Class 9: Halloween Mini-Project

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Importing Candy Data

```
read.csv("candy-data.csv")
```

```
                competitorname chocolate fruity caramel peanutyalmondy nougat
1                    100 Grand         1      0       1              0      0
2                 3 Musketeers         1      0       0              0      1
3                     One dime         0      0       0              0      0
4                  One quarter         0      0       0              0      0
5                    Air Heads         0      1       0              0      0
6                   Almond Joy         1      0       0              1      0
7                    Baby Ruth         1      0       1              1      1
8           Boston Baked Beans         0      0       0              1      0
9                   Candy Corn         0      0       0              0      0
10          Caramel Apple Pops         0      1       1              0      0
11             Charleston Chew         1      0       0              0      1
12  Chewey Lemonhead Fruit Mix         0      1       0              0      0
13                    Chiclets         0      1       0              0      0
14                        Dots         0      1       0              0      0
15                    Dum Dums         0      1       0              0      0
16                 Fruit Chews         0      1       0              0      0
17                     Fun Dip         0      1       0              0      0
18                  Gobstopper         0      1       0              0      0
19           Haribo Gold Bears         0      1       0              0      0
20           Haribo Happy Cola         0      0       0              0      0
21           Haribo Sour Bears         0      1       0              0      0
22          Haribo Twin Snakes         0      1       0              0      0
23            Hershey's Kisses         1      0       0              0      0
24           Hershey's Krackel         1      0       0              0      0
25    Hershey's Milk Chocolate         1      0       0              0      0
26      Hershey's Special Dark         1      0       0              0      0
27                  Jawbusters         0      1       0              0      0
28                Junior Mints         1      0       0              0      0
29                     Kit Kat         1      0       0              0      0
30                 Laffy Taffy         0      1       0              0      0
31                   Lemonhead         0      1       0              0      0
32 Lifesavers big ring gummies         0      1       0              0      0
33         Peanut butter M&M's         1      0       0              1      0
34                       M&M's         1      0       0              0      0
35                  Mike & Ike         0      1       0              0      0
36                   Milk Duds         1      0       1              0      0
37                   Milky Way         1      0       1              0      1
38          Milky Way Midnight         1      0       1              0      1
39    Milky Way Simply Caramel         1      0       1              0      0
```

```
40                      Mounds         1      0       0              0      0
41                 Mr Good Bar         1      0       0              1      0
42                       Nerds         0      1       0              0      0
43         Nestle Butterfinger         1      0       0              1      0
44               Nestle Crunch         1      0       0              0      0
45                   Nik L Nip         0      1       0              0      0
46                 Now & Later         0      1       0              0      0
47                      Payday         0      0       0              1      1
48                 Peanut M&Ms         1      0       0              1      0
49                Pixie Sticks         0      0       0              0      0
50                   Pop Rocks         0      1       0              0      0
51                   Red vines         0      1       0              0      0
52          Reese's Miniatures         1      0       0              1      0
53   Reese's Peanut Butter cup         1      0       0              1      0
54              Reese's pieces         1      0       0              1      0
55 Reese's stuffed with pieces         1      0       0              1      0
56                    Ring pop         0      1       0              0      0
57                        Rolo         1      0       1              0      0
58           Root Beer Barrels         0      0       0              0      0
59                       Runts         0      1       0              0      0
60                     Sixlets         1      0       0              0      0
61           Skittles original         0      1       0              0      0
62          Skittles wildberry         0      1       0              0      0
63             Nestle Smarties         1      0       0              0      0
64              Smarties candy         0      1       0              0      0
65                    Snickers         1      0       1              1      1
66            Snickers Crisper         1      0       1              1      0
67             Sour Patch Kids         0      1       0              0      0
68       Sour Patch Tricksters         0      1       0              0      0
69                   Starburst         0      1       0              0      0
70         Strawberry bon bons         0      1       0              0      0
71                Sugar Babies         0      0       1              0      0
72                 Sugar Daddy         0      0       1              0      0
73                Super Bubble         0      1       0              0      0
74                Swedish Fish         0      1       0              0      0
75                 Tootsie Pop         1      1       0              0      0
76        Tootsie Roll Juniors         1      0       0              0      0
77        Tootsie Roll Midgies         1      0       0              0      0
78     Tootsie Roll Snack Bars         1      0       0              0      0
79           Trolli Sour Bites         0      1       0              0      0
80                        Twix         1      0       1              0      0
81                   Twizzlers         0      1       0              0      0
82                    Warheads         0      1       0              0      0
83        Welch's Fruit Snacks         0      1       0              0      0
84  Werther's Original Caramel         0      0       1              0      0
85                    Whoppers         1      0       0              0      0
   crispedricewafer hard bar pluribus sugarpercent pricepercent winpercent
1                 1    0   1        0        0.732        0.860   66.97173
2                 0    0   1        0        0.604        0.511   67.60294
3                 0    0   0        0        0.011        0.116   32.26109
4                 0    0   0        0        0.011        0.511   46.11650
