -0.263718225  -0.39777357   0.425165928
## [20,]   0.18188336   0.352496086  -0.020282853   0.23802793   0.314294917
## [21,]  -0.36168377   0.238454789  -0.510575724  -0.19059553   0.576538156
## [22,]   1.00000000  -0.048856910  -0.227449984  -0.22141923   0.363198414
## [23,]  -0.04885691   1.000000000   0.032169444  -0.31189318   0.031316173
## [24,]  -0.22744998   0.032169444   1.000000000  -0.25473204   0.557787388
## [25,]  -0.22141923  -0.311893176  -0.254732041   1.00000000   0.335201419
## [26,]   0.36319841   0.031316173   0.557787388   0.33520142   1.000000000
## [27,]  -0.02490658   0.245930720   0.138680209   0.23044727   0.109606956
## [28,]   0.21547788   0.061835223   0.396659154   0.28923231  -0.013683314
## [29,]   0.22323715   0.203863080   0.032805292   0.15130891   0.149610210
## [30,]   0.22548975   0.272182655   0.116964928   0.32855656   0.201843373
## [31,]   0.33255593  -0.077590504   0.205567403   0.23206384  -0.063159911
## [32,]  -0.44274773  -0.149669258  -0.374125112  -0.41044849   0.507224689
## [33,]  -0.24224034   0.031370867  -0.356935980  -0.27826661   0.529259247
## [34,]   0.39175502  -0.045398388   0.546001990   0.27641328  -0.852380307
## [35,]   0.16931780  -0.192431587   0.148943465   0.01016706  -0.005889896
```

```
## [36,]  -0.16931780   0.192431587  -0.148943465  -0.01016706   0.005889896
## [37,]  -0.03490138   0.014243154   0.079785680   0.14487340  -0.334877990
## [38,]   0.03490138  -0.014243154  -0.079785680  -0.14487340   0.334877990
## [39,]   0.04559228  -0.309753311   0.087568928   0.07532911  -0.028862436
## [40,]  -0.04559228   0.309753311  -0.087568928  -0.07532911   0.028862436
## [41,]   0.15155854   0.026730849   0.231006443   0.12825861  -0.126440166
## [42,]  -0.15155854  -0.026730849  -0.231006443  -0.12825861   0.126440166
## [43,]   0.08285268  -0.130259226   0.006546578  -0.05307129   0.106560965
## [44,]  -0.08285268   0.130259226  -0.006546578   0.05307129  -0.106560965
## [45,]   0.12952549   0.092970123   0.139464232   0.08596758  -0.197647884
## [46,]  -0.12952549  -0.092970123  -0.139464232  -0.08596758   0.197647884
##                 [,27]         [,28]         [,29]          [,30]        [,31]
##   [1,]   0.12395719  -0.344419755   0.034425908  -0.0938181989  -0.31959061
##   [2,]   0.17634688   0.148547924   0.009851887   0.0351244249  -0.05576212
##   [3,]   0.40092347  -0.056321727  -0.153690330   0.0787606651  -0.17770465
##   [4,]   0.74674382   0.314994538   0.012344738   0.6237460852  -0.04066369
##   [5,]  -0.39932954  -0.277296405  -0.106091701  -0.3236308878  -0.12671778
##   [6,]  -0.07480148   0.349152205   0.635864279   0.1722490832   0.53779931
##   [7,]  -0.19438360   0.022684557  -0.135592137  -0.1768102593   0.13989308
##   [8,]   0.06997952  -0.312004741  -0.145713982  -0.1325424542  -0.32984742
##   [9,]  -0.18279135  -0.293503109  -0.034550593  -0.2151910946  -0.18976123
## [10,]  -0.26265777   0.018764498   0.080924174  -0.1119301557  -0.02311502
## [11,]   0.19978599   0.099891939  -0.035794065   0.0002649196  -0.52316177
## [12,]  -0.02771202  -0.030548313   0.166508571   0.1138440986   0.37033515
## [13,]  -0.05834389  -0.015100373  -0.161415570  -0.2043208202   0.20922707
## [14,]  -0.23290114  -0.060175277  -0.334676093  -0.3418640279   0.10913531
## [15,]  -0.01999705   0.010751064   0.143061772   0.2597383895   0.26578872
## [16,]  -0.21085664  -0.126706127   0.250791924   0.1847890976   0.36559641
## [17,]   0.09515579  -0.028439428   0.227110486   0.2349239371   0.31210506
## [18,]   0.16240835  -0.070587967   0.089013812   0.1241903926  -0.14782189
## [19,]   0.20712378   0.246982192   0.106902368   0.2444747632   0.24920479
## [20,]  -0.41771854  -0.222977278  -0.151201945  -0.5783517947  -0.02570321
## [21,]  -0.04380819   0.377190242   0.013389347   0.0480334435   0.28058787
## [22,]  -0.02490658   0.215477879   0.223237152   0.2254897503   0.33255593
## [23,]   0.24593072   0.061835223   0.203863080   0.2721826547  -0.07759050
## [24,]   0.13868021   0.396659154   0.032805292   0.1169649278   0.20556740
## [25,]   0.23044727   0.289232313   0.151308907   0.3285565623   0.23206384
## [26,]   0.10960696  -0.013683314   0.149610210   0.2018433733  -0.06315991
## [27,]   1.00000000  -0.238438015   0.092616120  -0.3955331985   0.19488247
## [28,]  -0.23843802   1.000000000  -0.161237226  -0.3521762221  -0.18011998
## [29,]   0.09261612  -0.161237226   1.000000000  -0.2158441760  -0.33539365
## [30,]  -0.39553320  -0.352176222  -0.215844176   1.0000000000  -0.12562535
## [31,]   0.19488247  -0.180119978  -0.335393653  -0.1256253460   1.00000000
## [32,]   0.12226254   0.310029388   0.201635730   0.2858183685   0.32928799
## [33,]   0.11994010   0.243323597  -0.048670257   0.1193920763   0.14749873
## [34,]   0.20692067  -0.019232820   0.151752728   0.2159826209  -0.09966379
## [35,]   0.16013419  -0.214498540   0.025691017  -0.0328675688  -0.05580768
## [36,]  -0.16013419   0.214498540  -0.025691017   0.0328675688   0.05580768
## [37,]  -0.05298940   0.084696811   0.274701286   0.1613948735   0.04354809
## [38,]   0.05298940  -0.084696811  -0.274701286  -0.1613948735  -0.04354809
## [39,]  -0.04042139   0.018823295   0.042340305   0.0417583932  -0.39713246
## [40,]   0.04042139  -0.018823295  -0.042340305  -0.0417583932   0.39713246
## [41,]  -0.34430438  -0.236612354   0.084640005  -0.0342155809   0.03193529
## [42,]   0.34430438   0.236612354  -0.084640005   0.0342155809  -0.03193529
```

```
## [43,]   0.14645167   0.065116830   0.026695180   0.0427270379  -0.50317972
## [44,]  -0.14645167  -0.065116830  -0.026695180  -0.0427270379   0.50317972
## [45,]  -0.10438299  -0.006449497   0.216449243   0.1182087340   0.11469775
## [46,]   0.10438299   0.006449497  -0.216449243  -0.1182087340  -0.11469775
##                 [,32]         [,33]         [,34]         [,35]         [,36]
##  [1,]   0.379066439   0.403008913  -0.55292004  -0.167246735   0.167246735
##  [2,]  -0.158952978  -0.327483431   0.18355791   0.006827459  -0.006827459
##  [3,]   0.131132034   0.050381848  -0.19986227   0.033632012  -0.033632012
##  [4,]  -0.170821295  -0.115724536  -0.25274429  -0.107548151   0.107548151
##  [5,]   0.494004479   0.394612992  -0.34123653   0.144624120  -0.144624120
##  [6,]  -0.301331383  -0.008658791   0.01745745  -0.044083487   0.044083487
##  [7,]  -0.542979474  -0.569810464   0.93415654   0.091284859  -0.091284859
##  [8,]   0.570292837   0.447469124  -0.65546689   0.039315974  -0.039315974
##  [9,]   0.306343693   0.289336139  -0.34854327  -0.149451041   0.149451041
## [10,]   0.274791927   0.284148304  -0.26387926  -0.135936472   0.135936472
## [11,]   0.022758966  -0.062076048   0.08375177  -0.138574740   0.138574740
## [12,]  -0.029999114   0.153318178  -0.23665006   0.109313146  -0.109313146
## [13,]   0.164123570   0.081556855  -0.03359551   0.087179894  -0.087179894
## [14,]  -0.110725139  -0.321299122   0.49165996   0.208349875  -0.208349875
## [15,]  -0.009849363   0.145484041  -0.24810174   0.049744027  -0.049744027
## [16,]   0.062989311   0.237266662  -0.31321483   0.037480774  -0.037480774
## [17,]  -0.134029429   0.050819924  -0.19528599  -0.171387987   0.171387987
## [18,]   0.577506651   0.574835990  -0.86715785  -0.092613083   0.092613083
## [19,]  -0.405009404  -0.308930811   0.39284759  -0.197697064   0.197697064
## [20,]   0.174452053   0.034854273   0.33049735  -0.105321381   0.105321381
## [21,]  -0.414745454  -0.448348139   0.63884799   0.182579549  -0.182579549
## [22,]  -0.442747730  -0.242240342   0.39175502   0.169317797  -0.169317797
## [23,]  -0.149669258   0.031370867  -0.04539839  -0.192431587   0.192431587
## [24,]  -0.374125112  -0.356935980   0.54600199   0.148943465  -0.148943465
## [25,]  -0.410448491  -0.278266608   0.27641328   0.010167056  -0.010167056
## [26,]   0.507224689   0.529259247  -0.85238031  -0.005889896   0.005889896
## [27,]   0.122262544   0.119940098   0.20692067   0.160134188  -0.160134188
## [28,]   0.310029388   0.243323597  -0.01923282  -0.214498540   0.214498540
## [29,]   0.201635730  -0.048670257   0.15175273   0.025691017  -0.025691017
## [30,]   0.285818369   0.119392076   0.21598262  -0.032867569   0.032867569
## [31,]   0.329287993   0.147498734  -0.09966379  -0.055807684   0.055807684
## [32,]   1.000000000  -0.391915015   0.50140062   0.055087440  -0.055087440
## [33,]  -0.391915015   1.000000000   0.56866269   0.109601724  -0.109601724
## [34,]   0.501400616   0.568662685   1.00000000  -0.050221397   0.050221397
## [35,]   0.055087440   0.109601724  -0.05022140   1.000000000   1.000000000
## [36,]  -0.055087440  -0.109601724   0.05022140   1.000000000   1.000000000
## [37,]   0.146735398   0.351042611  -0.34967908   0.068340607  -0.068340607
## [38,]  -0.146735398  -0.351042611   0.34967908  -0.068340607   0.068340607
## [39,]   0.099378330   0.108604346  -0.02112204   0.114789864  -0.114789864
## [40,]  -0.099378330  -0.108604346   0.02112204  -0.114789864   0.114789864
## [41,]   0.168742489   0.141769918  -0.07841684  -0.130377925   0.130377925
## [42,]  -0.168742489  -0.141769918   0.07841684   0.130377925  -0.130377925
## [43,]  -0.017216411  -0.070431142   0.08044827  -0.164848894   0.164848894
## [44,]   0.017216411   0.070431142  -0.08044827   0.164848894  -0.164848894
## [45,]   0.017476305  -0.142471966  -0.08611185   0.034177588  -0.034177588
## [46,]  -0.017476305   0.142471966   0.08611185  -0.034177588   0.034177588
##                 [,37]         [,38]         [,39]         [,40]         [,41]
##  [1,]  -0.156011647   0.156011647  -0.041237950   0.041237950  -0.107639346
##  [2,]   0.146533326  -0.146533326   0.165416369  -0.165416369  -0.032352684
```

```
## [3,]   0.282220331 -0.282220331 -0.056910891  0.056910891  0.073652280
## [4,]   0.137329420 -0.137329420  0.015578930 -0.015578930  0.138351084
## [5,]  -0.227953751  0.227953751 -0.065093429  0.065093429 -0.146046031
## [6,]  -0.164468893  0.164468893  0.007686382 -0.007686382  0.056808075
## [7,]   0.392147420 -0.392147420  0.016894854 -0.016894854  0.106037757
## [8,]  -0.164194749  0.164194749 -0.046448864  0.046448864 -0.078132251
## [9,]  -0.266113038  0.266113038  0.016128210 -0.016128210 -0.116407916
## [10,] -0.353372764  0.353372764  0.058386621 -0.058386621 -0.182095851
## [11,]  0.030364489 -0.030364489 -0.199992833  0.199992833  0.084841060
## [12,] -0.300656868  0.300656868  0.237973522 -0.237973522 -0.096124937
## [13,] -0.182389290  0.182389290  0.189500547 -0.189500547  0.113239784
## [14,]  0.589371814 -0.589371814  0.024072601 -0.024072601  0.005588387
## [15,] -0.242834066  0.242834066  0.082854301 -0.082854301 -0.051964038
## [16,] -0.181521898  0.181521898 -0.061506212  0.061506212 -0.227537331
## [17,] -0.116765898  0.116765898  0.215660129 -0.215660129  0.031776944
## [18,] -0.334458451  0.334458451 -0.033556981  0.033556981 -0.199092876
## [19,]  0.286086466 -0.286086466  0.094343425 -0.094343425  0.081015243
## [20,]  0.018511434 -0.018511434  0.072302794 -0.072302794 -0.023252402
## [21,]  0.161531245 -0.161531245  0.080005502 -0.080005502  0.147096966
## [22,] -0.034901382  0.034901382  0.045592282 -0.045592282  0.151558538
## [23,]  0.014243154 -0.014243154 -0.309753311  0.309753311  0.026730849
## [24,]  0.079785680 -0.079785680  0.087568928 -0.087568928  0.231006443
## [25,]  0.144873401 -0.144873401  0.075329106 -0.075329106  0.128258606
## [26,] -0.334877990  0.334877990 -0.028862436  0.028862436 -0.126440166
## [27,] -0.052989403  0.052989403 -0.040421391  0.040421391 -0.344304380
## [28,]  0.084696811 -0.084696811  0.018823295 -0.018823295 -0.236612354
## [29,]  0.274701286 -0.274701286  0.042340305 -0.042340305  0.084640005
## [30,]  0.161394874 -0.161394874  0.041758393 -0.041758393 -0.034215581
## [31,]  0.043548093 -0.043548093 -0.397132464  0.397132464  0.031935292
## [32,]  0.146735398 -0.146735398  0.099378330 -0.099378330  0.168742489
## [33,]  0.351042611 -0.351042611  0.108604346 -0.108604346  0.141769918
## [34,] -0.349679080  0.349679080 -0.021122039  0.021122039 -0.078416840
## [35,]  0.068340607 -0.068340607  0.114789864 -0.114789864 -0.130377925
## [36,] -0.068340607  0.068340607 -0.114789864  0.114789864  0.130377925
## [37,]  1.000000000  1.000000000 -0.022261433  0.022261433  0.001193478
## [38,]  1.000000000  1.000000000  0.022261433 -0.022261433 -0.001193478
## [39,] -0.022261433  0.022261433  1.000000000  1.000000000 -0.045372671
## [40,]  0.022261433 -0.022261433  1.000000000  1.000000000  0.045372671
## [41,]  0.001193478 -0.001193478 -0.045372671  0.045372671  1.000000000
## [42,] -0.001193478  0.001193478  0.045372671 -0.045372671  1.000000000
## [43,]  0.093011821 -0.093011821 -0.235337580  0.235337580  0.016710871
## [44,] -0.093011821  0.093011821  0.235337580 -0.235337580 -0.016710871
## [45,]  0.212981635 -0.212981635 -0.045077871  0.045077871 -0.284237605
## [46,] -0.212981635  0.212981635  0.045077871 -0.045077871  0.284237605
##              [,42]        [,43]        [,44]        [,45]        [,46]
## [1,]   0.107639346 -0.004759825  0.004759825 -0.053437001  0.053437001
## [2,]   0.032352684 -0.342194170  0.342194170 -0.403262569  0.403262569
## [3,]  -0.073652280 -0.019446682  0.019446682 -0.085377513  0.085377513
## [4,]  -0.138351084 -0.074071495  0.074071495 -0.049867087  0.049867087
## [5,]   0.146046031  0.151371341 -0.151371341 -0.089349215  0.089349215
## [6,]  -0.056808075  0.011645685 -0.011645685 -0.152916559  0.152916559
## [7,]  -0.106037757 -0.041002524  0.041002524  0.133003653 -0.133003653
## [8,]   0.078132251  0.014721201 -0.014721201 -0.072425130  0.072425130
## [9,]   0.116407916  0.005466069 -0.005466069  0.036850293 -0.036850293
```

```
## [10,]  0.182095851  0.007044720 -0.007044720  0.091772897 -0.091772897
## [11,] -0.084841060 -0.958654177  0.958654177 -0.005902718  0.005902718
## [12,]  0.096124937  0.581816036 -0.581816036  0.098453569 -0.098453569
## [13,] -0.113239784  0.621437020 -0.621437020  0.154627419 -0.154627419
## [14,] -0.005588387  0.351804660 -0.351804660  0.028392060 -0.028392060
## [15,]  0.051964038  0.383694066 -0.383694066 -0.173989894  0.173989894
## [16,]  0.227537331  0.598530146 -0.598530146 -0.211579693  0.211579693
## [17,] -0.031776944  0.326310891 -0.326310891  0.107806292 -0.107806292
## [18,]  0.199092876  0.086060367 -0.086060367 -0.146788273  0.146788273
## [19,] -0.081015243 -0.077733322  0.077733322 -0.014102321  0.014102321
## [20,]  0.023252402 -0.018307650  0.018307650  0.080308130 -0.080308130
## [21,] -0.147096966 -0.006724100  0.006724100  0.011218906 -0.011218906
## [22,] -0.151558538  0.082852681 -0.082852681  0.129525486 -0.129525486
## [23,] -0.026730849 -0.130259226  0.130259226  0.092970123 -0.092970123
## [24,] -0.231006443  0.006546578 -0.006546578  0.139464232 -0.139464232
## [25,] -0.128258606 -0.053071286  0.053071286  0.085967581 -0.085967581
## [26,]  0.126440166  0.106560965 -0.106560965 -0.197647884  0.197647884
## [27,]  0.344304380  0.146451672 -0.146451672 -0.104382989  0.104382989
## [28,]  0.236612354  0.065116830 -0.065116830 -0.006449497  0.006449497
## [29,] -0.084640005  0.026695180 -0.026695180  0.216449243 -0.216449243
## [30,]  0.034215581  0.042727038 -0.042727038  0.118208734 -0.118208734
## [31,] -0.031935292 -0.503179720  0.503179720  0.114697747 -0.114697747
## [32,] -0.168742489 -0.017216411  0.017216411  0.017476305 -0.017476305
## [33,] -0.141769918 -0.070431142  0.070431142 -0.142471966  0.142471966
## [34,]  0.078416840  0.080448274 -0.080448274 -0.086111853  0.086111853
## [35,]  0.130377925 -0.164848894  0.164848894  0.034177588 -0.034177588
## [36,] -0.130377925  0.164848894 -0.164848894 -0.034177588  0.034177588
## [37,] -0.001193478  0.093011821 -0.093011821  0.212981635 -0.212981635
## [38,]  0.001193478 -0.093011821  0.093011821 -0.212981635  0.212981635
## [39,]  0.045372671 -0.235337580  0.235337580 -0.045077871  0.045077871
## [40,] -0.045372671  0.235337580 -0.235337580  0.045077871 -0.045077871
## [41,]  1.000000000  0.016710871 -0.016710871 -0.284237605  0.284237605
## [42,]  1.000000000 -0.016710871  0.016710871  0.284237605 -0.284237605
## [43,] -0.016710871  1.000000000  1.000000000 -0.094068545  0.094068545
## [44,]  0.016710871  1.000000000  1.000000000  0.094068545 -0.094068545
## [45,]  0.284237605 -0.094068545  0.094068545  1.000000000  1.000000000
## [46,] -0.284237605  0.094068545 -0.094068545  1.000000000  1.000000000
##
## $p.value
##               [,1]         [,2]         [,3]         [,4]         [,5]
##  [1,] 0.000000e+00 0.404607980 9.517684e-01 8.202562e-01 8.742958e-02
##  [2,] 4.046080e-01 0.000000000 9.739095e-01 5.949378e-01 1.982744e-01
##  [3,] 9.517684e-01 0.973909487 0.000000e+00 2.535785e-05 4.051984e-02
##  [4,] 8.202562e-01 0.594937831 2.535785e-05 0.000000e+00 5.136396e-04
##  [5,] 8.742958e-02 0.198274351 4.051984e-02 5.136396e-04 0.000000e+00
##  [6,] 2.863784e-01 0.786395733 4.190530e-01 9.559600e-01 1.802977e-01
##  [7,] 1.731207e-04 0.539822869 4.862113e-01 2.466054e-01 9.630612e-03
##  [8,] 4.610821e-03 0.793653417 4.446399e-03 6.241531e-01 2.222775e-01
##  [9,] 1.254155e-03 0.753460277 1.744327e-02 1.442435e-02 3.794244e-03
## [10,] 4.671574e-02 0.961732767 4.108132e-06 3.064894e-03 2.557424e-02
## [11,] 7.755210e-01 0.039608050 6.021160e-01 5.780566e-01 3.561653e-01
## [12,] 3.810486e-01 0.799685275 8.084934e-01 6.859465e-01 9.151367e-01
## [13,] 7.247298e-01 0.107045251 9.771888e-01 3.826420e-01 1.191841e-01
## [14,] 1.533832e-01 0.698748998 3.088546e-01 6.341391e-02 5.243419e-01
```

```
## [15,] 8.647332e-01 0.742679547 4.779442e-01 4.742740e-01 9.303795e-01
## [16,] 2.119005e-01 0.004627478 8.673641e-01 9.780252e-01 2.632939e-01
## [17,] 2.507932e-01 0.763947407 9.237318e-01 2.784370e-01 2.176154e-01
## [18,] 4.014996e-04 0.259816309 1.904399e-01 2.505814e-01 1.240933e-02
## [19,] 3.986866e-03 0.277848793 2.598033e-01 3.020134e-02 3.236900e-03
## [20,] 2.298507e-01 0.496155479 3.071060e-01 2.763245e-05 1.433774e-01
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## [22,] 7.938608e-02 0.741495895 1.164846e-01 9.503871e-01 3.289110e-01
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## [32,] 1.070077e-02 0.0060671476 0.376615146 0.0225393453 1.162729e-02
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## [34,] 2.088010e-05 0.0164898489 0.789617736 0.0004730133 9.770321e-02
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## [36,] 2.794333e-01 0.3164267986 0.253851483 0.3789600970 9.523766e-01
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## [38,] 3.395147e-01 0.8375154155 0.933320218 0.6387768939 3.922684e-01
## [39,] 6.378499e-01 0.7887395455 0.062087913 0.6062940718 6.576842e-01
## [40,] 6.378499e-01 0.7887395455 0.062087913 0.6062940718 6.576842e-01
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## [42,] 3.849645e-01 0.3705513898 0.875209734 0.1689399422 4.493362e-01
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## [44,] 9.684936e-01 0.6258932723 0.442235561 0.9693250138 7.550710e-01
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## [46,] 9.474561e-01 0.4448326105 0.584177474 0.4103683264 6.129193e-01
##               [,26]        [,27]       [,28]        [,29]        [,30]
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##  [3,] 6.381215e-01 1.392603e-02 0.74057194 3.637794e-01 6.431063e-01
##  [4,] 3.482473e-01 1.111891e-07 0.05757339 9.421917e-01 3.714583e-05
##  [5,] 6.667958e-03 1.434589e-02 0.09659287 5.320046e-01 5.070743e-02
##  [6,] 7.617404e-01 6.599369e-01 0.03416794 2.345403e-05 3.079970e-01
##  [7,] 3.288852e-14 2.489744e-01 0.89398318 4.236112e-01 2.951655e-01
##  [8,] 1.043089e-04 6.806590e-01 0.06011550 3.894979e-01 4.342075e-01
##  [9,] 2.078583e-02 2.788663e-01 0.07788441 8.391271e-01 2.008700e-01
## [10,] 4.990323e-02 1.162833e-01 0.91222540 6.339820e-01 5.095403e-01
## [11,] 4.564451e-01 2.358047e-01 0.55637232 8.334171e-01 9.987584e-01
## [12,] 1.720290e-01 8.706671e-01 0.85755916 3.246401e-01 5.022810e-01
## [13,] 7.603572e-01 7.315957e-01 0.92931689 3.398653e-01 2.251204e-01
## [14,] 1.149073e-02 1.653745e-01 0.72349652 4.289935e-02 3.836217e-02
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## [34,] 2.173488e-11 2.191465e-01 0.91004352 3.699314e-01 1.991784e-01
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## [36,] 9.724008e-01 3.437637e-01 0.20235832 8.800282e-01 8.468684e-01
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## [38,] 4.276624e-02 7.554373e-01 0.61819854 9.988339e-02 3.399280e-01
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## [40,] 8.653462e-01 8.122443e-01 0.91195143 8.035017e-01 8.061505e-01
## [41,] 4.558435e-01 3.691356e-02 0.15854828 6.184350e-01 8.406668e-01
## [42,] 4.558435e-01 3.691356e-02 0.15854828 6.184350e-01 8.406668e-01
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## [44,] 5.301814e-01 3.870759e-01 0.70179226 8.753749e-01 8.017425e-01
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## [13,] 0.2139387358 0.3317161892 0.6313236477 8.435183e-01 0.6079008
## [14,] 0.5202342662 0.5141375210 0.0524930062 1.998558e-03 0.2159092
## [15,] 0.1118374237 0.9538630509 0.3902546392 1.387111e-01 0.7699986
## [16,] 0.0260696818 0.7111094078 0.1573662496 5.907610e-02 0.8256852
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## [40,] 0.0149420663 0.5584141169 0.5222783273 9.012485e-01 0.4987132
## [41,] 0.8511626419 0.3180980968 0.4025958381 6.445611e-01 0.4418162
## [42,] 0.8511626419 0.3180980968 0.4025958381 6.445611e-01 0.4418162
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## [44,] 0.0015015768 0.9194422344 0.6787080972 6.359845e-01 0.3295542
## [45,] 0.4990601703 0.9182302037 0.4002461065 6.123212e-01 0.8408415
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##  [3,] 8.433504e-01 9.057820e-02 0.0905782017 7.379531e-01 7.379531e-01
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##  [6,] 7.955799e-01 3.306858e-01 0.3306857786 9.639875e-01 9.639875e-01
##  [7,] 5.910396e-01 1.637253e-02 0.0163725273 9.209421e-01 9.209421e-01
##  [8,] 8.172909e-01 3.315036e-01 0.3315036363 7.848630e-01 7.848630e-01
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## [11,]   4.133894e-01  8.584076e-01 0.8584076071  2.353100e-01  2.353100e-01
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## [14,]   2.159092e-01  1.239751e-04 0.0001239751  8.875362e-01  8.875362e-01
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## [17,]   3.104585e-01  4.913008e-01 0.4913008066  1.998664e-01  1.998664e-01
## [18,]   5.856283e-01  4.304321e-02 0.0430432121  8.436956e-01  8.436956e-01
## [19,]   2.408399e-01  8.606095e-02 0.0860609474  5.786120e-01  5.786120e-01
## [20,]   5.350039e-01  9.134047e-01 0.9134046669  6.706449e-01  6.706449e-01
## [21,]   2.794333e-01  3.395147e-01 0.3395146796  6.378499e-01  6.378499e-01
## [22,]   3.164268e-01  8.375154e-01 0.8375154155  7.887395e-01  7.887395e-01
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## [24,]   3.789601e-01  6.387769e-01 0.6387768939  6.062941e-01  6.062941e-01
## [25,]   9.523766e-01  3.922684e-01 0.3922684073  6.576842e-01  6.576842e-01
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## [27,]   3.437637e-01  7.554373e-01 0.7554372967  8.122443e-01  8.122443e-01
## [28,]   2.023583e-01  6.181985e-01 0.6181985390  9.119514e-01  9.119514e-01
## [29,]   8.800282e-01  9.988339e-02 0.0998833874  8.035017e-01  8.035017e-01
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## [30,]   8.406668e-01 0.84066684 8.017425e-01 8.017425e-01  4.859245e-01
## [31,]   8.511626e-01 0.85116264 1.501577e-03 1.501577e-03  4.990602e-01
## [32,]   3.180981e-01 0.31809810 9.194422e-01 9.194422e-01  9.182302e-01
## [33,]   4.025958e-01 0.40259584 6.787081e-01 6.787081e-01  4.002461e-01
## [34,]   6.445611e-01 0.64456114 6.359845e-01 6.359845e-01  6.123212e-01
## [35,]   4.418162e-01 0.44181621 3.295542e-01 3.295542e-01  8.408415e-01
## [36,]   4.418162e-01 0.44181621 3.295542e-01 3.295542e-01  8.408415e-01
## [37,]   9.944065e-01 0.99440650 5.840081e-01 5.840081e-01  2.056449e-01
## [38,]   9.944065e-01 0.99440650 5.840081e-01 5.840081e-01  2.056449e-01
## [39,]   7.897342e-01 0.78973423 1.608696e-01 1.608696e-01  7.910700e-01
## [40,]   7.897342e-01 0.78973423 1.608696e-01 1.608696e-01  7.910700e-01
## [41,]   0.000000e+00        NaN 9.218003e-01 9.218003e-01  8.819897e-02
## [42,] 1.046515e-251 0.00000000 9.218003e-01 9.218003e-01  8.819897e-02
## [43,]   9.218003e-01 0.92180035 0.000000e+00 0.000000e+00  5.797241e-01
## [44,]   9.218003e-01 0.92180035 0.000000e+00 0.000000e+00  5.797241e-01
## [45,]   8.819897e-02 0.08819897 5.797241e-01 5.797241e-01  0.000000e+00
## [46,]   8.819897e-02 0.08819897 5.797241e-01 5.797241e-01 1.547064e-275
##             [,46]
##  [1,] 0.75343540
##  [2,] 0.01332871
##  [3,] 0.61536831
##  [4,] 0.76944497
##  [5,] 0.59896469
##  [6,] 0.36622878
##  [7,] 0.43259567
##  [8,] 0.67011917
##  [9,] 0.82857344
## [10,] 0.58904875
## [11,] 0.97234070
## [12,] 0.56209916
## [13,] 0.36082611
## [14,] 0.86752108
## [15,] 0.30305875
## [16,] 0.20871525
## [17,] 0.52535803
## [18,] 0.38597373
## [19,] 0.93397808
## [20,] 0.63657471
## [21,] 0.94745610
## [22,] 0.44483261
## [23,] 0.58417747
```

```
## [24,] 0.41036833
## [25,] 0.61291933
## [26,] 0.24095933
## [27,] 0.53866859
## [28,] 0.96977969
## [29,] 0.19818588
## [30,] 0.48592446
## [31,] 0.49906017
## [32,] 0.91823020
## [33,] 0.40024611
## [34,] 0.61232118
## [35,] 0.84084150
## [36,] 0.84084150
## [37,] 0.20564492
## [38,] 0.20564492
## [39,] 0.79106999
## [40,] 0.79106999
## [41,] 0.08819897
## [42,] 0.08819897
## [43,] 0.57972405
## [44,] 0.57972405
## [45,] 0.00000000
## [46,] 0.00000000
##
## $statistic
##               [,1]        [,2]        [,3]        [,4]        [,5]        [,6]
##  [1,]  0.00000000  0.84362520  0.06092130  0.22892946 -1.75835520  1.08262275
##  [2,]  0.84362520  0.00000000  0.03294011 -0.53660116  1.31135970  0.27308117
##  [3,]  0.06092130  0.03294011  0.00000000 -4.84816287  2.12726777  0.81771340
##  [4,]  0.22892946 -0.53660116 -4.84816287  0.00000000  3.82681774  0.05562111
##  [5,] -1.75835520  1.31135970  2.12726777  3.82681774  0.00000000  1.36714226
##  [6,]  1.08262275  0.27308117  0.81771340  0.05562111  1.36714226  0.00000000
##  [7,]  4.20246691 -0.61915645  0.70380369  1.17835324  2.73890977 -0.11505857
##  [8,] -3.02712822  0.26357455 -3.04101056 -0.49434229 -1.24259655  2.15555680
##  [9,] -3.50984003  0.31655684  2.49546599  2.57458633 -3.10132920  1.28748138
## [10,] -2.06177861  0.04832396  5.44952730  3.18172866 -2.33211037  0.30716965
## [11,]  0.28737347 -2.13764166 -0.52613025 -0.56146746  0.93505818  0.16185777
## [12,] -0.88715996  0.25569221  0.24421096 -0.40774211 -0.10733424  0.02151193
## [13,]  0.35498671  1.65412155  0.02879865  0.88416265 -1.59732377  0.04992812
## [14,]  1.45936171  0.39020597  1.03264173  1.91712483 -0.64311335  1.04737766
## [15,]  0.17160908  0.33091791 -0.71730822 -0.72334613  0.08799837 -1.12966573
## [16,] -1.27160017  3.02574802  0.16823849 -0.02774241 -1.13692486 -0.73475584
## [17,] -1.16777045  0.30265087  0.09642658 -1.10093983  1.25549846 -0.58949066
## [18,] -3.91277856  1.14539756 -1.33517129 -1.16830252 -2.63637924  0.25739852
## [19,]  3.08255174 -1.10231126 -1.14542931 -2.25923266  3.16124599 -1.29126163
## [20,]  1.22206276 -0.68773008  1.03643781  4.81960989 -1.49692440  0.23161830
## [21,]  5.33494777 -1.36235768  1.33469485  0.34638514  1.13136362 -1.28068286
## [22,]  1.80686977  0.33249888  1.60952938 -0.06266836  0.99012100 -1.54289509
## [23,] -1.54167816  0.57424587 -0.61784337 -1.84376659  3.33001832 -0.72306522
## [24,]  2.70919277 -0.76515521  0.76502209 -0.42245923  2.47755012 -1.56531584
## [25,]  2.29523476 -0.85733457 -1.21543858 -2.49594973  6.05392709 -1.20957961
## [26,] -3.44580014  1.10865221 -0.47445633 -0.95075728 -2.88442961  0.30557231
## [27,]  0.73904044  1.05989278  2.58908999  6.64218594 -2.57683921 -0.44377477
## [28,] -2.17040961  0.88868110 -0.33373357  1.96348711 -1.70746696  2.20434019
```