```

```
5                 0    0   0        0        0.906        0.511   52.34146
6                 0    0   1        0        0.465        0.767   50.34755
7                 0    0   1        0        0.604        0.767   56.91455
8                 0    0   0        1        0.313        0.511   23.41782
9                 0    0   0        1        0.906        0.325   38.01096
10                0    0   0        0        0.604        0.325   34.51768
11                0    0   1        0        0.604        0.511   38.97504
12                0    0   0        1        0.732        0.511   36.01763
13                0    0   0        1        0.046        0.325   24.52499
14                0    0   0        1        0.732        0.511   42.27208
15                0    1   0        0        0.732        0.034   39.46056
16                0    0   0        1        0.127        0.034   43.08892
17                0    1   0        0        0.732        0.325   39.18550
18                0    1   0        1        0.906        0.453   46.78335
19                0    0   0        1        0.465        0.465   57.11974
20                0    0   0        1        0.465        0.465   34.15896
21                0    0   0        1        0.465        0.465   51.41243
22                0    0   0        1        0.465        0.465   42.17877
23                0    0   0        1        0.127        0.093   55.37545
24                1    0   1        0        0.430        0.918   62.28448
25                0    0   1        0        0.430        0.918   56.49050
26                0    0   1        0        0.430        0.918   59.23612
27                0    1   0        1        0.093        0.511   28.12744
28                0    0   0        1        0.197        0.511   57.21925
29                1    0   1        0        0.313        0.511   76.76860
30                0    0   0        0        0.220        0.116   41.38956
31                0    1   0        0        0.046        0.104   39.14106
32                0    0   0        0        0.267        0.279   52.91139
33                0    0   0        1        0.825        0.651   71.46505
34                0    0   0        1        0.825        0.651   66.57458
35                0    0   0        1        0.872        0.325   46.41172
36                0    0   0        1        0.302        0.511   55.06407
37                0    0   1        0        0.604        0.651   73.09956
38                0    0   1        0        0.732        0.441   60.80070
39                0    0   1        0        0.965        0.860   64.35334
40                0    0   1        0        0.313        0.860   47.82975
41                0    0   1        0        0.313        0.918   54.52645
42                0    1   0        1        0.848        0.325   55.35405
43                0    0   1        0        0.604        0.767   70.73564
44                1    0   1        0        0.313        0.767   66.47068
45                0    0   0        1        0.197        0.976   22.44534
46                0    0   0        1        0.220        0.325   39.44680
47                0    0   1        0        0.465        0.767   46.29660
48                0    0   0        1        0.593        0.651   69.48379
49                0    0   0        1        0.093        0.023   37.72234
50                0    1   0        1        0.604        0.837   41.26551
51                0    0   0        1        0.581        0.116   37.34852
52                0    0   0        0        0.034        0.279   81.86626
53                0    0   0        0        0.720        0.651   84.18029
54                0    0   0        1        0.406        0.651   73.43499
55                0    0   0        0        0.988        0.651   72.88790
```

```
56                0    1   0        0        0.732        0.965   35.29076
57                0    0   0        1        0.860        0.860   65.71629
58                0    1   0        1        0.732        0.069   29.70369
59                0    1   0        1        0.872        0.279   42.84914
60                0    0   0        1        0.220        0.081   34.72200
61                0    0   0        1        0.941        0.220   63.08514
62                0    0   0        1        0.941        0.220   55.10370
63                0    0   0        1        0.267        0.976   37.88719
64                0    1   0        1        0.267        0.116   45.99583
65                0    0   1        0        0.546        0.651   76.67378
66                1    0   1        0        0.604        0.651   59.52925
67                0    0   0        1        0.069        0.116   59.86400
68                0    0   0        1        0.069        0.116   52.82595
69                0    0   0        1        0.151        0.220   67.03763
70                0    1   0        1        0.569        0.058   34.57899
71                0    0   0        1        0.965        0.767   33.43755
72                0    0   0        0        0.418        0.325   32.23100
73                0    0   0        0        0.162        0.116   27.30386
74                0    0   0        1        0.604        0.755   54.86111
75                0    1   0        0        0.604        0.325   48.98265
76                0    0   0        0        0.313        0.511   43.06890
77                0    0   0        1        0.174        0.011   45.73675
78                0    0   1        0        0.465        0.325   49.65350
79                0    0   0        1        0.313        0.255   47.17323
80                1    0   1        0        0.546        0.906   81.64291
81                0    0   0        0        0.220        0.116   45.46628
82                0    1   0        0        0.093        0.116   39.01190
83                0    0   0        1        0.313        0.313   44.37552
84                0    1   0        0        0.186        0.267   41.90431
85                1    0   0        1        0.872        0.848   49.52411
```

```r
candy = read.csv("candy-data.csv", row.names=1)
head(candy)
```

```
             chocolate fruity caramel peanutyalmondy nougat crispedricewafer
100 Grand            1      0       1              0      0                1
3 Musketeers         1      0       0              0      1                0
One dime             0      0       0              0      0                0
One quarter          0      0       0              0      0                0
Air Heads            0      1       0              0      0                0
Almond Joy           1      0       0              1      0                0
             hard bar pluribus sugarpercent pricepercent winpercent
100 Grand       0   1        0        0.732        0.860   66.97173
3 Musketeers    0   1        0        0.604        0.511   67.60294
One dime        0   0        0        0.011        0.116   32.26109
One quarter     0   0        0        0.011        0.511   46.11650
Air Heads       0   0        0        0.906        0.511   52.34146
Almond Joy      0   1        0        0.465        0.767   50.34755
```