```
## [29,]  0.20378721  0.05828738 -0.92017681  0.07303802 -0.63120929  4.87408584
## [30,] -0.55749487  0.20792720  0.46740635  4.72109004 -2.02352539  1.03450157
## [31,] -1.99536922 -0.33040722 -1.06831841 -0.24076877 -0.75576487  3.77388912
## [32,]  2.42345074 -0.95248829  0.78254492 -1.02566764  3.36136461 -1.86960051
## [33,]  2.60516080 -2.05048835  0.29844204 -0.68926653  2.54075039 -0.05122802
## [34,] -3.92580934  1.10471357 -1.20674848 -1.54543073 -2.14769247  0.10329539
## [35,] -1.00358038  0.04039273  0.19908229 -0.63997538  0.86469870 -0.26105521
## [36,]  1.00358038 -0.04039273 -0.19908229  0.63997538 -0.86469870  0.26105521
## [37,] -0.93441911  0.87636254  1.74038533  0.82022306 -1.38505845 -0.98644423
## [38,]  0.93441911 -0.87636254 -1.74038533 -0.82022306  1.38505845  0.98644423
## [39,] -0.24417471  0.99228635 -0.33723594  0.09217738 -0.38591638  0.04547459
## [40,]  0.24417471 -0.99228635  0.33723594 -0.09217738  0.38591638 -0.04547459
## [41,] -0.64052440 -0.19150131  0.43691944  0.82644376 -0.87338458  0.33662471
## [42,]  0.64052440  0.19150131 -0.43691944 -0.82644376  0.87338458 -0.33662471
## [43,] -0.02815982 -2.15451784 -0.11506988 -0.43941999  0.90596439  0.06890148
## [44,]  0.02815982  2.15451784  0.11506988  0.43941999 -0.90596439 -0.06890148
## [45,] -0.31658990 -2.60711882 -0.50695122 -0.29538516 -0.53071977 -0.91543288
## [46,]  0.31658990  2.60711882  0.50695122  0.29538516  0.53071977  0.91543288
##                   [,7]         [,8]         [,9]        [,10]         [,11]        [,12]
##    [1,]   4.20246691  -3.02712822  -3.50984003  -2.06177861   0.287373471  -0.88715996
##    [2,]  -0.61915645   0.26357455   0.31655684   0.04832396  -2.137641662   0.25569221
##    [3,]   0.70380369  -3.04101056   2.49546599   5.44952730  -0.526130245   0.24421096
##    [4,]   1.17835324  -0.49434229   2.57458633   3.18172866  -0.561467464  -0.40774211
##    [5,]   2.73890977  -1.24259655  -3.10132920  -2.33211037   0.935058178  -0.10733424
##    [6,]  -0.11505857   2.15555680   1.28748138   0.30716965   0.161857771   0.02151193
##    [7,]   0.00000000   5.32811528   2.79336354   2.27597360  -0.196545185   1.12655081
##    [8,]   5.32811528   0.00000000  -1.38089830   0.12311408  -0.151333885  -0.55663238
##    [9,]   2.79336354  -1.38089830   0.00000000  -3.03721916   0.205819853  -0.49090158
## [10,]   2.27597360   0.12311408  -3.03721916   0.00000000   0.254625879  -0.74071247
## [11,]  -0.19654518  -0.15133388   0.20581985   0.25462588   0.000000000   4.52871586
## [12,]   1.12655081  -0.55663238  -0.49090158  -0.74071247   4.528715864   0.00000000
## [13,]   0.40676611  -0.34420142  -0.28648833  -0.01158137   3.760180973  -0.84311277
## [14,]  -3.31721148   2.08540929   0.56788069   0.49424275   2.353777058   0.84314602
## [15,]   1.39705083  -1.11681767   0.23418908   0.29255431   2.422349634  -1.30176108
## [16,]   1.53065748  -0.54366773  -0.47972523  -0.42929148   5.505331932  -2.51150792
## [17,]   0.77294558  -0.20195836  -0.26988617  -0.46871708   2.555470344  -2.49114756
## [18,]  14.67891484  -5.44023546  -2.30171606  -1.56832575   0.369015253  -0.77754413
## [19,]  -2.93249259   3.42582361   2.73729583   2.16454812  -0.344849923   0.07609423
## [20,]  -1.63161769  -0.03127121  -0.76718982  -0.68187514  -0.502918694   1.32834574
## [21,]  -4.73576232   6.03487727   2.15412346   0.91186955  -0.264115086   0.93093643
## [22,]  -2.92101924   3.93364484   0.97625958   1.32227794   0.807541200  -0.97260000
## [23,]  -0.05468892  -0.04208930   0.31893565   0.16527283  -0.340106353  -0.49347061
## [24,]  -3.81210992   3.71082043   4.09655057   0.69208341  -0.312367279   0.97507239
## [25,]  -2.22201273   1.30232087   2.61063375   1.75769331  -0.199211986  -0.57434751
## [26,]  12.24575647  -4.37453639  -2.42132575  -2.03101470   0.753067653  -1.39425513
## [27,]  -1.17235076   0.41502187  -1.09994030  -1.61044869   1.206268747  -0.16400951
## [28,]   0.13423819  -1.94282996  -1.81638481   0.11103182   0.593939393  -0.18081064
## [29,]  -0.80965124  -0.87135573  -0.20452618   0.48032922  -0.211896331   0.99902437
## [30,]  -1.06276755  -0.79111145  -1.30362916  -0.66637518   0.001567286   0.67791817
## [31,]   0.83583773  -2.06708990  -1.14341821  -0.13678687  -3.631712642   2.35863548
## [32,]  -3.82533529   4.10728953   1.90389095   1.69077970   0.134678744  -0.17755706
## [33,]  -4.10214410   2.96015305   1.78822232   1.75331509  -0.367956485   0.91789496
## [34,]  15.48643804  -5.13462872  -2.19996357  -1.61849719   0.497229069  -1.44097150
## [35,]   0.54231276   0.23277641  -0.89420700  -0.81174600  -0.827805907   0.65060413
```

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```
## [36,] -0.54231276 -0.23277641  0.89420700  0.81174600   0.827805907 -0.65060413
## [37,]  2.52198000 -0.98475438 -1.63323752 -2.23476254   0.179721610 -1.86499909
## [38,] -2.52198000  0.98475438  1.63323752  2.23476254  -0.179721610  1.86499909
## [39,]  0.09996557 -0.27509210  0.09542819  0.34601019  -1.207569654  1.44951246
## [40,] -0.09996557  0.27509210 -0.09542819 -0.34601019   1.207569654 -1.44951246
## [41,]  0.63088469 -0.46365402 -0.69339255 -1.09561135   0.503742727 -0.57132846
## [42,] -0.63088469  0.46365402  0.69339255  1.09561135  -0.503742727  0.57132846
## [43,] -0.24277837  0.08710124  0.03233818  0.04167816 -19.929724089  4.23212060
## [44,]  0.24277837 -0.08710124 -0.03233818 -0.04167816  19.929724089 -4.23212060
## [45,]  0.79391371 -0.42960104  0.21815745  0.54523670  -0.034921557  0.58530278
## [46,] -0.79391371  0.42960104 -0.21815745 -0.54523670   0.034921557 -0.58530278
##              [,13]        [,14]        [,15]        [,16]        [,17]       [,18]
##  [1,]  0.35498671  1.45936171  0.17160908 -1.27160017 -1.16777045  -3.9127786
##  [2,]  1.65412155  0.39020597  0.33091791  3.02574802  0.30265087   1.1453976
##  [3,]  0.02879865  1.03264173 -0.71730822  0.16823849  0.09642658  -1.3351713
##  [4,]  0.88416265  1.91712483 -0.72334613 -0.02774241 -1.10093983  -1.1683025
##  [5,] -1.59732377 -0.64311335  0.08799837 -1.13692486  1.25549846  -2.6363792
##  [6,]  0.04992812  1.04737766 -1.12966573 -0.73475584 -0.58949066   0.2573985
##  [7,]  0.40676611 -3.31721148  1.39705083  1.53065748  0.77294558  14.6789148
##  [8,] -0.34420142  2.08540929 -1.11681767 -0.54366773 -0.20195836  -5.4402355
##  [9,] -0.28648833  0.56788069  0.23418908 -0.47972523 -0.26988617  -2.3017161
## [10,] -0.01158137  0.49424275  0.29255431 -0.42929148 -0.46871708  -1.5683258
## [11,]  3.76018097  2.35377706  2.42234963  5.50533193  2.55547034   0.3690153
## [12,] -0.84311277  0.84314602 -1.30176108 -2.51150792 -2.49114756  -0.7775441
## [13,]  0.00000000 -1.28326376 -1.03150482 -0.92925421  0.55691296  -0.8418814
## [14,] -1.28326376  0.00000000  1.09547812  0.37629561  1.38516911   2.6701549
## [15,] -1.03150482  1.09547812  0.00000000 -1.79991712 -0.64212685  -1.5323165
## [16,] -0.92925421  0.37629561 -1.79991712  0.00000000 -1.69269977  -1.6280633
## [17,]  0.55691296  1.38516911 -0.64212685 -1.69269977  0.00000000  -0.2868196
## [18,] -0.84188141  2.67015493 -1.53231648 -1.62806326 -0.28681959   0.0000000
## [19,]  1.10435698 -0.13765607  0.09228548  0.52637629 -0.70238496   2.9209161
## [20,] -1.32027207 -1.55674330  0.38243137  1.71405608  1.76748298   1.3580175
## [21,] -0.51073507 -2.31669208  1.05712129  1.54799920  1.26400899   4.6826152
## [22,]  0.58731923 -0.50129440  0.59787459 -0.64888248 -1.09390221   3.3262608
## [23,]  2.06893926  1.48811383 -0.05155209 -0.78659059 -1.83205698   0.2638892
## [24,] -0.65854859 -1.65207422  0.15867232  1.72927528  0.95817806   3.6537241
## [25,]  1.48542914  0.57597942 -0.41854227  0.30002678 -1.44706619   2.3995664
## [26,] -0.30740461  2.66768742 -1.07839528 -2.38135936 -0.95528620  -8.7993071
## [27,] -0.34575609 -1.41682382 -0.11832783 -1.27613607  0.56551530   0.9737486
## [28,] -0.08934520 -0.35664805  0.06360783 -0.75569422 -0.16831800  -0.4186483
## [29,] -0.96763647 -2.10113621  0.85516125  1.53268819  1.37965554   0.5287116
## [30,] -1.23482823 -2.15216398  1.59124616  1.11238430  1.42984474   0.7404526
## [31,]  1.26582034  0.64953291  1.63109563  2.32376357  1.94352203  -0.8842404
## [32,]  0.98431566 -0.65911159 -0.05827244  0.37339127 -0.80014825   4.1850001
## [33,]  0.48410958 -2.00726070  0.86995095  1.44494968  0.30104372   4.1560624
## [34,] -0.19886599  3.34031010 -1.51516277 -1.95118295 -1.17800847 -10.3008654
## [35,]  0.51773444  1.26027196  0.29465441  0.22189516 -1.02917305  -0.5502714
## [36,] -0.51773444 -1.26027196 -0.29465441 -0.22189516  1.02917305   0.5502714
## [37,] -1.09743757  4.31604787 -1.48095385 -1.09204020 -0.69555433  -2.0995977
## [38,]  1.09743757 -4.31604787  1.48095385  1.09204020  0.69555433   2.0995977
## [39,]  1.14178887  0.14245671  0.49186384 -0.36456589  1.30660902  -0.1986376
## [40,] -1.14178887 -0.14245671 -0.49186384  0.36456589 -1.30660902   0.1986376
## [41,]  0.67427273  0.03306186 -0.30783930 -1.38238998  0.18808992  -1.2019108
## [42,] -0.67427273 -0.03306186  0.30783930  1.38238998 -0.18808992   1.2019108
```

```
## [43,]   4.69258373   2.22344140   2.45810761   4.42011090   2.04227001    0.5110360
## [44,]  -4.69258373  -2.22344140  -2.45810761  -4.42011090  -2.04227001   -0.5110360
## [45,]   0.92592437   0.16803744  -1.04528131  -1.28071681   0.64152951   -0.8779208
## [46,]  -0.92592437  -0.16803744   1.04528131   1.28071681  -0.64152951    0.8779208
##              [,19]        [,20]        [,21]        [,22]        [,23]         [,24]
##  [1,]   3.08255174   1.22206276   5.33494777   1.80686977  -1.54167816    2.70919277
##  [2,]  -1.10231126  -0.68773008  -1.36235768   0.33249888   0.57424587   -0.76515521
##  [3,]  -1.14542931   1.03643781   1.33469485   1.60952938  -0.61784337    0.76502209
##  [4,]  -2.25923266   4.81960989   0.34638514  -0.06266836  -1.84376659   -0.42245923
##  [5,]   3.16124599  -1.49692440   1.13136362   0.99012100   3.33001832    2.47755012
##  [6,]  -1.29126163   0.23161830  -1.28068286  -1.54289509  -0.72306522   -1.56531584
##  [7,]  -2.93249259  -1.63161769  -4.73576232  -2.92101924  -0.05468892   -3.81210992
##  [8,]   3.42582361  -0.03127121   6.03487727   3.93364484  -0.04208930    3.71082043
##  [9,]   2.73729583  -0.76718982   2.15412346   0.97625958   0.31893565    4.09655057
## [10,]   2.16454812  -0.68187514   0.91186955   1.32227794   0.16527283    0.69208341
## [11,]  -0.34484992  -0.50291869  -0.26411509   0.80754120  -0.34010635   -0.31236728
## [12,]   0.07609423   1.32834574   0.93093643  -0.97260000  -0.49347061    0.97507239
## [13,]   1.10435698  -1.32027207  -0.51073507   0.58731923   2.06893926   -0.65854859
## [14,]  -0.13765607  -1.55674330  -2.31669208  -0.50129440   1.48811383   -1.65207422
## [15,]   0.09228548   0.38243137   1.05712129   0.59787459  -0.05155209    0.15867232
## [16,]   0.52637629   1.71405608   1.54799920  -0.64888248  -0.78659059    1.72927528
## [17,]  -0.70238496   1.76748298   1.26400899  -1.09390221  -1.83205698    0.95817806
## [18,]   2.92091615   1.35801753   4.68261522   3.32626077   0.26388923    3.65372410
## [19,]   0.00000000   0.71510402  -2.55522035  -1.69964995  -0.55586134   -1.61743567
## [20,]   0.71510402   0.00000000  -0.80310168   1.09428909   2.22843061   -0.12001966
## [21,]  -2.55522035  -0.80310168   0.00000000  -2.29512827   1.45262042   -3.51301642
## [22,]  -1.69964995   1.09428909  -2.29512827   0.00000000  -0.28938697   -1.38183035
## [23,]  -0.55586134   2.22843061   1.45262042  -0.28938697   0.00000000    0.19041555
## [24,]  -1.61743567  -0.12001966  -3.51301642  -1.38183035   0.19041555    0.00000000
## [25,]  -2.56490703   1.44986373  -1.14863440  -1.34327565  -1.94206037   -1.55842490
## [26,]   2.77899976   1.95864750   4.17448295   2.30619678   0.18535989    3.97587808
## [27,]   1.25252207  -2.71992097  -0.25942181  -0.14739507   1.50104680    0.82844830
## [28,]   1.50788046  -1.35322053   2.40946043   1.30545104   0.36652350    2.55637713
## [29,]   0.63608803  -0.90492681   0.07921955   1.35488034   1.23194175    0.19418324
## [30,]   1.49159364  -4.19419944   0.28449807   1.36928043   1.67343378    0.69675635
## [31,]   1.52234411  -0.15211250   1.72945533   2.08616454  -0.46041963    1.24269341
## [32,]  -2.62062249   1.04814486  -2.69652285  -2.92125348  -0.89554256   -2.38667883
## [33,]  -1.92165817   0.20632602  -2.96742921  -1.47710694   0.18568394   -2.26056795
## [34,]   2.52730386   2.07166176   4.91266555   2.51899864  -0.26885769    3.85563798
## [35,]  -1.19314042  -0.62657455   1.09862182   1.01637248  -1.16012286    0.89110102
## [36,]   1.19314042   0.62657455  -1.09862182  -1.01637248   1.16012286   -0.89110102
## [37,]   1.76633650   0.10953389   0.96834847  -0.20660523   0.08427218    0.47352804
## [38,]  -1.76633650  -0.10953389  -0.96834847   0.20660523  -0.08427218   -0.47352804
## [39,]   0.56064386   0.42887157   0.47484107   0.27000835  -1.92731660    0.52006260
## [40,]  -0.56064386  -0.42887157  -0.47484107  -0.27000835   1.92731660   -0.52006260
## [41,]   0.48087334  -0.13760027   0.87980787   0.90711109   0.15819836    1.40464507
## [42,]  -0.48087334   0.13760027  -0.87980787  -0.90711109  -0.15819836   -1.40464507
## [43,]  -0.46127226  -0.10832767  -0.03978121   0.49185416  -0.77724613    0.03873091
## [44,]   0.46127226   0.10832767   0.03978121  -0.49185416   0.77724613   -0.03873091
## [45,]  -0.08343875   0.47664884   0.06637612   0.77279305   0.55241121    0.83322454
## [46,]   0.08343875  -0.47664884  -0.06637612  -0.77279305  -0.55241121   -0.83322454
##              [,25]        [,26]        [,27]        [,28]        [,29]         [,30]
##  [1,]   2.29523476  -3.44580014   0.7390404  -2.17040961   0.20378721   -0.557494867
##  [2,]  -0.85733457   1.10865221   1.0598928   0.88868110   0.05828738    0.207927202
```

```
##  [3,] -1.21543858 -0.47445633  2.5890900 -0.33373357 -0.92017681  0.467406351
##  [4,] -2.49594973 -0.95075728  6.6421859  1.96348711  0.07303802  4.721090036
##  [5,]  6.05392709 -2.88442961 -2.5768392 -1.70746696 -0.63120929 -2.023525385
##  [6,] -1.20957961  0.30557231 -0.4437748  2.20434019  4.87408584  1.034501572
##  [7,] -2.22201273 12.24575647 -1.1723508  0.13423819 -0.80965124 -1.062767550
##  [8,]  1.30232087 -4.37453639  0.4150219 -1.94282996 -0.87135573 -0.791111450
##  [9,]  2.61063375 -2.42132575 -1.0999403 -1.81638481 -0.20452618 -1.303629161
## [10,]  1.75769331 -2.03101470 -1.6104487  0.11103182  0.48032922 -0.666375182
## [11,] -0.19921199  0.75306765  1.2062687  0.59393939 -0.21189633  0.001567286
## [12,] -0.57434751 -1.39425513 -0.1640095 -0.18081064  0.99902437  0.677918169
## [13,]  1.48542914 -0.30740461 -0.3457561 -0.08934520 -0.96763647 -1.234828235
## [14,]  0.57597942  2.66768742 -1.4168238 -0.35664805 -2.10113621 -2.152163975
## [15,] -0.41854227 -1.07839528 -0.1183278  0.06360783  0.85516125  1.591246163
## [16,]  0.30002678 -2.38135936 -1.2761361 -0.75569422  1.53268819  1.112384305
## [17,] -1.44706619 -0.95528620  0.5655153 -0.16831800  1.37965554  1.429844737
## [18,]  2.39956635 -8.79930711  0.9737486 -0.41864834  0.52871159  0.740452553
## [19,] -2.56490703  2.77899976  1.2525221  1.50788046  0.63608803  1.491593636
## [20,]  1.44986373  1.95864750 -2.7199210 -1.35322053 -0.90492681 -4.194199435
## [21,] -1.14863440  4.17448295 -0.2594218  2.40946043  0.07921955  0.284498072
## [22,] -1.34327565  2.30619678 -0.1473951  1.30545104  1.35488034  1.369280431
## [23,] -1.94206037  0.18535989  1.5010468  0.36652350  1.23194175  1.673433783
## [24,] -1.55842490  3.97587808  0.8284483  2.55637713  0.19418324  0.696756348
## [25,]  0.00000000  2.10485138  1.4010541  1.78752203  0.90558196  2.058019222
## [26,]  2.10485138  0.00000000  0.6523740 -0.08095916  0.89518116  1.219215624
## [27,]  1.40105407  0.65237404  0.0000000 -1.45251209  0.55028956 -2.547772528
## [28,]  1.78752203 -0.08095916 -1.4525121  0.00000000 -0.96653880 -2.226122007
## [29,]  0.90558196  0.89518116  0.5502896 -0.96653880  0.00000000 -1.307778555
## [30,]  2.05801922  1.21921562 -2.5477725 -2.22612201 -1.30777855  0.000000000
## [31,]  1.41143972 -0.37440661  1.1754781 -1.08332228 -2.10621144 -0.749144475
## [32,] -2.66288979  3.48193722  0.7287824  1.92921695  1.21790819  1.764533903
## [33,] -1.71394150  3.69037943  0.7147348  1.48412700 -0.28827876  0.711421717
## [34,]  1.70157841 -9.64340046  1.2512388 -0.11380395  0.90830074  1.308658410
## [35,]  0.06015222 -0.03484570  0.9597520 -1.29923097  0.15204029 -0.194552273
## [36,] -0.06015222  0.03484570 -0.9597520  1.29923097 -0.15204029  0.194552273
## [37,]  0.86622106 -2.10256379 -0.3139306  0.50288006  1.69017646  0.967509079
## [38,] -0.86622106  2.10256379  0.3139306 -0.50288006 -1.69017646 -0.967509079
## [39,]  0.44692283 -0.17082364 -0.2393318  0.11137985  0.25071345  0.247261663
## [40,] -0.44692283  0.17082364  0.2393318 -0.11137985 -0.25071345 -0.247261663
## [41,]  0.76510735 -0.75408220 -2.1695848 -1.44072829  0.50254034 -0.202540699
## [42,] -0.76510735  0.75408220  2.1695848  1.44072829 -0.50254034  0.202540699
## [43,] -0.31441706  0.63403325  0.8758635  0.38605571  0.15798712  0.253007616
## [44,]  0.31441706 -0.63403325 -0.8758635 -0.38605571 -0.15798712 -0.253007616
## [45,]  0.51048090 -1.19283154 -0.6209301 -0.03815653  1.31162453  0.704270102
## [46,] -0.51048090  1.19283154  0.6209301  0.03815653 -1.31162453 -0.704270102
##            [,31]       [,32]       [,33]       [,34]       [,35]         [,36]
##  [1,] -1.9953692  2.42345074  2.60516080  -3.9258093 -1.00358038  1.003580e+00
##  [2,] -0.3304072 -0.95248829 -2.05048835   1.1047136  0.04039273 -4.039273e-02
##  [3,] -1.0683184  0.78254492  0.29844204  -1.2067485  0.19908229 -1.990823e-01
##  [4,] -0.2407688 -1.02566764 -0.68926653  -1.5454307 -0.63997538  6.399754e-01
##  [5,] -0.7557649  3.36136461  2.54075039  -2.1476925  0.86469870 -8.646987e-01
##  [6,]  3.7738891 -1.86960051 -0.05122802   0.1032954 -0.26105521  2.610552e-01
##  [7,]  0.8358377 -3.82533529 -4.10214410  15.4864380  0.54231276 -5.423128e-01
##  [8,] -2.0670899  4.10728953  2.96015305  -5.1346287  0.23277641 -2.327764e-01
##  [9,] -1.1434182  1.90389095  1.78822232  -2.1999636 -0.89420700  8.942070e-01
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## [10,] -0.1367869  1.69077970  1.75331509  -1.6184972 -0.81174600  8.117460e-01
## [11,] -3.6317126  0.13467874 -0.36795648   0.4972291 -0.82780591  8.278059e-01
## [12,]  2.3586355 -0.17755706  0.91789496  -1.4409715  0.65060413 -6.506041e-01
## [13,]  1.2658203  0.98431566  0.48410958  -0.1988660  0.51773444 -5.177344e-01
## [14,]  0.6495329 -0.65911159 -2.00726070   3.3403101  1.26027196 -1.260272e+00
## [15,]  1.6310956 -0.05827244  0.86995095  -1.5151628  0.29465441 -2.946544e-01
## [16,]  2.3237636  0.37339127  1.44494968  -1.9511830  0.22189516 -2.218952e-01
## [17,]  1.9435220 -0.80014825  0.30104372  -1.1780085 -1.02917305  1.029173e+00
## [18,] -0.8842404  4.18500011  4.15606241 -10.3008654 -0.55027136  5.502714e-01
## [19,]  1.5223441 -2.62062249 -1.92165817   2.5273039 -1.19314042  1.193140e+00
## [20,] -0.1521125  1.04814486  0.20632602   2.0716618 -0.62657455  6.265746e-01
## [21,]  1.7294553 -2.69652285 -2.96742921   4.9126656  1.09862182 -1.098622e+00
## [22,]  2.0861645 -2.92125348 -1.47710694   2.5189986  1.01637248 -1.016372e+00
## [23,] -0.4604196 -0.89554256  0.18568394  -0.2688577 -1.16012286  1.160123e+00
## [24,]  1.2426934 -2.38667883 -2.26056795   3.8556380  0.89110102 -8.911010e-01
## [25,]  1.4114397 -2.66288979 -1.71394150   1.7015784  0.06015222 -6.015222e-02
## [26,] -0.3744066  3.48193722  3.69037943  -9.6434005 -0.03484570  3.484570e-02
## [27,]  1.1754781  0.72878244  0.71473477   1.2512388  0.95975199 -9.597520e-01
## [28,] -1.0833223  1.92921695  1.48412700  -0.1138039 -1.29923097  1.299231e+00
## [29,] -2.1062114  1.21790819 -0.28827876   0.9083007  0.15204029 -1.520403e-01
## [30,] -0.7491445  1.76453390  0.71142172   1.3086584 -0.19455227  1.945523e-01
## [31,]  0.0000000  2.06315728  0.88226427  -0.5925692 -0.33067806  3.306781e-01
## [32,]  2.0631573  0.00000000 -2.52021403   3.4284255  0.32639731 -3.263973e-01
## [33,]  0.8822643 -2.52021403  0.00000000   4.0899260  0.65234253 -6.523425e-01
## [34,] -0.5925692  3.42842554  4.08992605   0.0000000 -0.29748919  2.974892e-01
## [35,] -0.3306781  0.32639731  0.65234253  -0.2974892  0.00000000  9.108295e+07
## [36,]  0.3306781 -0.32639731 -0.65234253   0.2974892         NaN  0.000000e+00
## [37,]  0.2578786  0.87759763  2.21794741  -2.2081296  0.40525595 -4.052560e-01
## [38,] -0.2578786 -0.87759763 -2.21794741   2.2081296 -0.40525595  4.052560e-01
## [39,] -2.5599983  0.59085503  0.64633501  -0.1249876  0.68362489 -6.836249e-01
## [40,]  2.5599983 -0.59085503 -0.64633501   0.1249876 -0.68362489  6.836249e-01
## [41,]  0.1890282  1.01281766  0.84727998  -0.4653533 -0.77796664  7.779666e-01
## [42,] -0.1890282 -1.01281766 -0.84727998   0.4653533  0.77796664 -7.779666e-01
## [43,] -3.4447050 -0.10186876 -0.41771359   0.4774860 -0.98878697  9.887870e-01
## [44,]  3.4447050  0.10186876  0.41771359  -0.4774860  0.98878697 -9.887870e-01
## [45,]  0.6830690  0.10340701 -0.85156244  -0.5113440  0.20231553 -2.023155e-01
## [46,] -0.6830690 -0.10340701  0.85156244   0.5113440 -0.20231553  2.023155e-01
##             [,37]         [,38]         [,39]         [,40]         [,41]
##  [1,] -9.344191e-01  0.934419112 -2.441747e-01  2.441747e-01 -6.405244e-01
##  [2,]  8.763625e-01 -0.876362537  9.922864e-01 -9.922864e-01 -1.915013e-01
##  [3,]  1.740385e+00 -1.740385330 -3.372359e-01  3.372359e-01  4.369194e-01
##  [4,]  8.202231e-01 -0.820223063  9.217738e-02 -9.217738e-02  8.264438e-01
##  [5,] -1.385058e+00  1.385058449 -3.859164e-01  3.859164e-01 -8.733846e-01
##  [6,] -9.864442e-01  0.986444226  4.547459e-02 -4.547459e-02  3.366247e-01
##  [7,]  2.521980e+00 -2.521980005  9.996557e-02 -9.996557e-02  6.308847e-01
##  [8,] -9.847544e-01  0.984754377 -2.750921e-01  2.750921e-01 -4.636540e-01
##  [9,] -1.633238e+00  1.633237518  9.542819e-02 -9.542819e-02 -6.933926e-01
## [10,] -2.234763e+00  2.234762542  3.460102e-01 -3.460102e-01 -1.095611e+00
## [11,]  1.797216e-01 -0.179721610 -1.207570e+00  1.207570e+00  5.037427e-01
## [12,] -1.864999e+00  1.864999090  1.449512e+00 -1.449512e+00 -5.713285e-01
## [13,] -1.097438e+00  1.097437573  1.141789e+00 -1.141789e+00  6.742727e-01
## [14,]  4.316048e+00 -4.316047873  1.424567e-01 -1.424567e-01  3.306186e-02
## [15,] -1.480954e+00  1.480953852  4.918638e-01 -4.918638e-01 -3.078393e-01
## [16,] -1.092040e+00  1.092040200 -3.645659e-01  3.645659e-01 -1.382390e+00
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## [17,] -6.955543e-01   0.695554331   1.306609e+00 -1.306609e+00   1.880899e-01
## [18,] -2.099598e+00   2.099597669 -1.986376e-01   1.986376e-01 -1.201911e+00
## [19,]  1.766337e+00 -1.766336503   5.606439e-01 -5.606439e-01   4.808733e-01
## [20,]  1.095339e-01 -0.109533891   4.288716e-01 -4.288716e-01 -1.376003e-01
## [21,]  9.683485e-01 -0.968348472   4.748411e-01 -4.748411e-01   8.798079e-01
## [22,] -2.066052e-01   0.206605232   2.700084e-01 -2.700084e-01   9.071111e-01
## [23,]  8.427218e-02 -0.084272182 -1.927317e+00   1.927317e+00   1.581984e-01
## [24,]  4.735280e-01 -0.473528037   5.200626e-01 -5.200626e-01   1.404645e+00
## [25,]  8.662211e-01 -0.866221059   4.469228e-01 -4.469228e-01   7.651074e-01
## [26,] -2.102564e+00   2.102563788 -1.708236e-01   1.708236e-01 -7.540822e-01
## [27,] -3.139306e-01   0.313930583 -2.393318e-01   2.393318e-01 -2.169585e+00
## [28,]  5.028801e-01 -0.502880055   1.113798e-01 -1.113798e-01 -1.440728e+00
## [29,]  1.690176e+00 -1.690176462   2.507134e-01 -2.507134e-01   5.025403e-01
## [30,]  9.675091e-01 -0.967509079   2.472617e-01 -2.472617e-01 -2.025407e-01
## [31,]  2.578786e-01 -0.257878632 -2.559998e+00   2.559998e+00   1.890282e-01
## [32,]  8.775976e-01 -0.877597630   5.908550e-01 -5.908550e-01   1.012818e+00
## [33,]  2.217947e+00 -2.217947406   6.463350e-01 -6.463350e-01   8.472800e-01
## [34,] -2.208130e+00   2.208129566 -1.249876e-01   1.249876e-01 -4.653533e-01
## [35,]  4.052560e-01 -0.405255954   6.836249e-01 -6.836249e-01 -7.779666e-01
## [36,] -4.052560e-01   0.405255954 -6.836249e-01   6.836249e-01   7.779666e-01
## [37,]  0.000000e+00             NaN -1.317331e-01   1.317331e-01   7.060717e-03
## [38,]  7.940428e+07   0.000000000   1.317331e-01 -1.317331e-01 -7.060717e-03
## [39,] -1.317331e-01   0.131733062   0.000000e+00   2.807365e+08 -2.687051e-01
## [40,]  1.317331e-01 -0.131733062   2.807365e+08   0.000000e+00   2.687051e-01
## [41,]  7.060717e-03 -0.007060717 -2.687051e-01   2.687051e-01   0.000000e+00
## [42,] -7.060717e-03   0.007060717   2.687051e-01 -2.687051e-01   8.278468e+07
## [43,]  5.526611e-01 -0.552661140 -1.432510e+00   1.432510e+00   9.887665e-02
## [44,] -5.526611e-01   0.552661140   1.432510e+00 -1.432510e+00 -9.887665e-02
## [45,]  1.289605e+00 -1.289604773 -2.669556e-01   2.669556e-01 -1.753915e+00
## [46,] -1.289605e+00   1.289604773   2.669556e-01 -2.669556e-01   1.753915e+00
##               [,42]         [,43]         [,44]         [,45]         [,46]
##  [1,]  0.640524401  -0.02815982   0.02815982 -3.165899e-01   0.31658990
##  [2,]  0.191501308  -2.15451784   2.15451784 -2.607119e+00   2.60711882
##  [3,] -0.436919443  -0.11506988   0.11506988 -5.069512e-01   0.50695122
##  [4,] -0.826443759  -0.43941999   0.43941999 -2.953852e-01   0.29538516
##  [5,]  0.873384579   0.90596439  -0.90596439 -5.307198e-01   0.53071977
##  [6,] -0.336624712   0.06890148  -0.06890148 -9.154329e-01   0.91543288
##  [7,] -0.630884691  -0.24277837   0.24277837  7.939137e-01  -0.79391371
##  [8,]  0.463654020   0.08710124  -0.08710124 -4.296010e-01   0.42960104
##  [9,]  0.693392553   0.03233818  -0.03233818  2.181574e-01  -0.21815745
## [10,]  1.095611348   0.04167816  -0.04167816  5.452367e-01  -0.54523670
## [11,] -0.503742727 -19.92972409  19.92972409 -3.492156e-02   0.03492156
## [12,]  0.571328459   4.23212060  -4.23212060  5.853028e-01  -0.58530278
## [13,] -0.674272731   4.69258373  -4.69258373  9.259244e-01  -0.92592437
## [14,] -0.033061860   2.22344140  -2.22344140  1.680374e-01  -0.16803744
## [15,]  0.307839297   2.45810761  -2.45810761 -1.045281e+00   1.04528131
## [16,]  1.382389981   4.42011090  -4.42011090 -1.280717e+00   1.28071681
## [17,] -0.188089924   2.04227001  -2.04227001  6.415295e-01  -0.64152951
## [18,]  1.201910839   0.51103598  -0.51103598 -8.779208e-01   0.87792083
## [19,] -0.480873336  -0.46127226   0.46127226 -8.343875e-02   0.08343875
## [20,]  0.137600270  -0.10832767   0.10832767  4.766488e-01  -0.47664884
## [21,] -0.879807872  -0.03978121   0.03978121  6.637612e-02  -0.06637612
## [22,] -0.907111094   0.49185416  -0.49185416  7.727930e-01  -0.77279305
## [23,] -0.158198364  -0.77724613   0.77724613  5.524112e-01  -0.55241121
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## [24,] -1.404645075    0.03873091 -0.03873091  8.332245e-01 -0.83322454
## [25,] -0.765107355   -0.31441706  0.31441706  5.104809e-01 -0.51048090
## [26,]  0.754082198    0.63403325 -0.63403325 -1.192832e+00  1.19283154
## [27,]  2.169584760    0.87586349 -0.87586349 -6.209301e-01  0.62093012
## [28,]  1.440728292    0.38605571 -0.38605571 -3.815653e-02  0.03815653
## [29,] -0.502540338    0.15798712 -0.15798712  1.311625e+00 -1.31162453
## [30,]  0.202540699    0.25300762 -0.25300762  7.042701e-01 -0.70427010
## [31,] -0.189028153   -3.44470503  3.44470503  6.830690e-01 -0.68306898
## [32,] -1.012817658   -0.10186876  0.10186876  1.034070e-01 -0.10340701
## [33,] -0.847279984   -0.41771359  0.41771359 -8.515624e-01  0.85156244
## [34,]  0.465353261    0.47748604 -0.47748604 -5.113440e-01  0.51134399
## [35,]  0.777966643   -0.98878697  0.98878697  2.023155e-01 -0.20231553
## [36,] -0.777966643    0.98878697 -0.98878697 -2.023155e-01  0.20231553
## [37,] -0.007060717    0.55266114 -0.55266114  1.289605e+00 -1.28960477
## [38,]  0.007060717   -0.55266114  0.55266114 -1.289605e+00  1.28960477
## [39,]  0.268705075   -1.43250981  1.43250981 -2.669556e-01  0.26695565
## [40,] -0.268705075    1.43250981 -1.43250981  2.669556e-01 -0.26695565
## [41,]          NaN    0.09887665 -0.09887665 -1.753915e+00  1.75391454
## [42,]  0.000000000   -0.09887665  0.09887665  1.753915e+00 -1.75391454
## [43,] -0.098876654    0.00000000         Inf -5.589958e-01  0.55899576
## [44,]  0.098876654           Inf  0.00000000  5.589958e-01 -0.55899576
## [45,]  1.753914535   -0.55899576  0.55899576  0.000000e+00         Inf
## [46,] -1.753914535    0.55899576 -0.55899576  3.970214e+08  0.00000000
##
## $n
## [1] 81
##
## $gp
## [1] 44
##
## $method
## [1] "pearson"

pcor(dodgers_dummies)

## $estimate
##                 [,1]         [,2]        [,3]         [,4]        [,5]         [,6]
##  [1,]  1.00000000  0.040455145 -0.13104565  0.02245206 -0.12395476  0.95316844
##  [2,]  0.04045515  1.000000000  0.10339036 -0.09982544  0.10319337 -0.06848618
##  [3,] -0.13104565  0.103390363  1.00000000  0.99406867 -0.99997444  0.42474039
##  [4,]  0.02245206 -0.099825445  0.99406867  1.00000000  0.99482078 -0.32376431
##  [5,] -0.12395476  0.103193368 -0.99997444  0.99482078  1.00000000  0.41825726
##  [6,]  0.95316844 -0.068486181  0.42474039 -0.32376431  0.41825726  1.00000000
##  [7,] -0.31881778 -0.080883339  0.89786270 -0.94041899  0.90098737  0.01722962
##  [8,] -0.25063920 -0.085643500  0.92688699 -0.96220917  0.92954668 -0.05388486
##  [9,]  0.58642718  0.056419748 -0.72616804  0.79663127 -0.73106467 -0.31398693
## [10,] -0.07203769  0.101599650 -0.99824088  0.99876788 -0.99863923  0.37031823
## [11,] -0.40737744 -0.073879170  0.85199920 -0.90388321  0.85572034  0.11209304
## [12,]  0.99999860 -0.040285614  0.12938375 -0.02077628  0.12229134 -0.95266016
## [13,] -0.90573093 -0.005297273  0.30150586 -0.40341076  0.30831466  0.73512402
## [14,] -0.27672619  0.106273194 -0.98892567  0.96691965 -0.98783938  0.55439598
## [15,] -0.99985812  0.042116237 -0.14772650  0.03928933 -0.14065197  0.95812771
## [16,]  0.80090424 -0.091649571  0.69858368 -0.61662346  0.69345038 -0.94449540
## [17,]  0.99566053 -0.049485741  0.22273419 -0.11539090  0.21575890 -0.97717717
```

```
## [18,]   0.51737090 -0.105602230   0.91618068 -0.86716159   0.91329211 -0.75195801
## [19,]  -0.48650379 -0.066761504   0.80238995 -0.86253521   0.80663608  0.19948479
## [20,]  -0.32292458 -0.080576503   0.89594519 -0.93893580   0.89909771  0.02156488
## [21,]  -0.99871847  0.045411489  -0.18105181  0.07302108  -0.17401614  0.96725357
## [22,]  -0.25411157  0.105974601  -0.99213454  0.97263644  -0.99121427  0.53472346
## [23,]   0.98050646 -0.020226127  -0.06630129  0.17442291  -0.07343306 -0.87516235
## [24,]   0.63480231  0.050769481  -0.68282322  0.75822720  -0.68802886 -0.37138587
## [25,]  -0.95416237  0.068213233  -0.42174730  0.32063692  -0.41525426  0.99999454
## [26,]  -0.92361922  0.075288908  -0.50104201  0.40395181  -0.49484213  0.99629334
## [27,]  -0.94698227  0.006520496   0.19441726 -0.29994314   0.20142508  0.80546394
## [28,]   0.85762190 -0.085579548   0.62223337 -0.53340648   0.61662085 -0.97299717
## [29,]  -0.38949076 -0.075372834   0.86204665 -0.91205333   0.86564803  0.09269392
## [30,]   0.43438905 -0.106692854   0.94988259 -0.91025123   0.94762343 -0.68646126
## [31,]   0.89858208 -0.079768656   0.55277664 -0.45886988   0.54680488 -0.98921239
## [32,]  -0.21363336  0.105300904  -0.99648505  0.98146416  -0.99586070  0.49908637
## [33,]  -0.38371803  0.106892008  -0.96577136  0.93183279  -0.96389222  0.64503618
## [34,]   0.26728148 -0.106156725   0.99033465 -0.96937661   0.98931776 -0.54620100
## [35,]  -0.29933389  0.106514725  -0.98514658  0.96062857  -0.98389377  0.57388822
## [36,]   0.29933389 -0.106514725   0.98514658 -0.96062857   0.98389377 -0.57388822
## [37,]  -0.31739934  0.106666423  -0.98170802  0.95517920  -0.98032178  0.58933640
## [38,]   0.31739934 -0.106666423   0.98170802 -0.95517920   0.98032178 -0.58933640
## [39,]  -0.95286537  0.008529546   0.17590823 -0.28192319   0.18294145  0.81648290
## [40,]   0.95286537 -0.008529546  -0.17590823  0.28192319  -0.18294145 -0.81648290
## [41,]  -0.90696687  0.078370378  -0.53642373  0.44145907  -0.53037647  0.99188050
## [42,]   0.90696687 -0.078370378   0.53642373 -0.44145907   0.53037647 -0.99188050
## [43,]   0.17867579  0.090121702  -0.95200843  0.97964834  -0.95417226  0.12726496
## [44,]  -0.17867579 -0.090121702   0.95200843 -0.97964834   0.95417226 -0.12726496
## [45,]   0.99606667 -0.049057247   0.21837305 -0.11094837   0.21139081 -0.97621760
## [46,]  -0.99606667  0.049057247  -0.21837305  0.11094837  -0.21139081  0.97621760
##               [,7]         [,8]         [,9]        [,10]        [,11]        [,12]
##  [1,]  -0.31881778 -0.25063920   0.58642718 -0.07203769  -0.40737744  0.99999860
##  [2,]  -0.08088334 -0.08564350   0.05641975  0.10159965  -0.07387917 -0.04028561
##  [3,]   0.89786270  0.92688699  -0.72616804 -0.99824088   0.85199920  0.12938375
##  [4,]  -0.94041899 -0.96220917   0.79663127  0.99876788  -0.90388321 -0.02077628
##  [5,]   0.90098737  0.92954668  -0.73106467 -0.99863923   0.85572034  0.12229134
##  [6,]   0.01722962 -0.05388486  -0.31398693  0.37031823   0.11209304 -0.95266016
##  [7,]   1.00000000 -0.99747051   0.95469625  0.92238662  -0.99548153  0.32040603
##  [8,]  -0.99747051  1.00000000   0.93112879  0.94750994  -0.98621391  0.25226152
##  [9,]   0.95469625  0.93112879   1.00000000 -0.76565264   0.97863949 -0.58778406
## [10,]   0.92238662  0.94750994  -0.76565264  1.00000000   0.88154063  0.07036577
## [11,]  -0.99548153 -0.98621391   0.97863949  0.88154063   1.00000000  0.40890764
## [12,]   0.32040603  0.25226152  -0.58778406  0.07036577   0.40890764  1.00000000
## [13,]  -0.69049792 -0.63733566   0.87446710  0.35750516  -0.75606241  0.90644011
## [14,]   0.82257745  0.86091744  -0.61609065 -0.97838689   0.76486400  0.27511509
## [15,]  -0.30280687 -0.23429662   0.57269973 -0.08882840  -0.39193605  0.99982848
## [16,]  -0.31220257 -0.37894133   0.01535104  0.65493202  -0.22058281 -0.79989944
## [17,]   0.22923078  0.15946225  -0.50850384  0.16454303   0.32062192 -0.99550315
## [18,]  -0.64615720 -0.69877243   0.38976794  0.89080813  -0.57076721 -0.51593577
## [19,]  -0.98319251 -0.96772807   0.99298031  0.83636196  -0.99608617  0.48796754
## [20,]  -0.99999060 -0.99715292   0.95597761  0.92070307  -0.99588391  0.32451050
## [21,]  -0.27043972 -0.20132292   0.54468101 -0.12242442  -0.36063479  0.99863223
## [22,]   0.83568860  0.87261292  -0.63439564 -0.98296772   0.77976274  0.25249006
## [23,]   0.49883626  0.43596844  -0.73415036 -0.12534292   0.57887975 -0.98083443
## [24,]   0.93473963  0.90711761  -0.99813326 -0.72493743   0.96425685 -0.63609655
```

```
## [25,] -0.02053259  0.05058580  0.31712171 -0.36724752 -0.11537517  0.95365937
## [26,]  0.06884234  0.13958101  0.23115253 -0.44885079 -0.02619882  0.92297543
## [27,] -0.60643465 -0.54838146  0.81557829  0.25223269 -0.67919667  0.94751947
## [28,] -0.21401841 -0.28291152 -0.08636439  0.57472569 -0.12029616 -0.85675867
## [29,] -0.99714393 -0.98925326  0.97444437  0.89057944 -0.99980984  0.39103401
## [30,] -0.71523097 -0.76309978  0.47485175  0.92967757 -0.64563604 -0.43287867
## [31,] -0.12942292 -0.19957916 -0.17151966  0.50239719 -0.03468138 -0.89784531
## [32,]  0.85782455  0.89218648 -0.66602177 -0.98976545  0.80514688  0.21199558
## [33,]  0.75292488  0.79779952 -0.52297388 -0.94869326  0.68703206  0.38216963
## [34,] -0.82811897 -0.86586913  0.62379174  0.98036927 -0.77114968 -0.26566592
## [35,]  0.80892421  0.84866774 -0.59732456 -0.97323279  0.74944361  0.29773416
## [36,] -0.80892421 -0.84866774  0.59732456  0.97323279 -0.74944361 -0.29773416
## [37,]  0.79761378  0.83847031 -0.58198675 -0.96869294  0.73673569  0.31580939
## [38,] -0.79761378 -0.83847031  0.58198675  0.96869294 -0.73673569 -0.31580939
## [39,] -0.59135160 -0.53253473  0.80453544  0.23396300 -0.66525293  0.95337257
## [40,]  0.59135160  0.53253473 -0.80453544 -0.23396300  0.66525293 -0.95337257
## [41,]  0.11006482  0.18043599  0.19069560 -0.48544345  0.01518903  0.90625959
## [42,] -0.11006482 -0.18043599 -0.19069560  0.48544345 -0.01518903 -0.90625959
## [43,]  0.98952880  0.99728538 -0.90174775 -0.96848033  0.97135220 -0.18032474
## [44,] -0.98952880 -0.99728538  0.90174775  0.96848033 -0.97135220  0.18032474
## [45,]  0.23358067  0.16387468 -0.51234876  0.16013109  0.32485390 -0.99591675
## [46,] -0.23358067 -0.16387468  0.51234876 -0.16013109 -0.32485390  0.99591675
##                 [,13]        [,14]        [,15]        [,16]        [,17]       [,18]
##   [1,] -0.905730933 -0.27672619 -0.99985812  0.80090424  0.99566053  0.5173709
##   [2,] -0.005297273  0.10627319  0.04211624 -0.09164957 -0.04948574 -0.1056022
##   [3,]  0.301505863 -0.98892567 -0.14772650  0.69858368  0.22273419  0.9161807
##   [4,] -0.403410758  0.96691965  0.03928933 -0.61662346 -0.11539090 -0.8671616
##   [5,]  0.308314660 -0.98783938 -0.14065197  0.69345038  0.21575890  0.9132921
##   [6,]  0.735124023  0.55439598  0.95812771 -0.94449540 -0.97717717 -0.7519580
##   [7,] -0.690497917  0.82257745 -0.30280687 -0.31220257  0.22923078 -0.6461572
##   [8,] -0.637335661  0.86091744 -0.23429662 -0.37894133  0.15946225 -0.6987724
##   [9,]  0.874467100 -0.61609065  0.57269973  0.01535104 -0.50850384  0.3897679
## [10,]  0.357505162 -0.97838689 -0.08882840  0.65493202  0.16454303  0.8908081
## [11,] -0.756062409  0.76486400 -0.39193605 -0.22058281  0.32062192 -0.5707672
## [12,]  0.906440111  0.27511509  0.99982848 -0.79989944 -0.99550315 -0.5159358
## [13,]  1.000000000  0.15666169 -0.89846275  0.47160369  0.86235688  0.1058817
## [14,]  0.156661690  1.00000000 -0.29287382  0.79704007  0.36495098  0.9655129
## [15,] -0.898462747 -0.29287382  1.00000000  0.81087709  0.99708683  0.5317125
## [16,]  0.471603692  0.79704007  0.81087709  1.00000000 -0.85315220 -0.9267879
## [17,]  0.862356883  0.36495098  0.99708683 -0.85315220  1.00000000 -0.5947627
## [18,]  0.105881736  0.96551285  0.53171254 -0.92678794 -0.59476269  1.0000000
## [19,] -0.810952887  0.70493194 -0.47171792 -0.13350911  0.40308835 -0.4959573
## [20,] -0.693627854  0.82010400 -0.30693652 -0.30808030  0.23344924 -0.6428418
## [21,] -0.883118769 -0.32500570 -0.99942928  0.83018307  0.99909436  0.5600184
## [22,]  0.179783410 -0.99972491 -0.27036728  0.78265606  0.34301389  0.9591408
## [23,]  0.971356593  0.08251803  0.97705759 -0.66763696 -0.95796657 -0.3391397
## [24,]  0.902460635 -0.56683430  0.62169677 -0.04574415 -0.56014272  0.3327967
## [25,] -0.737359604 -0.55164356 -0.95906843  0.94340495  0.97787360  0.7497762
## [26,] -0.674082813 -0.62393215 -0.92994494  0.96925445  0.95528204  0.8058767
## [27,] -0.993889139  0.04668444 -0.94143594  0.56605858  0.91297409  0.2149971
## [28,]  0.558795184  0.73152390  0.86616312 -0.99482044 -0.90175910 -0.8838102
## [29,] -0.743155435  0.77728075 -0.37392101 -0.23956123  0.30208974 -0.5866709
## [30,]  0.011664337  0.98575778  0.44949986 -0.88725157 -0.51632528 -0.9955461
## [31,]  0.627884511  0.67033080  0.90584613 -0.98243160 -0.93551783 -0.8404130
```

```
## [32,]   0.220573681 -0.99788220 -0.23005887   0.75606853   0.30361764   0.9465328
## [33,]   0.043862021 -0.99357331 -0.39921883   0.86027647   0.46798892   0.9887776
## [34,]  -0.166347611  0.99995184   0.28347542  -0.79107435  -0.35579569  -0.9629111
## [35,]   0.133302833 -0.99972132 -0.31536377   0.81107466   0.38682773   0.9713899
## [36,]  -0.133302833  0.99972132   0.31536377  -0.81107466  -0.38682773  -0.9713899
## [37,]   0.114458126 -0.99909275 -0.33332800   0.82203654   0.40426978   0.9757247
## [38,]  -0.114458126  0.99909275   0.33332800  -0.82203654  -0.40426978  -0.9757247
## [39,]  -0.991633906  0.02786278  -0.94761960   0.58148420   0.92049672   0.2333524
## [40,]   0.991633906 -0.02786278   0.94761960  -0.58148420  -0.92049672  -0.2333524
## [41,]  -0.642940171 -0.65573502  -0.91393321   0.97860617   0.94222805   0.8296866
## [42,]   0.642940171  0.65573502   0.91393321  -0.97860617  -0.94222805  -0.8296866
## [43,]   0.578864679 -0.89604096   0.16207680   0.44605448  -0.08633822   0.7495487
## [44,]  -0.578864679  0.89604096  -0.16207680  -0.44605448   0.08633822  -0.7495487
## [45,]   0.864612056  0.36078449   0.99741790  -0.85081120  -0.99999000  -0.5911623
## [46,]  -0.864612056 -0.36078449  -0.99741790   0.85081120   0.99999000   0.5911623
##               [,19]       [,20]       [,21]       [,22]       [,23]       [,24]
##  [1,]  -0.48650379 -0.32292458 -0.99871847 -0.25411157   0.98050646   0.63480231
##  [2,]  -0.06676150 -0.08057650  0.04541149  0.10597460  -0.02022613   0.05076948
##  [3,]   0.80238995  0.89594519 -0.18105181 -0.99213454  -0.06630129  -0.68282322
##  [4,]  -0.86253521 -0.93893580  0.07302108  0.97263644   0.17442291   0.75822720
##  [5,]   0.80663608  0.89909771 -0.17401614 -0.99121427  -0.07343306  -0.68802886
##  [6,]   0.19948479  0.02156488  0.96725357  0.53472346  -0.87516235  -0.37138587
##  [7,]  -0.98319251 -0.99999060 -0.27043972  0.83568860   0.49883626   0.93473963
##  [8,]  -0.96772807 -0.99715292 -0.20132292  0.87261292   0.43596844   0.90711761
##  [9,]   0.99298031  0.95597761  0.54468101 -0.63439564  -0.73415036  -0.99813326
## [10,]   0.83636196  0.92070307 -0.12242442 -0.98296772  -0.12534292  -0.72493743
## [11,]  -0.99608617 -0.99588391 -0.36063479  0.77976274   0.57887975   0.96425685
## [12,]   0.48796754  0.32451050  0.99863223  0.25249006  -0.98083443  -0.63609655
## [13,]  -0.81095289 -0.69362785 -0.88311877  0.17978341   0.97135659   0.90246063
## [14,]   0.70493194  0.82010400 -0.32500570 -0.99972491   0.08251803  -0.56683430
## [15,]  -0.47171792 -0.30693652 -0.99942928 -0.27036728   0.97705759   0.62169677
## [16,]  -0.13350911 -0.30808030  0.83018307  0.78265606  -0.66763696  -0.04574415
## [17,]   0.40308835  0.23344924  0.99909436  0.34301389  -0.95796657  -0.56014272
## [18,]  -0.49595729 -0.64284182  0.56001842  0.95914076  -0.33913969   0.33279675
## [19,]   1.00000000 -0.98397491 -0.44166298  0.72137365   0.64868643   0.98390288
## [20,]  -0.98397491  1.00000000 -0.27461167  0.83329936   0.50258963   0.93627159
## [21,]  -0.44166298 -0.27461167  1.00000000 -0.30273516   0.96930560   0.59488331
## [22,]   0.72137365  0.83329936 -0.30273516  1.00000000   0.05912090  -0.58600087
## [23,]   0.64868643  0.50258963  0.96930560  0.05912090   1.00000000  -0.77424815
## [24,]   0.98390288  0.93627159  0.59488331 -0.58600087  -0.77424815   1.00000000
## [25,]  -0.20272087 -0.02486756 -0.96808678 -0.53192894   0.87675594   0.37445113
## [26,]  -0.11445345  0.06451591 -0.94183516 -0.60543138   0.83029900   0.29014073
## [27,]  -0.74141098 -0.60987670 -0.92950822  0.07010045   0.99165067   0.84939593
## [28,]  -0.03207970 -0.20978080  0.88255086  0.71533107  -0.73985442  -0.14704871
## [29,]  -0.99417313 -0.99746204 -0.34237776  0.79182337   0.56286854   0.95890640
## [30,]  -0.57561242 -0.71219382  0.47941856  0.98154224  -0.24894060   0.42021642
## [31,]   0.05378870 -0.12512210  0.91963870  0.65274175  -0.79484604  -0.23136814
## [32,]   0.74957521  0.85558799 -0.26280172 -0.99913333   0.01751817  -0.61922161
## [33,]   0.62011838  0.75006420 -0.42996260 -0.99064516   0.19479218  -0.46994150
## [34,]  -0.71185927 -0.82568059  0.31570821  0.99990695  -0.07273288   0.57489263
## [35,]   0.68799186  0.80636737 -0.34724026 -0.99889263   0.10602121  -0.54722840
## [36,]  -0.68799186 -0.80636737  0.34724026  0.99889263  -0.10602121   0.54722840
## [37,]   0.67408629  0.79499090 -0.36498615 -0.99781905   0.12488521  -0.53123528
## [38,]  -0.67408629 -0.79499090  0.36498615  0.99781905  -0.12488521   0.53123528
```

```
## [39,] -0.72864095 -0.59484271 -0.93628933  0.05130043  0.99390347  0.83930555
## [40,]  0.72864095  0.59484271  0.93628933 -0.05130043 -0.99390347 -0.83930555
## [41,] -0.07324773  0.10575406 -0.92712182 -0.63784675  0.80652623  0.25029260
## [42,]  0.07324773 -0.10575406  0.92712182  0.63784675 -0.80652623 -0.25029260
## [43,]  0.94654568  0.98889364  0.12865069 -0.90620755 -0.36851773 -0.87366452
## [44,] -0.94654568 -0.98889364 -0.12865069  0.90620755  0.36851773  0.87366452
## [45,]  0.40717622  0.23779460  0.99927462  0.33881049 -0.95923971 -0.56384108
## [46,] -0.40717622 -0.23779460 -0.99927462 -0.33881049  0.95923971  0.56384108
##              [,25]       [,26]        [,27]       [,28]       [,29]       [,30]
##  [1,] -0.95416237 -0.92361922 -0.946982266  0.85762190 -0.38949076  0.43438905
##  [2,]  0.06821323  0.07528891  0.006520496 -0.08557955 -0.07537283 -0.10669285
##  [3,] -0.42174730 -0.50104201  0.194417265  0.62223337  0.86204665  0.94988259
##  [4,]  0.32063692  0.40395181 -0.299943139 -0.53340648 -0.91205333 -0.91025123
##  [5,] -0.41525426 -0.49484213  0.201425077  0.61662085  0.86564803  0.94762343
##  [6,]  0.99999454  0.99629334  0.805463939 -0.97299717  0.09269392 -0.68646126
##  [7,] -0.02053259  0.06884234 -0.606434649 -0.21401841 -0.99714393 -0.71523097
##  [8,]  0.05058580  0.13958101 -0.548381456 -0.28291152 -0.98925326 -0.76309978
##  [9,]  0.31712171  0.23115253  0.815578292 -0.08636439  0.97444437  0.47485175
## [10,] -0.36724752 -0.44885079  0.252232694  0.57472569  0.89057944  0.92967757
## [11,] -0.11537517 -0.02619882 -0.679196673 -0.12029616 -0.99980984 -0.64563604
## [12,]  0.95365937  0.92297543  0.947519466 -0.85675867  0.39103401 -0.43287867
## [13,] -0.73735960 -0.67408281 -0.993889139  0.55879518 -0.74315543  0.01166434
## [14,] -0.55164356 -0.62393215  0.046684444  0.73152390  0.77728075  0.98575778
## [15,] -0.95906843 -0.92994494 -0.941435943  0.86616312 -0.37392101  0.44949986
## [16,]  0.94340495  0.96925445  0.566058582 -0.99482044 -0.23956123 -0.88725157
## [17,]  0.97787360  0.95528204  0.912974092 -0.90175910  0.30208974 -0.51632528
## [18,]  0.74977616  0.80587665  0.214997095 -0.88381015 -0.58667094 -0.99554612
## [19,] -0.20272087 -0.11445345 -0.741410979 -0.03207970 -0.99417313 -0.57561242
## [20,] -0.02486756  0.06451591 -0.609876701 -0.20978080 -0.99746204 -0.71219382
## [21,] -0.96808678 -0.94183516 -0.929508224  0.88255086 -0.34237776  0.47941856
## [22,] -0.53192894 -0.60543138  0.070100453  0.71533107  0.79182337  0.98154224
## [23,]  0.87675594  0.83029900  0.991650668 -0.73985442  0.56286854 -0.24894060
## [24,]  0.37445113  0.29014073  0.849395932 -0.14704871  0.95890640  0.42021642
## [25,]  1.00000000 -0.99600372 -0.807417383  0.97222934 -0.09598275  0.68405527
## [26,] -0.99600372  1.00000000 -0.751498539  0.98924568 -0.00669982  0.74646826
## [27,] -0.80741738 -0.75149854  1.000000000  0.64692162 -0.66475485  0.12196843
## [28,]  0.97222934  0.98924568  0.646921615  1.00000000 -0.13963238 -0.83576726
## [29,] -0.09598275 -0.00669982 -0.664754853 -0.13963238  1.00000000 -0.66040489
## [30,]  0.68405527  0.74646826  0.121968428 -0.83576726 -0.66040489  1.00000000
## [31,]  0.98872305  0.99814677  0.709959311 -0.99631287 -0.05416376 -0.78557743
## [32,] -0.49622093 -0.57177799  0.111561601  0.68562465  0.81655917  0.97273111
## [33,] -0.64250823 -0.70837826 -0.066682660  0.80399769  0.70107116  0.99845801
## [34,]  0.54343078  0.61623215 -0.056486150 -0.72479688 -0.78341824 -0.98405976
## [35,] -0.57117969 -0.64220639  0.023090487  0.74741546  0.76221190  0.98945304
## [36,]  0.57117969  0.64220639 -0.023090487 -0.74741546 -0.76221190 -0.98945304
## [37,] -0.58666428 -0.65664713  0.004101237  0.75989691  0.74978160  0.99202541
## [38,]  0.58666428  0.65664713 -0.004101237 -0.75989691 -0.74978160 -0.99202541
## [39,] -0.81838582 -0.76379063 -0.999822626  0.66116880 -0.65056684  0.14064010
## [40,]  0.81838582  0.76379063  0.999822626 -0.66116880  0.65056684 -0.14064010
## [41,] -0.99145496 -0.99914350 -0.723555311  0.99445071  0.03468460  0.77336377
## [42,]  0.99145496  0.99914350  0.723555311 -0.99445071 -0.03468460 -0.77336377
## [43,] -0.12398757 -0.21211464  0.485318510  0.35276866  0.97580173  0.80861608
## [44,]  0.12398757  0.21211464 -0.485318510 -0.35276866 -0.97580173 -0.80861608
## [45,]  0.97692846  0.95395037  0.914789310 -0.89981744  0.30634906 -0.51249098
```