> Q1. How many different candy types are in this dataset?

```
row.names(candy)
```

```
 [1] "100 Grand"                   "3 Musketeers"
 [3] "One dime"                    "One quarter"
 [5] "Air Heads"                   "Almond Joy"
 [7] "Baby Ruth"                   "Boston Baked Beans"
 [9] "Candy Corn"                  "Caramel Apple Pops"
[11] "Charleston Chew"             "Chewey Lemonhead Fruit Mix"
[13] "Chiclets"                    "Dots"
[15] "Dum Dums"                    "Fruit Chews"
[17] "Fun Dip"                     "Gobstopper"
[19] "Haribo Gold Bears"           "Haribo Happy Cola"
[21] "Haribo Sour Bears"           "Haribo Twin Snakes"
[23] "Hershey's Kisses"            "Hershey's Krackel"
[25] "Hershey's Milk Chocolate"    "Hershey's Special Dark"
[27] "Jawbusters"                  "Junior Mints"
[29] "Kit Kat"                     "Laffy Taffy"
[31] "Lemonhead"                   "Lifesavers big ring gummies"
[33] "Peanut butter M&M's"         "M&M's"
[35] "Mike & Ike"                  "Milk Duds"
[37] "Milky Way"                   "Milky Way Midnight"
[39] "Milky Way Simply Caramel"    "Mounds"
[41] "Mr Good Bar"                 "Nerds"
[43] "Nestle Butterfinger"         "Nestle Crunch"
[45] "Nik L Nip"                   "Now & Later"
[47] "Payday"                      "Peanut M&Ms"
[49] "Pixie Sticks"                "Pop Rocks"
[51] "Red vines"                   "Reese's Miniatures"
[53] "Reese's Peanut Butter cup"   "Reese's pieces"
[55] "Reese's stuffed with pieces" "Ring pop"
[57] "Rolo"                        "Root Beer Barrels"
[59] "Runts"                       "Sixlets"
[61] "Skittles original"           "Skittles wildberry"
[63] "Nestle Smarties"             "Smarties candy"
[65] "Snickers"                    "Snickers Crisper"
[67] "Sour Patch Kids"             "Sour Patch Tricksters"
[69] "Starburst"                   "Strawberry bon bons"
[71] "Sugar Babies"                "Sugar Daddy"
[73] "Super Bubble"                "Swedish Fish"
[75] "Tootsie Pop"                 "Tootsie Roll Juniors"
[77] "Tootsie Roll Midgies"        "Tootsie Roll Snack Bars"
[79] "Trolli Sour Bites"           "Twix"
[81] "Twizzlers"                   "Warheads"
[83] "Welch's Fruit Snacks"        "Werther's Original Caramel"
[85] "Whoppers"
```

> Q2. How many fruity candy types are in the dataset?

```
sum(candy$fruity)
```

```
[1] 38
```

What is your favorite candy

> Q3. What is your favorite candy in the dataset and what is it’s winpercent value?

```
candy["Skittles original", "winpercent"]
```

```
[1] 63.08514
```

```
candy["Hershey's Kisses",]$winpercent
```

```
[1] 55.37545
```

```
library(dplyr)
```

```

Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

    filter, lag

The following objects are masked from 'package:base':

    intersect, setdiff, setequal, union
```

```
candy |>
  filter(rownames(candy)=="Hershey's Kisses")|>select(winpercent)
```

```
                 winpercent
Hershey's Kisses   55.37545
```

> Q. Find fruity candy with a winpercent above 50%

```
candy |>
  filter(winpercent > 50) |>
  filter(fruity==1)
```

```
                            chocolate fruity caramel peanutyalmondy nougat
Air Heads                           0      1       0              0      0
Haribo Gold Bears                   0      1       0              0      0
Haribo Sour Bears                   0      1       0              0      0
Lifesavers big ring gummies         0      1       0              0      0
Nerds                               0      1       0              0      0
Skittles original                   0      1       0              0      0
Skittles wildberry                  0      1       0              0      0
Sour Patch Kids                     0      1       0              0      0
Sour Patch Tricksters               0      1       0              0      0
Starburst                           0      1       0              0      0
Swedish Fish                        0      1       0              0      0
                            crispedricewafer hard bar pluribus sugarpercent
Air Heads                                  0    0   0        0        0.906
Haribo Gold Bears                          0    0   0        1        0.465
Haribo Sour Bears                          0    0   0        1        0.465
Lifesavers big ring gummies                0    0   0        0        0.267
Nerds                                      0    1   0        1        0.848
Skittles original                          0    0   0        1        0.941
Skittles wildberry                         0    0   0        1        0.941
Sour Patch Kids                            0    0   0        1        0.069
Sour Patch Tricksters                      0    0   0        1        0.069
Starburst                                  0    0   0        1        0.151
Swedish Fish                               0    0   0        1        0.604
                            pricepercent winpercent
Air Heads                          0.511   52.34146
Haribo Gold Bears                  0.465   57.11974
Haribo Sour Bears                  0.465   51.41243
Lifesavers big ring gummies        0.279   52.91139
Nerds                              0.325   55.35405
Skittles original                  0.220   63.08514
Skittles wildberry                 0.220   55.10370
Sour Patch Kids                    0.116   59.86400
Sour Patch Tricksters              0.116   52.82595
Starburst                          0.220   67.03763
Swedish Fish                       0.755   54.86111
```

```r
top.candy <- candy[candy$winpercent > 50,]
top.candy[top.candy$fruit==1,]
```

```
                            chocolate fruity caramel peanutyalmondy nougat
Air Heads                           0      1       0              0      0
Haribo Gold Bears                   0      1       0              0      0
Haribo Sour Bears                   0      1       0              0      0
Lifesavers big ring gummies         0      1       0              0      0
Nerds                               0      1       0              0      0
Skittles original                   0      1       0              0      0
Skittles wildberry                  0      1       0              0      0
Sour Patch Kids                     0      1       0              0      0
Sour Patch Tricksters               0      1       0              0      0
```

```
Starburst                           0      1       0              0      0
Swedish Fish                        0      1       0              0      0
                            crispedricewafer hard bar pluribus sugarpercent
Air Heads                                  0    0   0        0        0.906
Haribo Gold Bears                          0    0   0        1        0.465
Haribo Sour Bears                          0    0   0        1        0.465
Lifesavers big ring gummies                0    0   0        0        0.267
Nerds                                      0    1   0        1        0.848
Skittles original                          0    0   0        1        0.941
Skittles wildberry                         0    0   0        1        0.941
Sour Patch Kids                            0    0   0        1        0.069
Sour Patch Tricksters                      0    0   0        1        0.069
Starburst                                  0    0   0        1        0.151
Swedish Fish                               0    0   0        1        0.604
                            pricepercent winpercent
Air Heads                          0.511   52.34146
Haribo Gold Bears                  0.465   57.11974
Haribo Sour Bears                  0.465   51.41243
Lifesavers big ring gummies        0.279   52.91139
Nerds                              0.325   55.35405
Skittles original                  0.220   63.08514
Skittles wildberry                 0.220   55.10370
Sour Patch Kids                    0.116   59.86400
Sour Patch Tricksters              0.116   52.82595
Starburst                          0.220   67.03763
Swedish Fish                       0.755   54.86111
```