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## [46,] -0.97692846 -0.95395037 -0.914789310  0.89981744 -0.30634906  0.51249098
##              [,31]       [,32]       [,33]       [,34]       [,35]       [,36]
##  [1,]  0.89858208 -0.21363336 -0.38371803  0.26728148 -0.299333893  0.299333893
##  [2,] -0.07976866  0.10530090  0.10689201 -0.10615672  0.106514725 -0.106514725
##  [3,]  0.55277664 -0.99648505 -0.96577136  0.99033465 -0.985146576  0.985146576
##  [4,] -0.45886988  0.98146416  0.93183279 -0.96937661  0.960628570 -0.960628570
##  [5,]  0.54680488 -0.99586070 -0.96389222  0.98931776 -0.983893772  0.983893772
##  [6,] -0.98921239  0.49908637  0.64503618 -0.54620100  0.573888220 -0.573888220
##  [7,] -0.12942292  0.85782455  0.75292488 -0.82811897  0.808924205 -0.808924205
##  [8,] -0.19957916  0.89218648  0.79779952 -0.86586913  0.848667745 -0.848667745
##  [9,] -0.17151966 -0.66602177 -0.52297388  0.62379174 -0.597324560  0.597324560
## [10,]  0.50239719 -0.98976545 -0.94869326  0.98036927 -0.973232786  0.973232786
## [11,] -0.03468138  0.80514688  0.68703206 -0.77114968  0.749443613 -0.749443613
## [12,] -0.89784531  0.21199558  0.38216963 -0.26566592  0.297734156 -0.297734156
## [13,]  0.62788451  0.22057368  0.04386202 -0.16634761  0.133302833 -0.133302833
## [14,]  0.67033080 -0.99788220 -0.99357331  0.99995184 -0.999721323  0.999721323
## [15,]  0.90584613 -0.23005887 -0.39921883  0.28347542 -0.315363766  0.315363766
## [16,] -0.98243160  0.75606853  0.86027647 -0.79107435  0.811074656 -0.811074656
## [17,] -0.93551783  0.30361764  0.46798892 -0.35579569  0.386827731 -0.386827731
## [18,] -0.84041295  0.94653277  0.98877755 -0.96291105  0.971389915 -0.971389915
## [19,]  0.05378870  0.74957521  0.62011838 -0.71185927  0.687991859 -0.687991859
## [20,] -0.12512210  0.85558799  0.75006420 -0.82568059  0.806367369 -0.806367369
## [21,]  0.91963870 -0.26280172 -0.42996260  0.31570821 -0.347240257  0.347240257
## [22,]  0.65274175 -0.99913333 -0.99064516  0.99990695 -0.998892626  0.998892626
## [23,] -0.79484604  0.01751817  0.19479218 -0.07273288  0.106021215 -0.106021215
## [24,] -0.23136814 -0.61922161 -0.46994150  0.57489263 -0.547228401  0.547228401
## [25,]  0.98872305 -0.49622093 -0.64250823  0.54343078 -0.571179690  0.571179690
## [26,]  0.99814677 -0.57177799 -0.70837826  0.61623215 -0.642206388  0.642206388
## [27,]  0.70995931  0.11156160 -0.06668266 -0.05648615  0.023090487 -0.023090487
## [28,] -0.99631287  0.68562465  0.80399769 -0.72479688  0.747415457 -0.747415457
## [29,] -0.05416376  0.81655917  0.70107116 -0.78341824  0.762211899 -0.762211899
## [30,] -0.78557743  0.97273111  0.99845801 -0.98405976  0.989453040 -0.989453040
## [31,]  1.00000000  0.62064228  0.75001719 -0.66301542  0.687661625 -0.687661625
## [32,]  0.62064228  1.00000000 -0.98410642  0.99847256 -0.996068575  0.996068575
## [33,]  0.75001719 -0.98410642  1.00000000  0.99241452 -0.995968472  0.995968472
## [34,] -0.66301542  0.99847256  0.99241452  1.00000000  0.999441480 -0.999441480
## [35,]  0.68766163 -0.99606858 -0.99596847  0.99944148  1.000000000  1.000000000
## [36,] -0.68766163  0.99606858  0.99596847 -0.99944148  1.000000000  1.000000000
## [37,]  0.70132506 -0.99420670 -0.99749236  0.99862665 -0.999819671  0.999819671
## [38,] -0.70132506  0.99420670  0.99749236 -0.99862665  0.999819671 -0.999819671
## [39,]  0.72309703  0.09282546 -0.08546283 -0.03767228  0.004257492 -0.004257492
## [40,] -0.72309703 -0.09282546  0.08546283  0.03767228 -0.004257492  0.004257492
## [41,]  0.99980991 -0.60523644 -0.73697863  0.64829346 -0.673375122  0.673375122
## [42,] -0.99980991  0.60523644  0.73697863 -0.64829346  0.673375122 -0.673375122
## [43,]  0.27118936 -0.92302231 -0.84002903  0.90035522 -0.885310556  0.885310556
## [44,] -0.27118936  0.92302231  0.84002903 -0.90035522  0.885310556 -0.885310556
## [45,] -0.93392888  0.29935444  0.46403286 -0.35161348  0.382700702 -0.382700702
## [46,]  0.93392888 -0.29935444 -0.46403286  0.35161348 -0.382700702  0.382700702
##              [,37]       [,38]       [,39]       [,40]       [,41]
##  [1,] -0.317399335  0.317399335 -0.952865368  0.952865368 -0.90696687
##  [2,]  0.106666423 -0.106666423  0.008529546 -0.008529546  0.07837038
##  [3,] -0.981708021  0.981708021  0.175908231 -0.175908231 -0.53642373
##  [4,]  0.955179196 -0.955179196 -0.281923185  0.281923185  0.44145907
##  [5,] -0.980321779  0.980321779  0.182941450 -0.182941450 -0.53037647
```

```
##  [6,]   0.589336404 -0.589336404  0.816482896 -0.816482896  0.99188050
##  [7,]   0.797613778 -0.797613778 -0.591351605  0.591351605  0.11006482
##  [8,]   0.838470315 -0.838470315 -0.532534730  0.532534730  0.18043599
##  [9,]  -0.581986753  0.581986753  0.804535443 -0.804535443  0.19069560
## [10,]  -0.968692938  0.968692938  0.233962998 -0.233962998 -0.48544345
## [11,]   0.736735693 -0.736735693 -0.665252927  0.665252927  0.01518903
## [12,]   0.315809390 -0.315809390  0.953372568 -0.953372568  0.90625959
## [13,]   0.114458126 -0.114458126 -0.991633906  0.991633906 -0.64294017
## [14,]  -0.999092750  0.999092750  0.027862778 -0.027862778 -0.65573502
## [15,]  -0.333327995  0.333327995 -0.947619602  0.947619602 -0.91393321
## [16,]   0.822036544 -0.822036544  0.581484203 -0.581484203  0.97860617
## [17,]   0.404269779 -0.404269779  0.920496724 -0.920496724  0.94222805
## [18,]   0.975724721 -0.975724721  0.233352444 -0.233352444  0.82968660
## [19,]   0.674086293 -0.674086293 -0.728640947  0.728640947 -0.07324773
## [20,]   0.794990899 -0.794990899 -0.594842712  0.594842712  0.10575406
## [21,]  -0.364986150  0.364986150 -0.936289329  0.936289329 -0.92712182
## [22,]  -0.997819046  0.997819046  0.051300431 -0.051300431 -0.63784675
## [23,]   0.124885215 -0.124885215  0.993903471 -0.993903471  0.80652623
## [24,]  -0.531235281  0.531235281  0.839305554 -0.839305554  0.25029260
## [25,]  -0.586664280  0.586664280 -0.818385817  0.818385817 -0.99145496
## [26,]  -0.656647133  0.656647133 -0.763790634  0.763790634 -0.99914350
## [27,]   0.004101237 -0.004101237 -0.999822626  0.999822626 -0.72355531
## [28,]   0.759896914 -0.759896914  0.661168797 -0.661168797  0.99445071
## [29,]   0.749781602 -0.749781602 -0.650566844  0.650566844  0.03468460
## [30,]   0.992025412 -0.992025412  0.140640100 -0.140640100  0.77336377
## [31,]   0.701325064 -0.701325064  0.723097034 -0.723097034  0.99980991
## [32,]  -0.994206703  0.994206703  0.092825463 -0.092825463 -0.60523644
## [33,]  -0.997492362  0.997492362 -0.085462833  0.085462833 -0.73697863
## [34,]   0.998626649 -0.998626649 -0.037672281  0.037672281  0.64829346
## [35,]  -0.999819671  0.999819671  0.004257492 -0.004257492 -0.67337512
## [36,]   0.999819671 -0.999819671 -0.004257492  0.004257492  0.67337512
## [37,]   1.000000000  1.000000000 -0.014733253  0.014733253 -0.68729313
## [38,]   1.000000000  1.000000000  0.014733253 -0.014733253  0.68729313
## [39,]  -0.014733253  0.014733253  1.000000000  1.000000000 -0.73642739
## [40,]   0.014733253 -0.014733253  1.000000000  1.000000000  0.73642739
## [41,]  -0.687293130  0.687293130 -0.736427394  0.736427394  1.00000000
## [42,]   0.687293130 -0.687293130  0.736427394 -0.736427394  1.00000000
## [43,]  -0.876320484  0.876320484  0.468765225 -0.468765225 -0.25237097
## [44,]   0.876320484 -0.876320484 -0.468765225  0.468765225  0.25237097
## [45,]   0.400176164 -0.400176164  0.922234661 -0.922234661  0.94072089
## [46,]  -0.400176164  0.400176164 -0.922234661  0.922234661 -0.94072089
##             [,42]       [,43]       [,44]       [,45]       [,46]
##  [1,]   0.90696687  0.17867579 -0.17867579  0.99606667 -0.99606667
##  [2,]  -0.07837038  0.09012170 -0.09012170 -0.04905725  0.04905725
##  [3,]   0.53642373 -0.95200843  0.95200843  0.21837305 -0.21837305
##  [4,]  -0.44145907  0.97964834 -0.97964834 -0.11094837  0.11094837
##  [5,]   0.53037647 -0.95417226  0.95417226  0.21139081 -0.21139081
##  [6,]  -0.99188050  0.12726496 -0.12726496 -0.97621760  0.97621760
##  [7,]  -0.11006482  0.98952880 -0.98952880  0.23358067 -0.23358067
##  [8,]  -0.18043599  0.99728538 -0.99728538  0.16387468 -0.16387468
##  [9,]  -0.19069560 -0.90174775  0.90174775 -0.51234876  0.51234876
## [10,]   0.48544345 -0.96848033  0.96848033  0.16013109 -0.16013109
## [11,]  -0.01518903  0.97135220 -0.97135220  0.32485390 -0.32485390
## [12,]  -0.90625959 -0.18032474  0.18032474 -0.99591675  0.99591675
```