To get a quick insight into a new dataset some folks like using the skimer package and its “skim()”

```
skimr::skim(candy)
```

Data summary

Name	candy
Number of rows	85
Number of columns	12
_______________________	
Column type frequency:	
numeric	12
________________________	
Group variables	None

Variable type: numeric

skim_variable	n_missing	complete_rate	mean	sd	p0	p25	p50	p75	p100	hist
chocolate	0	1	0.44	0.50	0.00	0.00	0.00	1.00	1.00	▇▁▁▁▆
fruity	0	1	0.45	0.50	0.00	0.00	0.00	1.00	1.00	▇▁▁▁▆

skim_variable	n_missing	complete_rate	mean	sd	p0	p25	p50	p75	p100	hist
caramel	0	1	0.16	0.37	0.00	0.00	0.00	0.00	1.00	▇▁▁▁▂
peanutyalmondy	0	1	0.16	0.37	0.00	0.00	0.00	0.00	1.00	▇▁▁▁▂
nougat	0	1	0.08	0.28	0.00	0.00	0.00	0.00	1.00	▇▁▁▁▁
crispedricewafer	0	1	0.08	0.28	0.00	0.00	0.00	0.00	1.00	▇▁▁▁▁
hard	0	1	0.18	0.38	0.00	0.00	0.00	0.00	1.00	▇▁▁▁▂
bar	0	1	0.25	0.43	0.00	0.00	0.00	0.00	1.00	▇▁▁▁▂
pluribus	0	1	0.52	0.50	0.00	0.00	1.00	1.00	1.00	▇▁▁▁▇
sugarpercent	0	1	0.48	0.28	0.01	0.22	0.47	0.73	0.99	▇▇▇▇▆
pricepercent	0	1	0.47	0.29	0.01	0.26	0.47	0.65	0.98	▇▇▇▇▆
winpercent	0	1	50.32	14.71	22.45	39.14	47.83	59.86	84.18	▃▇▆▅▂

Looks like the 'winpercent' variable or column is measure on a different scale than everything else! I will need to scale my data before doing any analysis like PCA ect.

> Q3. What is your favorite candy in the dataset and what is it's winpercent value?

```
candy["Hershey's Kisses", "winpercent"]
```

```
[1] 55.37545
```

> Q4. What is the winpercent value for "Kit Kat"?

```
candy["Kit Kat", "winpercent"]
```

```
[1] 76.7686
```

> Q5. What is the winpercent value for "Tootsie Roll Snack Bars"?

```
candy["Tootsie Roll Snack Bars", "winpercent"]
```

```
[1] 49.6535
```

> Q6. Is there any variable/column that looks to be on a different scale to the majority of the other columns in the dataset?