```
## [13,]   0.64294017   0.57886468  -0.57886468   0.86461206  -0.86461206
## [14,]   0.65573502  -0.89604096   0.89604096   0.36078449  -0.36078449
## [15,]   0.91393321   0.16207680  -0.16207680   0.99741790  -0.99741790
## [16,]  -0.97860617   0.44605448  -0.44605448  -0.85081120   0.85081120
## [17,]  -0.94222805  -0.08633822   0.08633822  -0.99999000   0.99999000
## [18,]  -0.82968660   0.74954871  -0.74954871  -0.59116231   0.59116231
## [19,]   0.07324773   0.94654568  -0.94654568   0.40717622  -0.40717622
## [20,]  -0.10575406   0.98889364  -0.98889364   0.23779460  -0.23779460
## [21,]   0.92712182   0.12865069  -0.12865069   0.99927462  -0.99927462
## [22,]   0.63784675  -0.90620755   0.90620755   0.33881049  -0.33881049
## [23,]  -0.80652623  -0.36851773   0.36851773  -0.95923971   0.95923971
## [24,]  -0.25029260  -0.87366452   0.87366452  -0.56384108   0.56384108
## [25,]   0.99145496  -0.12398757   0.12398757   0.97692846  -0.97692846
## [26,]   0.99914350  -0.21211464   0.21211464   0.95395037  -0.95395037
## [27,]   0.72355531   0.48531851  -0.48531851   0.91478931  -0.91478931
## [28,]  -0.99445071   0.35276866  -0.35276866  -0.89981744   0.89981744
## [29,]  -0.03468460   0.97580173  -0.97580173   0.30634906  -0.30634906
## [30,]  -0.77336377   0.80861608  -0.80861608  -0.51249098   0.51249098
## [31,]  -0.99980991   0.27118936  -0.27118936  -0.93392888   0.93392888
## [32,]   0.60523644  -0.92302231   0.92302231   0.29935444  -0.29935444
## [33,]   0.73697863  -0.84002903   0.84002903   0.46403286  -0.46403286
## [34,]  -0.64829346   0.90035522  -0.90035522  -0.35161348   0.35161348
## [35,]   0.67337512  -0.88531056   0.88531056   0.38270070  -0.38270070
## [36,]  -0.67337512   0.88531056  -0.88531056  -0.38270070   0.38270070
## [37,]   0.68729313  -0.87632048   0.87632048   0.40017616  -0.40017616
## [38,]  -0.68729313   0.87632048  -0.87632048  -0.40017616   0.40017616
## [39,]   0.73642739   0.46876523  -0.46876523   0.92223466  -0.92223466
## [40,]  -0.73642739  -0.46876523   0.46876523  -0.92223466   0.92223466
## [41,]   1.00000000  -0.25237097   0.25237097   0.94072089  -0.94072089
## [42,]   1.00000000   0.25237097  -0.25237097  -0.94072089   0.94072089
## [43,]   0.25237097   1.00000000   1.00000000  -0.09079190   0.09079190
## [44,]  -0.25237097   1.00000000   1.00000000   0.09079190  -0.09079190
## [45,]  -0.94072089  -0.09079190   0.09079190   1.00000000   1.00000000
## [46,]   0.94072089   0.09079190  -0.09079190   1.00000000   1.00000000
##
##
## $p.value
##               [,1]        [,2]        [,3]         [,4]         [,5]
##  [1,] 0.000000e+00  0.8120904  4.394613e-01  8.950637e-01  4.648190e-01
##  [2,] 8.120904e-01  0.0000000  5.425581e-01  5.566365e-01  5.433317e-01
##  [3,] 4.394613e-01  0.5425581  0.000000e+00  2.540126e-35  1.061242e-76
##  [4,] 8.950637e-01  0.5566365  2.540126e-35  0.000000e+00  2.381708e-36
##  [5,] 4.648190e-01  0.5433317  1.061242e-76  2.381708e-36  0.000000e+00
##  [6,] 9.307452e-20  0.6871245  8.785384e-03  5.060675e-02  9.990887e-03
##  [7,] 5.444797e-02  0.6341537  5.025446e-14  5.682255e-18  2.993128e-14
##  [8,] 1.345882e-01  0.6142639  1.831317e-16  2.343716e-21  9.782442e-17
##  [9,] 1.365979e-04  0.7401360  3.636757e-07  3.689990e-09  2.769860e-07
## [10,] 6.717849e-01  0.5496086  1.518979e-44  2.999666e-47  1.703873e-46
## [11,] 1.233042e-02  0.6638818  2.266573e-11  1.823021e-14  1.497390e-11
## [12,] 9.505784e-99  0.8128638  4.453352e-01  9.028573e-01  4.708782e-01
## [13,] 1.317675e-14  0.9751768  6.975402e-02  1.329160e-02  6.337485e-02
## [14,] 9.730867e-02  0.5312991  1.357547e-30  2.367792e-22  6.921935e-30
## [15,] 1.129996e-63  0.8045213  3.829112e-01  8.174127e-01  4.063539e-01
## [16,] 2.639685e-09  0.5895516  1.523854e-06  4.824207e-05  1.955113e-06
## [17,] 1.084557e-37  0.7711608  1.851531e-01  4.964527e-01  1.996556e-01
```

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## [18,] 1.041178e-03 0.5339094 1.835543e-15 3.879342e-12 3.244045e-15
## [19,] 2.264224e-03 0.6946188 2.345043e-09 6.795978e-12 1.662776e-09
## [20,] 5.124308e-02 0.6354447 6.850477e-14 8.634388e-18 4.102999e-14
## [21,] 5.967143e-47 0.7895584 2.835451e-01 6.675601e-01 3.029847e-01
## [22,] 1.290940e-01 0.5324600 3.493814e-33 8.954290e-24 2.404933e-32
## [23,] 2.520893e-26 0.9054180 6.966235e-01 3.018383e-01 6.657932e-01
## [24,] 2.443758e-05 0.7653889 3.223813e-06 5.459385e-08 2.529925e-06
## [25,] 6.445156e-20 0.6883086 9.325528e-03 5.300916e-02 1.059534e-02
## [26,] 3.833692e-16 0.6578557 1.584586e-03 1.315688e-02 1.848610e-03
## [27,] 7.768308e-19 0.9694472 2.488908e-01 7.128692e-02 2.319041e-01
## [28,] 1.206116e-11 0.6145293 3.928728e-05 6.750738e-04 4.824663e-05
## [29,] 1.718071e-02 0.6574976 7.201965e-12 4.116523e-15 4.670973e-12
## [30,] 7.222173e-03 0.5296696 2.970438e-19 5.785330e-15 6.310744e-19
## [31,] 4.466939e-14 0.6388487 3.883648e-04 4.282116e-03 4.621888e-04
## [32,] 2.042284e-01 0.5350837 2.732007e-39 1.051857e-26 4.753530e-38
## [33,] 1.905267e-02 0.5288971 4.263170e-22 5.594245e-17 1.070181e-21
## [34,] 1.097634e-01 0.5317518 1.268547e-31 6.255286e-23 7.246501e-31
## [35,] 7.189164e-02 0.5303610 2.245345e-28 4.740905e-21 9.171370e-28
## [36,] 7.189164e-02 0.5303610 2.245345e-28 4.740905e-21 9.171370e-28
## [37,] 5.559133e-02 0.5297722 8.358681e-27 4.387908e-20 2.968855e-26
## [38,] 5.559133e-02 0.5297722 8.358681e-27 4.387908e-20 2.968855e-26
## [39,] 1.039460e-19 0.9600401 2.976755e-01 9.093280e-02 2.784649e-01
## [40,] 1.039460e-19 0.9600401 2.976755e-01 9.093280e-02 2.784649e-01
## [41,] 1.056523e-14 0.6447578 6.207181e-04 6.234101e-03 7.338744e-04
## [42,] 1.056523e-14 0.6447578 6.207181e-04 6.234101e-03 7.338744e-04
## [43,] 2.900176e-01 0.5957964 1.415061e-19 5.321452e-26 6.421360e-20
## [44,] 2.900176e-01 0.5957964 1.415061e-19 5.321452e-26 6.421360e-20
## [45,] 1.948933e-38 0.7730901 1.941303e-01 5.132843e-01 2.091313e-01
## [46,] 1.948933e-38 0.7730901 1.941303e-01 5.132843e-01 2.091313e-01
##              [,6]         [,7]         [,8]         [,9]        [,10]
##  [1,] 9.307452e-20 5.444797e-02 1.345882e-01 1.365979e-04 6.717849e-01
##  [2,] 6.871245e-01 6.341537e-01 6.142639e-01 7.401360e-01 5.496086e-01
##  [3,] 8.785384e-03 5.025446e-14 1.831317e-16 3.636757e-07 1.518979e-44
##  [4,] 5.060675e-02 5.682255e-18 2.343716e-21 3.689990e-09 2.999666e-47
##  [5,] 9.990887e-03 2.993128e-14 9.782442e-17 2.769860e-07 1.703873e-46
##  [6,] 0.000000e+00 9.193806e-01 7.514339e-01 5.842039e-02 2.406265e-02
##  [7,] 9.193806e-01 0.000000e+00 8.695873e-42 5.272802e-20 5.022946e-16
##  [8,] 7.514339e-01 8.695873e-42 0.000000e+00 6.658363e-17 6.548420e-19
##  [9,] 5.842039e-02 5.272802e-20 6.658363e-17 0.000000e+00 3.374613e-08
## [10,] 2.406265e-02 5.022946e-16 6.548420e-19 3.374613e-08 0.000000e+00
## [11,] 5.089204e-01 2.197092e-37 6.140139e-29 1.231073e-25 5.884473e-13
## [12,] 1.119731e-19 5.319007e-02 1.320001e-01 1.306443e-04 6.789904e-01
## [13,] 2.200295e-07 2.251266e-06 2.215073e-05 1.531568e-12 2.982975e-02
## [14,] 3.702538e-04 4.225111e-10 8.228629e-12 4.918203e-05 1.509274e-25
## [15,] 1.365441e-20 6.849769e-02 1.627834e-01 2.120834e-04 6.011049e-01
## [16,] 1.698528e-18 5.994460e-02 2.072782e-02 9.281466e-01 1.091722e-05
## [17,] 3.877405e-25 1.723311e-01 3.458188e-01 1.311255e-03 3.304648e-01
## [18,] 8.088157e-08 1.562326e-05 1.509807e-06 1.709486e-02 1.526428e-13
## [19,] 2.365263e-01 1.922855e-27 1.545554e-22 4.803573e-34 1.152771e-10
## [20,] 8.991886e-01 2.661833e-84 6.873176e-41 3.224140e-20 7.213405e-16
## [21,] 1.987851e-22 1.054714e-01 2.321459e-01 4.913153e-04 4.703919e-01
## [22,] 6.508491e-04 1.231658e-10 1.949443e-12 2.482404e-05 2.421895e-27
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## [24,] 2.362707e-02 2.671125e-17 1.028225e-14 4.290200e-44 3.890822e-07
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## [25,] 1.955219e-88 9.039914e-01 7.662140e-01 5.581734e-02 2.535270e-02
## [26,] 6.909755e-39 6.855805e-01 4.099726e-01 1.686631e-01 5.327721e-03
## [27,] 1.829850e-09 6.935622e-05 4.415738e-04 7.835761e-10 1.320458e-01
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## [29,] 5.852997e-01 7.262714e-41 8.047450e-31 2.746170e-24 1.580381e-13
## [30,] 2.722895e-06 6.546832e-07 3.989318e-08 2.981124e-03 9.479235e-17
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## [32,] 1.664035e-03 1.178413e-11 1.236056e-13 6.824918e-06 3.437649e-31
## [33,] 1.634199e-05 7.618161e-08 3.369726e-09 8.970659e-04 4.435540e-19
## [34,] 4.703094e-04 2.541259e-10 4.546608e-12 3.708288e-05 2.846996e-26
## [35,] 2.043143e-04 1.376727e-09 3.254215e-11 9.496066e-05 6.118030e-24
## [36,] 2.043143e-04 1.376727e-09 3.254215e-11 9.496066e-05 6.118030e-24
## [37,] 1.241204e-04 3.418857e-09 9.351732e-11 1.578273e-04 9.155998e-23
## [38,] 1.241204e-04 3.418857e-09 9.351732e-11 1.578273e-04 9.155998e-23
## [39,] 7.245215e-10 1.160894e-04 6.915462e-04 1.973131e-09 1.634001e-01
## [40,] 7.245215e-10 1.160894e-04 6.915462e-04 1.973131e-09 1.634001e-01
## [41,] 6.081687e-33 5.166654e-01 2.852136e-01 2.582419e-01 2.322537e-03
## [42,] 6.081687e-33 5.166654e-01 2.852136e-01 2.582419e-01 2.322537e-03
## [43,] 4.528857e-01 5.119134e-31 2.989044e-41 2.631664e-14 1.028993e-22
## [44,] 4.528857e-01 5.119134e-31 2.989044e-41 2.631664e-14 1.028993e-22
## [45,] 7.911599e-25 1.641091e-01 3.324601e-01 1.187370e-03 3.437731e-01
## [46,] 7.911599e-25 1.641091e-01 3.324601e-01 1.187370e-03 3.437731e-01
##              [,11]        [,12]        [,13]        [,14]        [,15]
##  [1,] 1.233042e-02 9.505635e-99 1.317675e-14 9.730867e-02 1.129996e-63
##  [2,] 6.638818e-01 8.128638e-01 9.751768e-01 5.312991e-01 8.045213e-01
##  [3,] 2.266573e-11 4.453352e-01 6.975402e-02 1.357547e-30 3.829112e-01
##  [4,] 1.823021e-14 9.028573e-01 1.329160e-02 2.367792e-22 8.174127e-01
##  [5,] 1.497390e-11 4.708782e-01 6.337485e-02 6.921935e-30 4.063539e-01
##  [6,] 5.089204e-01 1.119731e-19 2.200295e-07 3.702538e-04 1.365441e-20
##  [7,] 2.197092e-37 5.319007e-02 2.251266e-06 4.225111e-10 6.849769e-02
##  [8,] 6.140139e-29 1.320001e-01 2.215073e-05 8.228629e-12 1.627834e-01
##  [9,] 1.231073e-25 1.306443e-04 1.531568e-12 4.918203e-05 2.120834e-04
## [10,] 5.884473e-13 6.789904e-01 2.982975e-02 1.509274e-25 6.011049e-01
## [11,] 0.000000e+00 1.197570e-02 6.261268e-08 3.554444e-08 1.643564e-02
## [12,] 1.197570e-02 0.000000e+00 1.161252e-14 9.935305e-02 3.124709e-62
## [13,] 6.261268e-08 1.161252e-14 0.000000e+00 3.544648e-01 4.555370e-14
## [14,] 3.554444e-08 9.935305e-02 3.544648e-01 0.000000e+00 7.855375e-02
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##  [9,] 3.100813e-01 6.824918e-06 8.970659e-04 3.708288e-05  9.496066e-05
## [10,] 1.531508e-03 3.437649e-31 4.435540e-19 2.846996e-26  6.118030e-24
## [11,] 8.385261e-01 1.877652e-09 2.651121e-06 2.336709e-08  9.438782e-08
## [12,] 5.039724e-14 2.078011e-01 1.958282e-02 1.120093e-01  7.349863e-02
## [13,] 3.181714e-05 1.895630e-01 7.965853e-01 3.251146e-01  4.315519e-01
## [14,] 5.656235e-06 3.895985e-43 1.029912e-34 6.957461e-72  1.524561e-58
## [15,] 1.290989e-14 1.707436e-01 1.437544e-02 8.909218e-02  5.726547e-02
## [16,] 4.148203e-27 6.258853e-08 8.870651e-12 5.638470e-09  1.150253e-09
## [17,] 2.178905e-17 6.772380e-02 3.490031e-03 3.067861e-02  1.802415e-02
## [18,] 7.691827e-11 8.972834e-19 1.710923e-30 1.697623e-21  1.933376e-23
## [19,] 7.518635e-01 9.363223e-08 4.246914e-05 7.805339e-07  2.534331e-06
## [20,] 4.605918e-01 1.519930e-11 9.087320e-08 3.185307e-10  1.699774e-09
## [21,] 9.030946e-16 1.160760e-01 7.906848e-03 5.697940e-02  3.523016e-02
## [22,] 1.195175e-05 6.372410e-50 7.181093e-32 7.028100e-67  4.636884e-48
## [23,] 4.234395e-09 9.180350e-01 2.479615e-01 6.687972e-01  5.322787e-01
## [24,] 1.682551e-01 4.388739e-05 3.338073e-03 1.979487e-04  4.565683e-04
## [25,] 1.861496e-30 1.786769e-03 1.807448e-05 5.092156e-04  2.224059e-04
## [26,] 3.778486e-44 2.182903e-04 9.334977e-07 4.893080e-05  1.829215e-05
## [27,] 8.608976e-07 5.109442e-01 6.949621e-01 7.398408e-01  8.920971e-01
## [28,] 6.300299e-39 2.831315e-06 2.060815e-09 3.920855e-07  1.067691e-07
## [29,] 7.501884e-01 7.197365e-10 1.348004e-06 9.908602e-09  4.226339e-08
## [30,] 8.471520e-09 8.433623e-24 1.517119e-45 7.660726e-28  5.803973e-31
## [31,] 0.000000e+00 4.165993e-05 9.113514e-08 7.766658e-06  2.573971e-06
## [32,] 4.165993e-05 0.000000e+00 7.280243e-28 1.285425e-45  1.932488e-38
## [33,] 9.113514e-08 7.280243e-28 0.000000e+00 1.856845e-33  2.998283e-38
## [34,] 7.766658e-06 1.285425e-45 1.856845e-33 0.000000e+00  2.924882e-53
## [35,] 2.573971e-06 1.932488e-38 2.998283e-38 2.924882e-53  0.000000e+00
## [36,] 2.573971e-06 1.932488e-38 2.998283e-38 2.924882e-53 2.867697e-270
## [37,] 1.331146e-06 1.684107e-35 7.472421e-42 2.001470e-46  7.505367e-62
## [38,] 1.331146e-06 1.684107e-35 7.472421e-42 2.001470e-46  7.505367e-62
## [39,] 4.301416e-07 5.847651e-01 6.150139e-01 8.248083e-01  9.800482e-01
## [40,] 4.301416e-07 5.847651e-01 6.150139e-01 8.248083e-01  9.800482e-01
## [41,] 1.888562e-61 7.232223e-05 1.977894e-07 1.433276e-05  4.944187e-06
## [42,] 1.888562e-61 7.232223e-05 1.977894e-07 1.433276e-05  4.944187e-06
## [43,] 1.044716e-01 4.372058e-16 7.996311e-11 3.328521e-14  3.446565e-13
## [44,] 1.044716e-01 4.372058e-16 7.996311e-11 3.328521e-14  3.446565e-13
## [45,] 3.293821e-17 7.187118e-02 3.816449e-03 3.283922e-02  1.939961e-02
## [46,] 3.293821e-17 7.187118e-02 3.816449e-03 3.283922e-02  1.939961e-02
##              [,36]        [,37]        [,38]        [,39]        [,40]
##  [1,] 7.189164e-02 5.559133e-02 5.559133e-02 1.039460e-19 1.039460e-19
##  [2,] 5.303610e-01 5.297722e-01 5.297722e-01 9.600401e-01 9.600401e-01
##  [3,] 2.245345e-28 8.358681e-27 8.358681e-27 2.976755e-01 2.976755e-01
##  [4,] 4.740905e-21 4.387908e-20 4.387908e-20 9.093280e-02 9.093280e-02
##  [5,] 9.171370e-28 2.968855e-26 2.968855e-26 2.784649e-01 2.784649e-01
##  [6,] 2.043143e-04 1.241204e-04 1.241204e-04 7.245215e-10 7.245215e-10
##  [7,] 1.376727e-09 3.418857e-09 3.418857e-09 1.160894e-04 1.160894e-04
##  [8,] 3.254215e-11 9.351732e-11 9.351732e-11 6.915462e-04 6.915462e-04
##  [9,] 9.496066e-05 1.578273e-04 1.578273e-04 1.973131e-09 1.973131e-09
## [10,] 6.118030e-24 9.155998e-23 9.155998e-23 1.634001e-01 1.634001e-01
## [11,] 9.438782e-08 2.005795e-07 2.005795e-07 7.055272e-06 7.055272e-06
## [12,] 7.349863e-02 5.689558e-02 5.689558e-02 8.636504e-20 8.636504e-20
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## [13,]    4.315519e-01    4.999632e-01    4.999632e-01    1.024634e-32    1.024634e-32
## [14,]    1.524561e-58    1.418980e-49    1.418980e-49    8.699695e-01    8.699695e-01
## [15,]    5.726547e-02    4.379674e-02    4.379674e-02    6.318626e-19    6.318626e-19
## [16,]    1.150253e-09    4.435899e-10    4.435899e-10    1.604078e-04    1.604078e-04
## [17,]    1.802415e-02    1.307825e-02    1.307825e-02    7.536437e-16    7.536437e-16
## [18,]    1.933376e-23    1.128429e-24    1.128429e-24    1.645333e-01    1.645333e-01
## [19,]    2.534331e-06    4.790131e-06    4.790131e-06    3.171810e-07    3.171810e-07
## [20,]    1.699774e-09    4.187585e-09    4.187585e-09    1.032777e-04    1.032777e-04
## [21,]    3.523016e-02    2.633889e-02    2.633889e-02    1.776027e-17    1.776027e-17
## [22,]    4.636884e-48    6.512478e-43    6.512478e-43    7.630053e-01    7.630053e-01
## [23,]    5.322787e-01    4.614479e-01    4.614479e-01    4.102833e-35    4.102833e-35
## [24,]    4.565683e-04    7.167634e-04    7.167634e-04    8.600869e-11    8.600869e-11
## [25,]    2.224059e-04    1.355403e-04    1.355403e-04    6.135588e-10    6.135588e-10
## [26,]    1.829215e-05    1.016488e-05    1.016488e-05    3.813473e-08    3.813473e-08
## [27,]    8.920971e-01    9.807803e-01    9.807803e-01    5.620862e-62    5.620862e-62
## [28,]    1.067691e-07    4.906987e-08    4.906987e-08    8.402453e-06    8.402453e-06
## [29,]    4.226339e-08    9.245840e-08    9.245840e-08    1.306671e-05    1.306671e-05
## [30,]    5.803973e-31    4.442702e-33    4.442702e-33    4.063939e-01    4.063939e-01
## [31,]    2.573971e-06    1.331146e-06    1.331146e-06    4.301416e-07    4.301416e-07
## [32,]    1.932488e-38    1.684107e-35    1.684107e-35    5.847651e-01    5.847651e-01
## [33,]    2.998283e-38    7.472421e-42    7.472421e-42    6.150139e-01    6.150139e-01
## [34,]    2.924882e-53    2.001470e-46    2.001470e-46    8.248083e-01    8.248083e-01
## [35,] 2.867697e-270    7.505367e-62    7.505367e-62    9.800482e-01    9.800482e-01
## [36,]    0.000000e+00    7.505367e-62    7.505367e-62    9.800482e-01    9.800482e-01
## [37,]    7.505367e-62    0.000000e+00   1.547064e-275    9.310312e-01    9.310312e-01
## [38,]    7.505367e-62   1.547064e-275    0.000000e+00    9.310312e-01    9.310312e-01
## [39,]    9.800482e-01    9.310312e-01    9.310312e-01    0.000000e+00   1.547064e-275
## [40,]    9.800482e-01    9.310312e-01    9.310312e-01   1.547064e-275    0.000000e+00
## [41,]    4.944187e-06    2.618875e-06    2.618875e-06    2.041727e-07    2.041727e-07
## [42,]    4.944187e-06    2.618875e-06    2.618875e-06    2.041727e-07    2.041727e-07
## [43,]    3.446565e-13    1.198792e-12    1.198792e-12    3.428910e-03    3.428910e-03
## [44,]    3.446565e-13    1.198792e-12    1.198792e-12    3.428910e-03    3.428910e-03
## [45,]    1.939961e-02    1.412157e-02    1.412157e-02    5.191475e-16    5.191475e-16
## [46,]    1.939961e-02    1.412157e-02    1.412157e-02    5.191475e-16    5.191475e-16
##               [,41]          [,42]          [,43]          [,44]          [,45]
##  [1,]    1.056523e-14    1.056523e-14    2.900176e-01    2.900176e-01    1.948933e-38
##  [2,]    6.447578e-01    6.447578e-01    5.957964e-01    5.957964e-01    7.730901e-01
##  [3,]    6.207181e-04    6.207181e-04    1.415061e-19    1.415061e-19    1.941303e-01
##  [4,]    6.234101e-03    6.234101e-03    5.321452e-26    5.321452e-26    5.132843e-01
##  [5,]    7.338744e-04    7.338744e-04    6.421360e-20    6.421360e-20    2.091313e-01
##  [6,]    6.081687e-33    6.081687e-33    4.528857e-01    4.528857e-01    7.911599e-25
##  [7,]    5.166654e-01    5.166654e-01    5.119134e-31    5.119134e-31    1.641091e-01
##  [8,]    2.852136e-01    2.852136e-01    2.989044e-41    2.989044e-41    3.324601e-01
##  [9,]    2.582419e-01    2.582419e-01    2.631664e-14    2.631664e-14    1.187370e-03
## [10,]    2.322537e-03    2.322537e-03    1.028993e-22    1.028993e-22    3.437731e-01
## [11,]    9.289029e-01    9.289029e-01    1.977875e-23    1.977875e-23    4.979053e-02
## [12,]    1.199328e-14    1.199328e-14    2.855157e-01    2.855157e-01    3.746148e-38
## [13,]    1.776710e-05    1.776710e-05    1.744830e-04    1.744830e-04    5.297236e-12
## [14,]    1.055888e-05    1.055888e-05    6.746265e-14    6.746265e-14    2.825538e-02
## [15,]    2.863818e-15    2.863818e-15    3.378642e-01    3.378642e-01    1.246225e-41
## [16,]    1.264785e-25    1.264785e-25    5.656244e-03    5.656244e-03    2.581182e-11
## [17,]    3.361077e-18    3.361077e-18    6.113832e-01    6.113832e-01    7.794607e-84
## [18,]    2.193655e-10    2.193655e-10    9.378393e-08    9.378393e-08    1.168233e-04
## [19,]    6.665878e-01    6.665878e-01    8.935905e-19    8.935905e-19    1.237772e-02
```

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## [20,]    5.333182e-01  5.333182e-01 1.427562e-30 1.427562e-30 1.564172e-01
## [21,]    1.734348e-16  1.734348e-16 4.479398e-01 4.479398e-01 2.833121e-51
## [22,]    2.171366e-05  2.171366e-05 1.210519e-14 1.210519e-14 4.023949e-02
## [23,]    1.677809e-09  1.677809e-09 2.481229e-02 2.481229e-02 8.601011e-21
## [24,]    1.351460e-01  1.351460e-01 1.700940e-12 1.700940e-12 2.788616e-04
## [25,]    1.481865e-32  1.481865e-32 4.646999e-01 4.646999e-01 4.678046e-25
## [26,]    5.184183e-50  5.184183e-50 2.075400e-01 2.075400e-01 6.975417e-20
## [27,]    4.195601e-07  4.195601e-07 2.329494e-03 2.329494e-03 2.420952e-15
## [28,]    7.946096e-36  7.946096e-36 3.223035e-02 3.223035e-02 3.641252e-14
## [29,]    8.385113e-01  8.385113e-01 1.068048e-24 1.068048e-24 6.516713e-02
## [30,]    2.009418e-08  2.009418e-08 1.412382e-09 1.412382e-09 1.182993e-03
## [31,]    1.888562e-61  1.888562e-61 1.044716e-01 1.044716e-01 3.293821e-17
## [32,]    7.232223e-05  7.232223e-05 4.372058e-16 4.372058e-16 7.187118e-02
## [33,]    1.977894e-07  1.977894e-07 7.996311e-11 7.996311e-11 3.816449e-03
## [34,]    1.433276e-05  1.433276e-05 3.328521e-14 3.328521e-14 3.283922e-02
## [35,]    4.944187e-06  4.944187e-06 3.446565e-13 3.446565e-13 1.939961e-02
## [36,]    4.944187e-06  4.944187e-06 3.446565e-13 3.446565e-13 1.939961e-02
## [37,]    2.618875e-06  2.618875e-06 1.198792e-12 1.198792e-12 1.412157e-02
## [38,]    2.618875e-06  2.618875e-06 1.198792e-12 1.198792e-12 1.412157e-02
## [39,]    2.041727e-07  2.041727e-07 3.428910e-03 3.428910e-03 5.191475e-16
## [40,]    2.041727e-07  2.041727e-07 3.428910e-03 3.428910e-03 5.191475e-16
## [41,]    0.000000e+00 2.867697e-270 1.318269e-01 1.318269e-01 5.211506e-18
## [42,]   2.867697e-270  0.000000e+00 1.318269e-01 1.318269e-01 5.211506e-18
## [43,]    1.318269e-01  1.318269e-01 0.000000e+00 0.000000e+00 5.930535e-01
## [44,]    1.318269e-01  1.318269e-01 0.000000e+00 0.000000e+00 5.930535e-01
## [45,]    5.211506e-18  5.211506e-18 5.930535e-01 5.930535e-01 0.000000e+00
## [46,]    5.211506e-18  5.211506e-18 5.930535e-01 5.930535e-01          NaN
##               [,46]
##  [1,] 1.948933e-38
##  [2,] 7.730901e-01
##  [3,] 1.941303e-01
##  [4,] 5.132843e-01
##  [5,] 2.091313e-01
##  [6,] 7.911599e-25
##  [7,] 1.641091e-01
##  [8,] 3.324601e-01
##  [9,] 1.187370e-03
## [10,] 3.437731e-01
## [11,] 4.979053e-02
## [12,] 3.746148e-38
## [13,] 5.297236e-12
## [14,] 2.825538e-02
## [15,] 1.246225e-41
## [16,] 2.581182e-11
## [17,] 7.794607e-84
## [18,] 1.168233e-04
## [19,] 1.237772e-02
## [20,] 1.564172e-01
## [21,] 2.833121e-51
## [22,] 4.023949e-02
## [23,] 8.601011e-21
## [24,] 2.788616e-04
## [25,] 4.678046e-25
## [26,] 6.975417e-20
```

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## [27,] 2.420952e-15
## [28,] 3.641252e-14
## [29,] 6.516713e-02
## [30,] 1.182993e-03
## [31,] 3.293821e-17
## [32,] 7.187118e-02
## [33,] 3.816449e-03
## [34,] 3.283922e-02
## [35,] 1.939961e-02
## [36,] 1.939961e-02
## [37,] 1.412157e-02
## [38,] 1.412157e-02
## [39,] 5.191475e-16
## [40,] 5.191475e-16
## [41,] 5.211506e-18
## [42,] 5.211506e-18
## [43,] 5.930535e-01
## [44,] 5.930535e-01
## [45,]          NaN
## [46,] 0.000000e+00
##
## $statistic
##                [,1]        [,2]         [,3]         [,4]          [,5]
## [1,]     0.0000000  0.23953196   -0.7820204    0.1328617    -0.7390257
## [2,]     0.2395320  0.00000000    0.6149613   -0.5935400     0.6137770
## [3,]    -0.7820204  0.61496130    0.0000000   54.0759899  -827.4957850
## [4,]     0.1328617 -0.59354005   54.0759899    0.0000000    57.9021303
## [5,]    -0.7390257  0.61377696 -827.4957847   57.9021303     0.0000000
## [6,]    18.6450917 -0.40612326    2.7756057   -2.0244573     2.7241719
## [7,]    -1.9899974 -0.48008525   12.0647787  -16.3626525    12.2862062
## [8,]    -1.5316923 -0.50854224   14.6094999  -20.9043969    14.9151238
## [9,]     4.2831378  0.33431625   -6.2486693    7.7968612    -6.3388321
## [10,]   -0.4272908  0.60419814  -99.6086957  119.0669154  -113.2878671
## [11,]   -2.6389831 -0.43827278    9.6276608  -12.5004763     9.7837884
## [12,] 3529.5057805 -0.23852654    0.7719330   -0.1229407     0.7289567
## [13,]  -12.6420594 -0.03133953    1.8707913   -2.6082630     1.9174224
## [14,]   -1.7036644  0.63230144  -39.4211896   22.4257016   -37.5882226
## [15,] -351.1633101  0.24938429   -0.8836570    0.2326184    -0.8404632
## [16,]    7.9129478 -0.54449779    5.7759790   -4.6337954     5.6939386
## [17,]   63.2970618 -0.29312072    1.3516682   -0.6872525     1.3072366
## [18,]    3.5767073 -0.62826418   13.5246131  -10.3010448    13.2655050
## [19,]   -3.2943415 -0.39584954    7.9540919  -10.0846976     8.0739974
## [20,]   -2.0185944 -0.47825209   11.9336005  -16.1433955    12.1511324
## [21,] -116.7444094  0.26893544   -1.0891162    0.4331549    -1.0454439
## [22,]   -1.5543665  0.63050467  -46.8903080   24.7670745   -44.3357146
## [23,]   29.5223574 -0.11968386   -0.3931087    1.0479643    -0.4356119
## [24,]    4.8604434  0.30074414   -5.5293282    6.8800589    -5.6091045
## [25,]  -18.8610083  0.40449710   -2.7517964    2.0026491    -2.7005197
## [26,]  -14.2552681  0.44668298   -3.4251512    2.6124428    -3.3689104
## [27,]  -17.4375027  0.03857660    1.1725618   -1.8601335     1.2165820
## [28,]    9.8657392 -0.50815970    4.7023923   -3.7307342     4.6337639
## [29,]   -2.5018267 -0.44718375   10.0624417  -13.1581416    10.2291253
## [30,]    2.8531231 -0.63482701   17.9765115  -13.0057616    17.5528963
## [31,]   12.1148973 -0.47342635    3.9243431   -3.0553745     3.8637233
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```
## [32,]   -1.2937394  0.62645137 -70.3740417  30.2976698 -64.8192212
## [33,]   -2.4582876  0.63602567 -22.0265787  15.1914590 -21.4142697
## [34,]    1.6409591 -0.63160057  42.2419701 -23.3526161  40.1500935
## [35,]   -1.8559829  0.63375497 -33.9410513  20.4550837 -32.5631268
## [36,]    1.8559829 -0.63375497  33.9410513 -20.4550837  32.5631268
## [37,]   -1.9801494  0.63466794 -30.5046597  19.0891141 -29.3793290
## [38,]    1.9801494 -0.63466794  30.5046597 -19.0891141  29.3793290
## [39,]  -18.5805836  0.05046331   1.0571721  -1.7383946   1.1008748
## [40,]   18.5805836 -0.05046331  -1.0571721   1.7383946  -1.1008748
## [41,]  -12.7389915  0.46507584  -3.7603295   2.9106891  -3.7012141
## [42,]   12.7389915 -0.46507584   3.7603295  -2.9106891   3.7012141
## [43,]    1.0743486  0.53534563 -18.4014258  28.8742228 -18.8631920
## [44,]   -1.0743486 -0.53534563  18.4014258 -28.8742228  18.8631920
## [45,]   66.5050472 -0.29057645   1.3238633  -0.6604570   1.2795200
## [46,]  -66.5050472  0.29057645  -1.3238633   0.6604570  -1.2795200
##               [,6]         [,7]        [,8]         [,9]        [,10]
## [1,]    18.6450917   -1.9899974  -1.5316923   4.28313778   -0.4272908
## [2,]    -0.4061233   -0.4800852  -0.5085422   0.33431625    0.6041981
## [3,]     2.7756057   12.0647787  14.6094999  -6.24866935  -99.6086957
## [4,]    -2.0244573  -16.3626525 -20.9043969   7.79686121  119.0669154
## [5,]     2.7241719   12.2862062  14.9151238  -6.33883206 -113.2878671
## [6,]     0.0000000    0.1019469  -0.3192509  -1.95651813    2.3585106
## [7,]     0.1019469    0.0000000 -83.0190666  18.97983796   14.1272736
## [8,]    -0.3192509  -83.0190666   0.0000000  15.10495077   17.5323216
## [9,]    -1.9565181   18.9798380  15.1049508   0.00000000   -7.0417911
## [10,]    2.3585106   14.1272736  17.5323216  -7.04179111    0.0000000
## [11,]    0.6673573  -62.0222746 -35.2591289  28.16226998   11.0467582
## [12,]  -18.5372500    2.0010420   1.5422779  -4.29827020    0.4173239
## [13,]    6.4151688   -5.6475136  -4.8930647  10.66497408    2.2647005
## [14,]    3.9409299    8.5578254  10.0114189  -4.62734031  -27.9917751
## [15,]   19.7958240   -1.8796768  -1.4258045   4.13305816   -0.5276016
## [16,]  -17.0084971   -1.9441948  -2.4225168   0.09082867    5.1272895
## [17,]  -27.2144660    1.3932468   0.9556195  -3.49377537    0.9869012
## [18,]   -6.7484364   -5.0087734  -5.7790283   2.50392596   11.5984327
## [19,]    1.2043748  -31.8594839 -22.7191639  49.66657045    9.0262430
## [20,]    0.1276092 -1364.3744543 -78.2331092  19.27360616   13.9571035
## [21,]   22.5456228   -1.6618693  -1.2159389   3.84236813   -0.7297620
## [22,]    3.7436274    9.0021272  10.5698534  -4.85523138  -31.6430986
## [23,]  -10.7011492    3.4050628   2.8659257  -6.39672410   -0.7474334
## [24,]   -2.3663964   15.5628323  12.7509393 -96.68700340   -6.2263298
## [25,] 1790.8083586   -0.1214981   0.2996533   1.97822365   -2.3358900
## [26,]   68.5200149    0.4082453   0.8339361   1.40558349   -2.9715948
## [27,]    8.0405481   -4.5120933  -3.8796444   8.33846614    1.5420897
## [28,]  -24.9389247   -1.2961831  -1.7450181  -0.51285485    4.1548715
## [29,]    0.5507558  -78.1092982 -40.0274715  25.66405675   11.5840323
## [30,]   -5.5849111   -6.0544215  -6.9854466   3.19210317   14.9305930
## [31,]  -39.9503228   -0.7721707  -1.2049681  -1.02998770    3.4375374
## [32,]    3.4073361    9.8745619  11.6861399  -5.28229962  -41.0327932
## [33,]    4.9938825    6.7684544   7.8282750  -3.62991713  -17.7501040
## [34,]   -3.8576407   -8.7399822 -10.2395604   4.72165569   29.4159179
## [35,]    4.1458408    8.1400829   9.4924110  -4.40626120  -25.0530153
## [36,]   -4.1458408   -8.1400829  -9.4924110   4.40626120   25.0530153
## [37,]    4.3156506    7.8232643   9.1026371  -4.23399828  -23.0839437
## [38,]   -4.3156506   -7.8232643  -9.1026371   4.23399828   23.0839437
```

```
## [39,]    8.3661796   -4.3383225   -3.7222207   8.01424261    1.4236566
## [40,]   -8.3661796    4.3383225    3.7222207  -8.01424261   -1.4236566
## [41,]   46.1420660    0.6551326    1.0852868   1.14926020   -3.2849446
## [42,]  -46.1420660   -0.6551326   -1.0852868  -1.14926020    3.2849446
## [43,]    0.7590819   40.5591673   80.1269967 -12.34159725  -23.0021526
## [44,]   -0.7590819  -40.5591673  -80.1269967  12.34159725   23.0021526
## [45,]  -26.6400728    1.4211958    0.9827818  -3.52954777    0.9597329
## [46,]   26.6400728   -1.4211958   -0.9827818   3.52954777   -0.9597329
##                   [,11]        [,12]         [,13]        [,14]        [,15]
##  [1,]        -2.63898309 3529.5073656  -12.64205938   -1.7036644 -351.1633102
##  [2,]        -0.43827278   -0.2385265   -0.03133953    0.6323014    0.2493843
##  [3,]         9.62766077    0.7719330    1.87079128  -39.4211896   -0.8836570
##  [4,]       -12.50047634   -0.1229407   -2.60826304   22.4257016    0.2326184
##  [5,]         9.78378845    0.7289567    1.91742245  -37.5882226   -0.8404632
##  [6,]         0.66735726  -18.5372500    6.41516883    3.9409299   19.7958240
##  [7,]       -62.02227465    2.0010420   -5.64751362    8.5578254   -1.8796768
##  [8,]       -35.25912894    1.5422779   -4.89306465   10.0114189   -1.4258045
##  [9,]        28.16226998   -4.2982702   10.66497408   -4.6273403    4.1330582
## [10,]        11.04675816    0.4173239    2.26470048  -27.9917751   -0.5276016
## [11,]         0.00000000    2.6508815   -6.83411573    7.0243000   -2.5203738
## [12,]         2.65088151    0.0000000   12.69745565    1.6929308  319.3774493
## [13,]        -6.83411573   12.6974557    0.00000000    0.9384102  -12.1065487
## [14,]         7.02430002    1.6929308    0.93841024    0.0000000   -1.8121246
## [15,]        -2.52037382  319.3774504  -12.10654868   -1.8121246    0.0000000
## [16,]        -1.33794133   -7.8853530    3.16399579    7.8078264    8.1973313
## [17,]         2.00254468  -62.1721718   10.07656135    2.3190302   77.3366307
## [18,]        -4.11235576   -3.5631801    0.62994590   21.9394381    3.7142063
## [19,]       -66.67147198    3.3073449   -8.19956940    5.8798546   -3.1649814
## [20,]       -65.00285211    2.0296716   -5.69674676    8.4789895   -1.9079581
## [21,]        -2.28747497  112.9969364  -11.13632491   -2.0331343 -175.0343214
## [22,]         7.36834653    1.5437703    1.08123033 -252.1678770   -1.6613891
## [23,]         4.19995648  -29.7813778   24.18342349    0.4898539   27.1409449
## [24,]        21.52936433   -4.8770759   12.39408549   -4.0705358    4.6957805
## [25,]        -0.68715757   18.7508909   -6.45784686   -3.9127751  -20.0368582
## [26,]        -0.15504750   14.1880479   -5.39889867   -4.7233958  -14.9623235
## [27,]        -5.47468780   17.5340457  -53.26847303    0.2764904  -16.5176282
## [28,]        -0.71688767   -9.8283505    3.98631879    6.3473944   10.2534736
## [29,]      -303.32002235    2.5135247   -6.57068175    7.3089507   -2.3851651
## [30,]        -5.00184368   -2.8409102    0.06901185   34.6778565    2.9769791
## [31,]        -0.20530129  -12.0635733    4.77268886    5.3442007   12.6510176
## [32,]         8.03154659    1.2833526    1.33788313  -90.7583067   -1.3985606
## [33,]         5.59370342    2.4466671    0.25974119  -51.9306779   -2.5759893
## [34,]        -7.16587630   -1.6302848   -0.99803113  602.7511652    1.7487999
## [35,]         6.69684538    1.8450963    0.79573182 -250.5405049   -1.9660427
## [36,]        -6.69684538   -1.8450963   -0.79573182  250.5405049    1.9660427
## [37,]         6.44588981    1.9691283    0.68162298 -138.7905372   -2.0916124
## [38,]        -6.44588981   -1.9691283   -0.68162298  138.7905372    2.0916124
## [39,]        -5.27135565   18.6888847  -45.44847011    0.1649024  -17.5522013
## [40,]         5.27135565  -18.6888847   45.44847011   -0.1649024   17.5522013
## [41,]         0.08986988   12.6832976   -4.96618866   -5.1383131  -13.3219340
## [42,]        -0.08986988  -12.6832976    4.96618866    5.1383131   13.3219340
## [43,]        24.18148710   -1.0845952    4.19979202  -11.9400703    0.9717071
## [44,]       -24.18148710    1.0845952   -4.19979202   11.9400703   -0.9717071
## [45,]         2.03207268  -65.2653653   10.18054596    2.2885666   82.1656545
```

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## [46,]   -2.03207268   65.2653653 -10.18054596   -2.2885666  -82.1656545
##                [,16]        [,17]        [,18]        [,19]        [,20]
##  [1,]    7.91294783   63.2970618    3.5767073   -3.2943415   -2.0185944
##  [2,]   -0.54449779   -0.2931207   -0.6282642   -0.3958495   -0.4782521
##  [3,]    5.77597898    1.3516682   13.5246131    7.9540919   11.9336005
##  [4,]   -4.63379545   -0.6872525  -10.3010448  -10.0846976  -16.1433955
##  [5,]    5.69393860    1.3072366   13.2655050    8.0739974   12.1511324
##  [6,]  -17.00849711  -27.2144660   -6.7484364    1.2043748    0.1276092
##  [7,]   -1.94419479    1.3932468   -5.0087734  -31.8594839 -1364.3744639
##  [8,]   -2.42251677    0.9556195   -5.7790283  -22.7191639  -78.2331092
##  [9,]    0.09082867   -3.4937754    2.5039260   49.6665705   19.2736062
## [10,]    5.12728946    0.9869012   11.5984327    9.0262430   13.9571035
## [11,]   -1.33794133    2.0025447   -4.1123558  -66.6714720  -65.0028521
## [12,]   -7.88535299  -62.1721718   -3.5631801    3.3073449    2.0296716
## [13,]    3.16399579   10.0765614    0.6299459   -8.1995694   -5.6967468
## [14,]    7.80782636    2.3190302   21.9394381    5.8798546    8.4789895
## [15,]    8.19733134   77.3366307    3.7142063   -3.1649814   -1.9079581
## [16,]    0.00000000   -9.6754522  -14.5984285   -0.7969855   -1.9158120
## [17,]   -9.67545221    0.0000000   -4.3769844    2.6057739    1.4203500
## [18,]  -14.59842848   -4.3769844    0.0000000   -3.3789754   -4.9648939
## [19,]   -0.79698552    2.6057739   -3.3789754    0.0000000  -32.6474874
## [20,]   -1.91581203    1.4203500   -4.9648939  -32.6474874    0.0000000
## [21,]    8.80988280  138.9138735    3.9990259   -2.9123592   -1.6895801
## [22,]    7.43870666    2.1603662   20.0557271    6.1623396    8.9176360
## [23,]   -5.30538946  -19.7553324   -2.1327742    5.0425747    3.4392990
## [24,]   -0.27090965   -4.0003193    2.0878633   32.5725689   15.7683478
## [25,]   16.82911558   27.6542651    6.7036304   -1.2247427   -0.1471640
## [26,]   23.30396242   19.1126081    8.0522949   -0.6815947    0.3824781
## [27,]    4.06233606   13.2377340    1.3023969   -6.5363809   -4.5528025
## [28,]  -57.90023618  -12.3424289  -11.1761018   -0.1898838   -1.2693244
## [29,]   -1.45977004    1.8747776   -4.2858522  -54.5628553  -82.8797460
## [30,]  -11.37917153   -3.5668474  -62.4734293   -4.1644548   -6.0021342
## [31,]  -31.14377033  -15.6663442   -9.1742442    0.3186796   -0.7460956
## [32,]    6.83424497    1.8852200   17.3578118    6.6995289    9.7781406
## [33,]    9.98271191    3.1329096   39.1557634    4.6763941    6.7095167
## [34,]   -7.65065538   -2.2522976  -21.1128866   -5.9964169   -8.6588621
## [35,]    8.20316724    2.4816990   24.1981280    5.6085318    8.0663053
## [36,]   -8.20316724   -2.4816990  -24.1981280   -5.6085318   -8.0663053
## [37,]    8.54045856    2.6149007   26.3582150    5.3989497    7.7531553
## [38,]   -8.54045856   -2.6149007  -26.3582150   -5.3989497   -7.7531553
## [39,]    4.22847324   13.9366043    1.4197272   -6.2939464   -4.3778957
## [40,]   -4.22847324  -13.9366043   -1.4197272    6.2939464    4.3778957
## [41,]   28.13960760   16.6410768    8.7929649   -0.4345066    0.6291777
## [42,]  -28.13960760  -16.6410768   -8.7929649    0.4345066   -0.6291777
## [43,]    2.94846569   -0.5126983    6.6989884   17.3600877   39.3633488
## [44,]   -2.94846569    0.5126983   -6.6989884  -17.3600877  -39.3633488
## [45,]   -9.57895304 -1323.1269139   -4.3361876    2.6374205    1.4483573
## [46,]    9.57895304 1323.1269139    4.3361876   -2.6374205   -1.4483573
##                [,21]        [,22]        [,23]        [,24]        [,25]
##  [1,] -116.7444094   -1.5543665   29.5223574    4.8604434  -18.8610083
##  [2,]    0.2689354    0.6305047   -0.1196839    0.3007441    0.4044971
##  [3,]   -1.0891162  -46.8903080   -0.3931087   -5.5293282   -2.7517964
##  [4,]    0.4331549   24.7670745    1.0479643    6.8800589    2.0026491
##  [5,]   -1.0454439  -44.3357146   -0.4356119   -5.6091045   -2.7005197
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```
##  [6,]   22.5456228    3.7436274 -10.7011492  -2.3663964 1790.8083098
##  [7,]   -1.6618693    9.0021272   3.4050628  15.5628323   -0.1214981
##  [8,]   -1.2159389   10.5698534   2.8659257  12.7509393    0.2996533
##  [9,]    3.8423681   -4.8552314  -6.3967241 -96.6870034    1.9782236
## [10,]   -0.7297620  -31.6430986  -0.7474334  -6.2263298   -2.3358900
## [11,]   -2.2874750    7.3683465   4.1999565  21.5293643   -0.6871576
## [12,]  112.9969363    1.5437703 -29.7813778  -4.8770759   18.7508909
## [13,]  -11.1363249    1.0812303  24.1834235  12.3940855   -6.4578469
## [14,]   -2.0331343 -252.1678770   0.4898539  -4.0705358   -3.9127751
## [15,] -175.0343214   -1.6613891  27.1409449   4.6957805  -20.0368582
## [16,]    8.8098828    7.4387067  -5.3053895  -0.2709096   16.8291156
## [17,]  138.9138735    2.1603662 -19.7553324  -4.0003193   27.6542651
## [18,]    3.9990259   20.0557271  -2.1327742   2.0878633    6.7036304
## [19,]   -2.9123592    6.1623396   5.0425747  32.5725689   -1.2247427
## [20,]   -1.6895801    8.9176360   3.4392990  15.7683478   -0.1471640
## [21,]    0.0000000   -1.8791867  23.3243015   4.3783581  -22.8528764
## [22,]   -1.8791867    0.0000000   0.3503768  -4.2783948   -3.7163143
## [23,]   23.3243015    0.3503768   0.0000000  -7.2375464   10.7851411
## [24,]    4.3783581   -4.2783948  -7.2375464   0.0000000    2.3890976
## [25,]  -22.8528764   -3.7163143  10.7851411   2.3890976    0.0000000
## [26,]  -16.5795403   -4.5003035   8.8138430   1.7936514  -65.9760898
## [27,]  -14.9105861    0.4157426  45.4946463   9.5216212   -8.0964446
## [28,]   11.1038984    6.0561566  -6.5060234  -0.8795128   24.5771177
## [29,]   -2.1558272    7.6700597   4.0287818  19.9947654   -0.5704755
## [30,]    3.2319081   30.3635036  -1.5206236   2.7396610    5.5480644
## [31,]   13.8521771    5.0973755  -7.7493180  -1.4069687   39.0594199
## [32,]   -1.6113968 -142.0072519   0.1036548  -4.6654209   -3.3813582
## [33,]   -2.8174141  -42.9474214   1.1749121  -3.1496761   -4.9605053
## [34,]    1.9684276  433.6472533  -0.4314362   4.1566740    3.8298464
## [35,]   -2.1906091 -125.6061556   0.6307852  -3.8679945   -4.1167660
## [36,]    2.1906091  125.6061556  -0.6307852   3.8679945    4.1167660
## [37,]   -2.3192880  -89.4302664   0.7446607  -3.7095609   -4.2857781
## [38,]    2.3192880   89.4302664  -0.7446607   3.7095609    4.2857781
## [39,]  -15.7707694    0.3038976  53.3316300   9.1332794   -8.4250836
## [40,]   15.7707694   -0.3038976 -53.3316300  -9.1332794    8.4250836
## [41,]  -14.6358341   -4.8996781   8.0708512   1.5294325  -44.9639775
## [42,]   14.6358341    4.8996781  -8.0708512  -1.5294325   44.9639775
## [43,]    0.7674856  -12.6792241  -2.3452364 -10.6235616   -0.7392244
## [44,]   -0.7674856   12.6792241   2.3452364  10.6235616    0.7392244
## [45,]  155.2386820    2.1304352 -20.0816192  -4.0389832   27.0621944
## [46,] -155.2386820   -2.1304352  20.0816192   4.0389832  -27.0621944
##              [,26]        [,27]       [,28]        [,29]        [,30]
##  [1,]  -14.25526806 -17.43750273   9.8657392  -2.50182671   2.85312306
##  [2,]    0.44668298   0.03857660  -0.5081597  -0.44718375  -0.63482701
##  [3,]   -3.42515123   1.17256180   4.7023923  10.06244175  17.97651153
##  [4,]    2.61244282  -1.86013352  -3.7307342 -13.15814158 -13.00576160
##  [5,]   -3.36891043   1.21658198   4.6337639  10.22912535  17.55289627
##  [6,]   68.52001486   8.04054813 -24.9389247   0.55075582  -5.58491111
##  [7,]    0.40824533  -4.51209328  -1.2961831 -78.10929819  -6.05442149
##  [8,]    0.83393610  -3.87964438  -1.7450181 -40.02747151  -6.98544663
##  [9,]    1.40558349   8.33846614  -0.5128548  25.66405675   3.19210317
## [10,]   -2.97159483   1.54208973   4.1548715  11.58403230  14.93059296
## [11,]   -0.15504750  -5.47468780  -0.7168877 -303.32002256  -5.00184368
## [12,]   14.18804794  17.53404573  -9.8283505   2.51352475  -2.84091020
```

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## [13,]   -5.39889867 -53.26847303   3.9863188   -6.57068175   0.06901185
## [14,]   -4.72339579   0.27649036   6.3473944    7.30895074  34.67785651
## [15,]  -14.96232351 -16.51762819  10.2534736   -2.38516512   2.97697907
## [16,]   23.30396242   4.06233606 -57.9002362   -1.45977004 -11.37917153
## [17,]   19.11260809  13.23773397 -12.3424289    1.87477756  -3.56684742
## [18,]    8.05229490   1.30239693 -11.1761018   -4.28585222 -62.47342927
## [19,]   -0.68159474  -6.53638095  -0.1898838  -54.56285533  -4.16445477
## [20,]    0.38247811  -4.55280252  -1.2693244  -82.87974600  -6.00213421
## [21,]  -16.57954032 -14.91058613  11.1038984   -2.15582722   3.23190806
## [22,]   -4.50030348   0.41574263   6.0561566    7.67005974  30.36350358
## [23,]    8.81384301  45.49464631  -6.5060234    4.02878180  -1.52062357
## [24,]    1.79365144   9.52162119  -0.8795128   19.99476539   2.73966097
## [25,]  -65.97608983  -8.09644459  24.5771177   -0.57047551   5.54806438
## [26,]    0.00000000  -6.73895877  40.0131222   -0.03963756   6.63664898
## [27,]   -6.73895877   0.00000000   5.0189591   -5.26428197   0.72700277
## [28,]   40.01312217   5.01895907   0.0000000   -0.83424907  -9.00493725
## [29,]   -0.03963756  -5.26428197  -0.8342491    0.00000000  -5.20303303
## [30,]    6.63664898   0.72700277  -9.0049372   -5.20303303   0.00000000
## [31,]   97.03978242   5.96410292 -68.7023341   -0.32090818  -7.51101148
## [32,]   -4.12317118   0.66415330   5.5720598    8.36852466  24.81185216
## [33,]   -5.93741331  -0.39537996   7.9990836    5.81635595 106.40836974
## [34,]    4.62905362  -0.33471097  -6.2237865   -7.45744670 -32.73637961
## [35,]   -4.95653850   0.13664159   6.6557136    6.96603452  40.41091752
## [36,]    4.95653850  -0.13664159  -6.6557136   -6.96603452 -40.41091752
## [37,]   -5.15087166   0.02426345   6.9158604    6.70374150  46.56453279
## [38,]    5.15087166  -0.02426345  -6.9158604   -6.70374150 -46.56453279
## [39,]   -7.00061635 -314.06261971   5.2137210   -5.06789180   0.84039088
## [40,]    7.00061635  314.06261971  -5.2137210    5.06789180  -0.84039088
## [41,] -142.84843620  -6.20138965  55.9225394    0.20532040   7.21695933
## [42,]  142.84843620   6.20138965 -55.9225394   -0.20532040  -7.21695933
## [43,]   -1.28410726   3.28383862   2.2303986   26.40169047   8.13112189
## [44,]    1.28410726  -3.28383862  -2.2303986  -26.40169047  -8.13112189
## [45,]   18.81438144  13.39823419 -12.2021520    1.90392777  -3.53087651
## [46,]  -18.81438144 -13.39823419  12.2021520   -1.90392777   3.53087651
##               [,31]        [,32]        [,33]        [,34]        [,35]
## [1,]     12.1148973   -1.2937394   -2.4582876    1.6409591 -1.855983e+00
## [2,]     -0.4734264    0.6264514    0.6360257   -0.6316006  6.337550e-01
## [3,]      3.9243431  -70.3740417  -22.0265787   42.2419701 -3.394105e+01
## [4,]     -3.0553745   30.2976698   15.1914590  -23.3526161  2.045508e+01
## [5,]      3.8637233  -64.8192212  -21.4142697   40.1500935 -3.256313e+01
## [6,]    -39.9503228    3.4073361    4.9938825   -3.8576407  4.145841e+00
## [7,]     -0.7721707    9.8745619    6.7684544   -8.7399822  8.140083e+00
## [8,]     -1.2049681   11.6861399    7.8282750  -10.2395604  9.492411e+00
## [9,]     -1.0299877   -5.2822996   -3.6299171    4.7216557 -4.406261e+00
## [10,]     3.4375374  -41.0327932  -17.7501040   29.4159179 -2.505302e+01
## [11,]    -0.2053013    8.0315466    5.5937034   -7.1658763  6.696845e+00
## [12,]   -12.0635733    1.2833526    2.4466671   -1.6302848  1.845096e+00
## [13,]     4.7726889    1.3378831    0.2597412   -0.9980311  7.957318e-01
## [14,]     5.3442007  -90.7583067  -51.9306779  602.7511643 -2.505405e+02
## [15,]    12.6510176   -1.3985606   -2.5759893    1.7487999 -1.966043e+00
## [16,]   -31.1437703    6.8342450    9.9827119   -7.6506554  8.203167e+00
## [17,]   -15.6663442    1.8852200    3.1329096   -2.2522976  2.481699e+00
## [18,]    -9.1742442   17.3578118   39.1557634  -21.1128866  2.419813e+01
## [19,]     0.3186796    6.6995289    4.6763941   -5.9964169  5.608532e+00
```