variables with different scale: winpercent from 0-100 scale

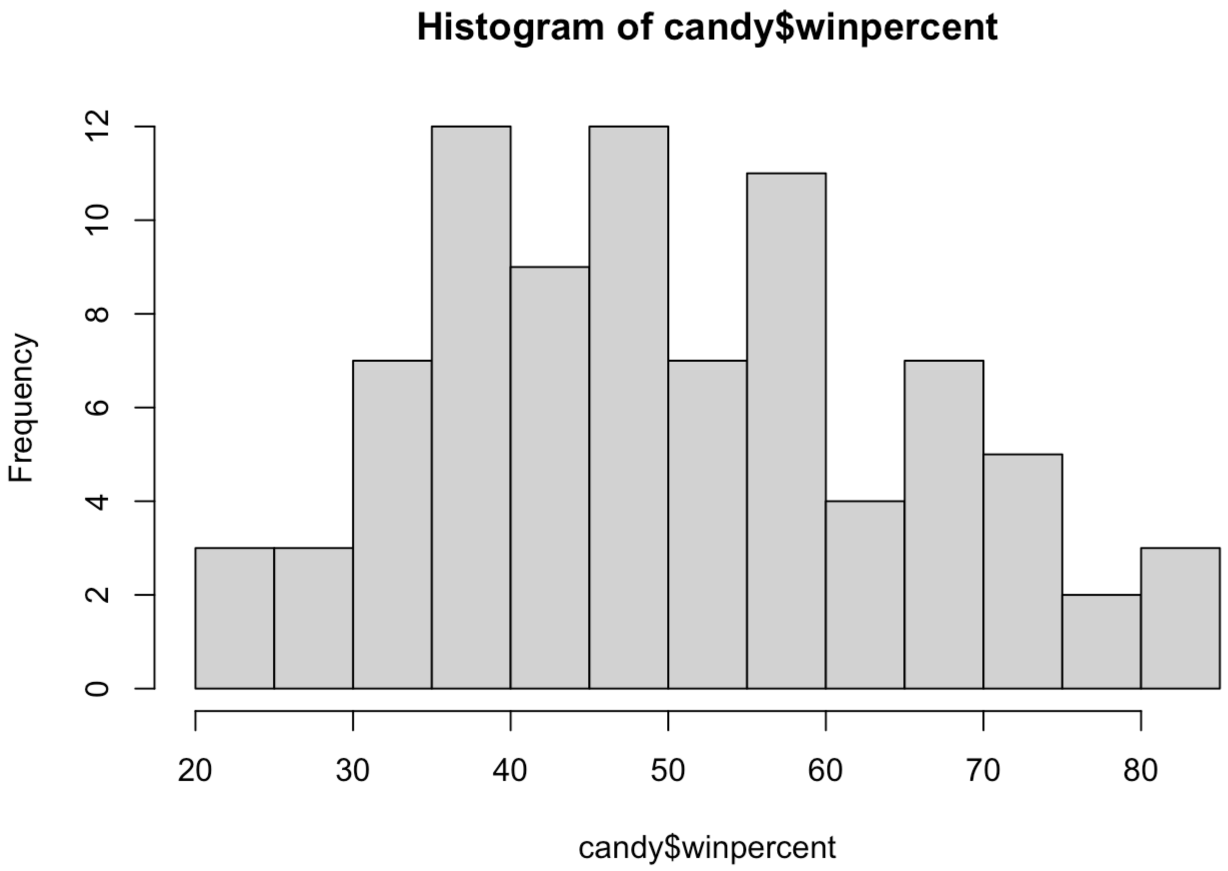
> Q7. What do you think a zero and one represent for the candy$chocolate column?

zero represents it is not a chocolate (False), and one means it is a chocolate (True)

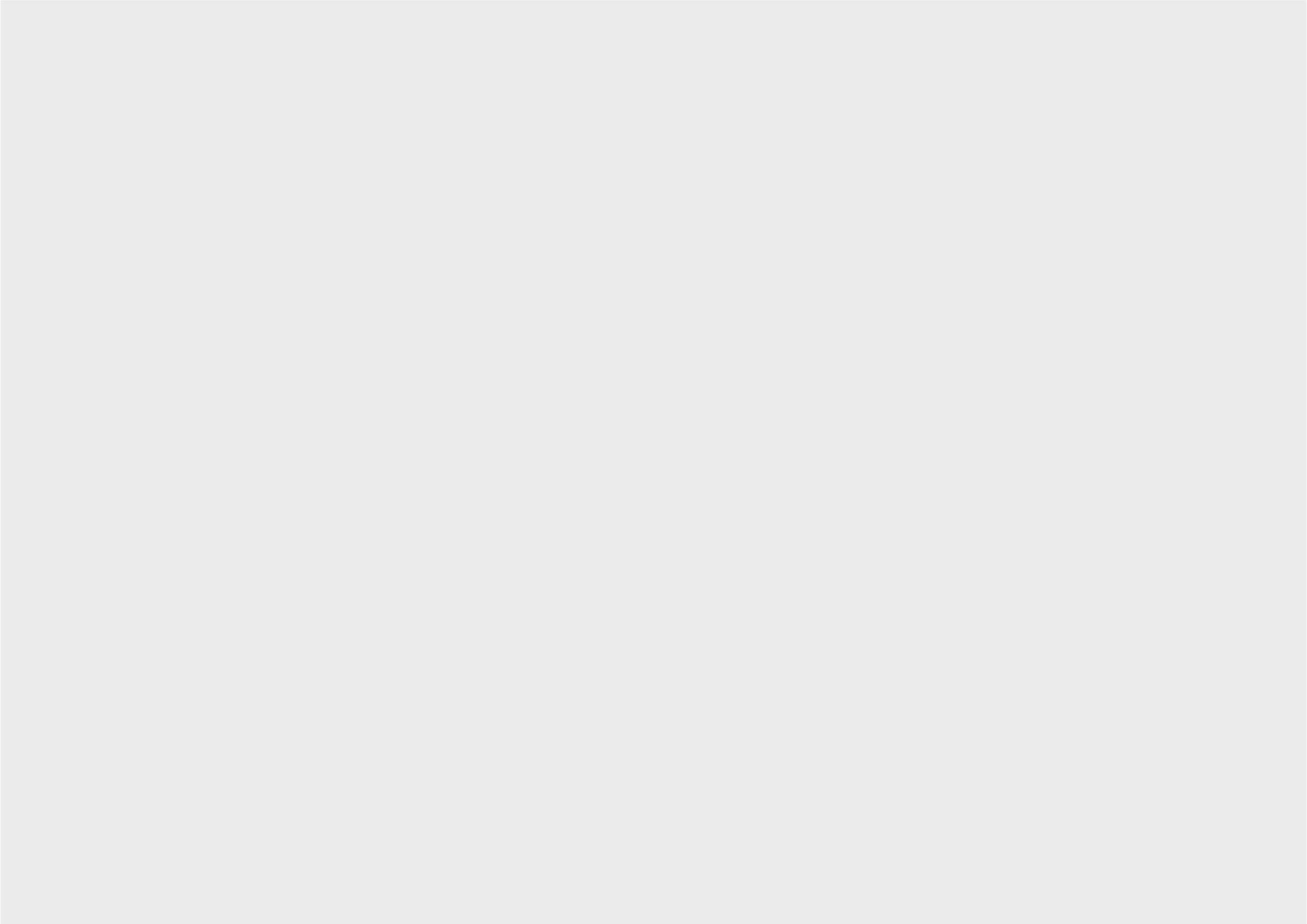
> Q8. Plot a histogram of winpercent values