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## [20,]   -0.7460956    9.7781406    6.7095167   -8.6588621  8.066305e+00
## [21,]   13.8521771   -1.6113968   -2.8174141    1.9684276 -2.190609e+00
## [22,]    5.0973755 -142.0072519  -42.9474214  433.6472529 -1.256062e+02
## [23,]   -7.7493180    0.1036548    1.1749121   -0.4314362  6.307852e-01
## [24,]   -1.4069687   -4.6654209   -3.1496761    4.1566740 -3.867995e+00
## [25,]   39.0594199   -3.3813582   -4.9605053    3.8298464 -4.116766e+00
## [26,]   97.0397824   -4.1231712   -5.9374133    4.6290536 -4.956539e+00
## [27,]    5.9641029    0.6641533   -0.3953800   -0.3347110  1.366416e-01
## [28,]  -68.7023341    5.5720598    7.9990836   -6.2237865  6.655714e+00
## [29,]   -0.3209082    8.3685247    5.8163560   -7.4574467  6.966035e+00
## [30,]   -7.5110115   24.8118522  106.4083697  -32.7363796  4.041092e+01
## [31,]    0.0000000    4.6828186    6.7085555   -5.2396768  5.603424e+00
## [32,]    4.6828186    0.0000000  -32.7855749  106.9149190 -6.652127e+01
## [33,]    6.7085555  -32.7855749    0.0000000   47.7579712 -6.568526e+01
## [34,]   -5.2396768  106.9149190   47.7579712    0.0000000  1.769367e+02
## [35,]    5.6034236  -66.5212746  -65.6852607  176.9366640  0.000000e+00
## [36,]   -5.6034236   66.5212746   65.6852607 -176.9366640  2.807365e+08
## [37,]    5.8205006  -54.7220972  -83.3812850  112.7666292 -3.114780e+02
## [38,]   -5.8205006   54.7220972   83.3812850 -112.7666292  3.114780e+02
## [39,]    6.1931547    0.5515442   -0.5074616   -0.2230305  2.518789e-02
## [40,]   -6.1931547   -0.5515442    0.5074616    0.2230305 -2.518789e-02
## [41,]  303.3702016   -4.4980167   -6.4505413    5.0373042 -5.388524e+00
## [42,] -303.3702016    4.4980167    6.4505413   -5.0373042  5.388524e+00
## [43,]    1.6668410  -14.1929155   -9.1599983   12.2406153 -1.126358e+01
## [44,]   -1.6668410   14.1929155    9.1599983  -12.2406153  1.126358e+01
## [45,]  -15.4568763    1.8561228    3.0991191   -2.2220626  2.450650e+00
## [46,]   15.4568763   -1.8561228   -3.0991191    2.2220626 -2.450650e+00
##              [,36]        [,37]        [,38]        [,39]        [,40]
##  [1,]  1.855983e+00 -1.980149e+00  1.980149e+00 -1.858058e+01  1.858058e+01
##  [2,] -6.337550e-01  6.346679e-01 -6.346679e-01  5.046331e-02 -5.046331e-02
##  [3,]  3.394105e+01 -3.050466e+01  3.050466e+01  1.057172e+00 -1.057172e+00
##  [4,] -2.045508e+01  1.908911e+01 -1.908911e+01 -1.738395e+00  1.738395e+00
##  [5,]  3.256313e+01 -2.937933e+01  2.937933e+01  1.100875e+00 -1.100875e+00
##  [6,] -4.145841e+00  4.315651e+00 -4.315651e+00  8.366180e+00 -8.366180e+00
##  [7,] -8.140083e+00  7.823264e+00 -7.823264e+00 -4.338322e+00  4.338322e+00
##  [8,] -9.492411e+00  9.102637e+00 -9.102637e+00 -3.722221e+00  3.722221e+00
##  [9,]  4.406261e+00 -4.233998e+00  4.233998e+00  8.014243e+00 -8.014243e+00
## [10,]  2.505302e+01 -2.308394e+01  2.308394e+01  1.423657e+00 -1.423657e+00
## [11,] -6.696845e+00  6.445890e+00 -6.445890e+00 -5.271356e+00  5.271356e+00
## [12,] -1.845096e+00  1.969128e+00 -1.969128e+00  1.868888e+01 -1.868888e+01
## [13,] -7.957318e-01  6.816230e-01 -6.816230e-01 -4.544847e+01  4.544847e+01
## [14,]  2.505405e+02 -1.387905e+02  1.387905e+02  1.649024e-01 -1.649024e-01
## [15,]  1.966043e+00 -2.091612e+00  2.091612e+00 -1.755220e+01  1.755220e+01
## [16,] -8.203167e+00  8.540459e+00 -8.540459e+00  4.228473e+00 -4.228473e+00
## [17,] -2.481699e+00  2.614901e+00 -2.614901e+00  1.393660e+01 -1.393660e+01
## [18,] -2.419813e+01  2.635821e+01 -2.635821e+01  1.419727e+00 -1.419727e+00
## [19,] -5.608532e+00  5.398950e+00 -5.398950e+00 -6.293946e+00  6.293946e+00
## [20,] -8.066305e+00  7.753155e+00 -7.753155e+00 -4.377896e+00  4.377896e+00
## [21,]  2.190609e+00 -2.319288e+00  2.319288e+00 -1.577077e+01  1.577077e+01
## [22,]  1.256062e+02 -8.943027e+01  8.943027e+01  3.038976e-01 -3.038976e-01
## [23,] -6.307852e-01  7.446607e-01 -7.446607e-01  5.333163e+01 -5.333163e+01
## [24,]  3.867995e+00 -3.709561e+00  3.709561e+00  9.133279e+00 -9.133279e+00
## [25,]  4.116766e+00 -4.285778e+00  4.285778e+00 -8.425084e+00  8.425084e+00
## [26,]  4.956539e+00 -5.150872e+00  5.150872e+00 -7.000616e+00  7.000616e+00
```

```
## [27,] -1.366416e-01  2.426345e-02 -2.426345e-02 -3.140626e+02  3.140626e+02
## [28,] -6.655714e+00  6.915860e+00 -6.915860e+00  5.213721e+00 -5.213721e+00
## [29,] -6.966035e+00  6.703741e+00 -6.703741e+00 -5.067892e+00  5.067892e+00
## [30,] -4.041092e+01  4.656453e+01 -4.656453e+01  8.403909e-01 -8.403909e-01
## [31,] -5.603424e+00  5.820501e+00 -5.820501e+00  6.193155e+00 -6.193155e+00
## [32,]  6.652127e+01 -5.472210e+01  5.472210e+01  5.515442e-01 -5.515442e-01
## [33,]  6.568526e+01 -8.338128e+01  8.338128e+01 -5.074616e-01  5.074616e-01
## [34,] -1.769367e+02  1.127666e+02 -1.127666e+02 -2.230305e-01  2.230305e-01
## [35,]  2.807365e+08 -3.114780e+02  3.114780e+02  2.518789e-02 -2.518789e-02
## [36,]  0.000000e+00  3.114780e+02 -3.114780e+02 -2.518789e-02  2.518789e-02
## [37,]  3.114780e+02  0.000000e+00  3.970214e+08 -8.717256e-02  8.717256e-02
## [38,] -3.114780e+02  3.970214e+08  0.000000e+00  8.717256e-02 -8.717256e-02
## [39,] -2.518789e-02 -8.717256e-02  8.717256e-02  0.000000e+00  3.970214e+08
## [40,]  2.518789e-02  8.717256e-02 -8.717256e-02  3.970214e+08  0.000000e+00
## [41,]  5.388524e+00 -5.597731e+00  5.597731e+00 -6.439995e+00  6.439995e+00
## [42,] -5.388524e+00  5.597731e+00 -5.597731e+00  6.439995e+00 -6.439995e+00
## [43,]  1.126358e+01 -1.076204e+01  1.076204e+01  3.139569e+00 -3.139569e+00
## [44,] -1.126358e+01  1.076204e+01 -1.076204e+01 -3.139569e+00  3.139569e+00
## [45,] -2.450650e+00  2.583343e+00 -2.583343e+00  1.411170e+01 -1.411170e+01
## [46,]  2.450650e+00 -2.583343e+00  2.583343e+00 -1.411170e+01  1.411170e+01
##                [,41]         [,42]         [,43]         [,44]         [,45]
##  [1,] -1.273899e+01  1.273899e+01   1.0743486  -1.0743486    66.5050472
##  [2,]  4.650758e-01 -4.650758e-01   0.5353456  -0.5353456    -0.2905765
##  [3,] -3.760330e+00  3.760330e+00 -18.4014258  18.4014258     1.3238633
##  [4,]  2.910689e+00 -2.910689e+00  28.8742228 -28.8742228    -0.6604570
##  [5,] -3.701214e+00  3.701214e+00 -18.8631920  18.8631920     1.2795200
##  [6,]  4.614207e+01 -4.614207e+01   0.7590819  -0.7590819   -26.6400728
##  [7,]  6.551326e-01 -6.551326e-01  40.5591673 -40.5591673     1.4211958
##  [8,]  1.085287e+00 -1.085287e+00  80.1269967 -80.1269967     0.9827818
##  [9,]  1.149260e+00 -1.149260e+00 -12.3415972  12.3415972    -3.5295478
## [10,] -3.284945e+00  3.284945e+00 -23.0021526  23.0021526     0.9597329
## [11,]  8.986988e-02 -8.986988e-02  24.1814871 -24.1814871     2.0320727
## [12,]  1.268330e+01 -1.268330e+01  -1.0845952   1.0845952   -65.2653653
## [13,] -4.966189e+00  4.966189e+00   4.1997920  -4.1997920    10.1805460
## [14,] -5.138313e+00  5.138313e+00 -11.9400703  11.9400703     2.2885666
## [15,] -1.332193e+01  1.332193e+01   0.9717071  -0.9717071    82.1656545
## [16,]  2.813961e+01 -2.813961e+01   2.9484657  -2.9484657    -9.5789530
## [17,]  1.664108e+01 -1.664108e+01  -0.5126983   0.5126983 -1323.1269519
## [18,]  8.792965e+00 -8.792965e+00   6.6989884  -6.6989884    -4.3361876
## [19,] -4.345066e-01  4.345066e-01  17.3600877 -17.3600877     2.6374205
## [20,]  6.291777e-01 -6.291777e-01  39.3633488 -39.3633488     1.4483573
## [21,] -1.463583e+01  1.463583e+01   0.7674856  -0.7674856   155.2386820
## [22,] -4.899678e+00  4.899678e+00 -12.6792241  12.6792241     2.1304352
## [23,]  8.070851e+00 -8.070851e+00  -2.3452364   2.3452364   -20.0816192
## [24,]  1.529432e+00 -1.529432e+00 -10.6235616  10.6235616    -4.0389832
## [25,] -4.496398e+01  4.496398e+01  -0.7392244   0.7392244    27.0621944
## [26,] -1.428484e+02  1.428484e+02  -1.2841073   1.2841073    18.8143814
## [27,] -6.201390e+00  6.201390e+00   3.2838386  -3.2838386    13.3982342
## [28,]  5.592254e+01 -5.592254e+01   2.2303986  -2.2303986   -12.2021520
## [29,]  2.053204e-01 -2.053204e-01  26.4016905 -26.4016905     1.9039278
## [30,]  7.216959e+00 -7.216959e+00   8.1311219  -8.1311219    -3.5308765
## [31,]  3.033702e+02 -3.033702e+02   1.6668410  -1.6668410   -15.4568763
## [32,] -4.498017e+00  4.498017e+00 -14.1929155  14.1929155     1.8561228
## [33,] -6.450541e+00  6.450541e+00  -9.1599983   9.1599983     3.0991191
```

```
## [34,]   5.037304e+00 -5.037304e+00  12.2406153 -12.2406153    -2.2220626
## [35,]  -5.388524e+00  5.388524e+00 -11.2635811  11.2635811     2.4506500
## [36,]   5.388524e+00 -5.388524e+00  11.2635811 -11.2635811    -2.4506500
## [37,]  -5.597731e+00  5.597731e+00 -10.7620397  10.7620397     2.5833428
## [38,]   5.597731e+00 -5.597731e+00  10.7620397 -10.7620397    -2.5833428
## [39,]  -6.439995e+00  6.439995e+00   3.1395685  -3.1395685    14.1116964
## [40,]   6.439995e+00 -6.439995e+00  -3.1395685   3.1395685   -14.1116964
## [41,]   0.000000e+00  2.807365e+08  -1.5429926   1.5429926    16.4082564
## [42,]   2.807365e+08  0.000000e+00   1.5429926  -1.5429926   -16.4082564
## [43,]  -1.542993e+00  1.542993e+00   0.0000000         Inf    -0.5393598
## [44,]   1.542993e+00 -1.542993e+00         Inf   0.0000000     0.5393598
## [45,]   1.640826e+01 -1.640826e+01  -0.5393598   0.5393598     0.0000000
## [46,]  -1.640826e+01  1.640826e+01   0.5393598  -0.5393598           NaN
##                [,46]
##  [1,]  -66.5050472
##  [2,]    0.2905765
##  [3,]   -1.3238633
##  [4,]    0.6604570
##  [5,]   -1.2795200
##  [6,]   26.6400728
##  [7,]   -1.4211958
##  [8,]   -0.9827818
##  [9,]    3.5295478
## [10,]   -0.9597329
## [11,]   -2.0320727
## [12,]   65.2653653
## [13,]  -10.1805460
## [14,]   -2.2885666
## [15,]  -82.1656545
## [16,]    9.5789530
## [17,] 1323.1269519
## [18,]    4.3361876
## [19,]   -2.6374205
## [20,]   -1.4483573
## [21,] -155.2386820
## [22,]   -2.1304352
## [23,]   20.0816192
## [24,]    4.0389832
## [25,]  -27.0621944
## [26,]  -18.8143814
## [27,]  -13.3982342
## [28,]   12.2021520
## [29,]   -1.9039278
## [30,]    3.5308765
## [31,]   15.4568763
## [32,]   -1.8561228
## [33,]   -3.0991191
## [34,]    2.2220626
## [35,]   -2.4506500
## [36,]    2.4506500
## [37,]   -2.5833428
## [38,]    2.5833428
## [39,]  -14.1116964
## [40,]   14.1116964
```

```
## [41,]  -16.4082564
## [42,]   16.4082564
## [43,]    0.5393598
## [44,]   -0.5393598
## [45,]         NaN
## [46,]    0.0000000
##
## $n
## [1] 81
##
## $gp
## [1] 44
##
## $method
## [1] "pearson"
```

Summary Recommending ways to increase attendance at L.A. Dodgers home games is a particularly vexing issue for several reasons. The Dodgers have led MLB in attendance for years, so they are at the top. Moreover, the most common recommendation is to put a winning product on the field, and the Dodgers have done just that. Statistically it is highly unlikely to outperform their winning percentages. It is highly unlikely that they even match their prior years wins totals. They won 111 and 106 games respectively over the past two years. A 100-win season is an aberration in baseball, let alone accomplishing this feat three years in a row. The main declines in attendance across MLB are due to the Covid-19 pandemic. MLB is recovering slowly. The greatest spur to attendance may very well be the time lapsed since the end of the pandemic. Recommendation goals should be small increases in attendance. I reduced the problem by creating three dfs including small attendance (less than 35,000), medium attendance (between 35,000 and 45,000), and large attendance (more than 45,000). Approaching attendance granularly, one can aim to give incremental boosts by comparing a smaller group to a larger group, and suggesting what the larger group includes which is missing in the smaller group. While fireworks shows do not figure in large audiences, they do occur in medium audiences, and not small ones. I recommend more fireworks displays for the expected boost it gives in attendance. Likewise, bobblehead giveaways only occurred on large crowd days. Adding more bobblehead giveaway days should add more large attendance days. There is not data on bat giveaways, but I recommend bat days because they have historically brought out the fans. The PCA produced two components which account for 29% of the variance. These two components suggest scheduling as many Friday night games as feasible. Also fireworks shows are positively correlated with attendance, so one would expect more large attendances with more fireworks shows.

References McDonald, Mark and Rascher, Daniel A., "Does Bat Day Make Cents? The Effect of Promotions on the Demand for Major League Baseball" (2000). Kinesiology (Formerly Exercise and Sport Science). 1. https://repository.usfca.edu/ess/1 Cooper, JJ (2022) "MLB Attendance Dipped Significantly From Pre-Pandemic Numbers" Baseball America, retrieved 3/30/2023 from: https://www.baseballamerica.com/stories/mlb-attendance-dipped-significantly-from-pre-pandemic-numbers/