We can do this a few ways, e.g. the “base” R ‘hist()’ function or with ‘ggplot()’

```r
hist(candy$winpercent, breaks=10)
```



```r
library(ggplot2)

ggplot(candy)
```



```
  aes(winpercent) +
  geom_histogram(binwidth = 8)
```

```
NULL
```

> Q9. Is the distribution of winpercent values symmetrical?

No, looks slanted

> Q10. Is the center of the distribution above or below 50%?

```
summary(candy$winpercent)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
  22.45   39.14   47.83   50.32   59.86   84.18 
```

> Q11. On average is chocolate candy higher or lower ranked than fruit candy?

```
fruity.candy <- candy |>
  filter(fruity==1)
```

```
summary(fruity.candy$winpercent)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
  22.45   39.04   42.97   44.12   52.11   67.04 
```

```
#summary(candy[as.logical(candy$chocolate),]$winpercent)
choc.candy <- candy |>
  filter(chocolate==1)

summary(choc.candy$winpercent)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
  34.72   50.35   60.80   60.92   70.74   84.18 
```

> Q12. Is this difference statistically significant?

```
t.test(choc.candy$winpercent, fruity.candy$winpercent)
```

```

	Welch Two Sample t-test

data:  choc.candy$winpercent and fruity.candy$winpercent
t = 6.2582, df = 68.882, p-value = 2.871e-08
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 11.44563 22.15795
sample estimates:
mean of x mean of y 
 60.92153  44.11974 
```

> Q13. What are the five least liked candy types in this set?

```
play <- c("d", "a", "c")
sort(play)
```

```
[1] "a" "c" "d"
```

```
order(play)
```

```
[1] 2 3 1
```

```
play[order(play)]
```

```
[1] "a" "c" "d"
```

```
head(candy[order(candy$winpercent),], 5)
```

```
                   chocolate fruity caramel peanutyalmondy nougat
Nik L Nip                  0      1       0              0      0
Boston Baked Beans         0      0       0              1      0
Chiclets                   0      1       0              0      0
Super Bubble               0      1       0              0      0
Jawbusters                 0      1       0              0      0
                   crispedricewafer hard bar pluribus sugarpercent pricepercent
Nik L Nip                         0    0   0        1        0.197        0.976
Boston Baked Beans                0    0   0        1        0.313        0.511
Chiclets                          0    0   0        1        0.046        0.325
Super Bubble                      0    0   0        0        0.162        0.116
Jawbusters                        0    1   0        1        0.093        0.511
                   winpercent
Nik L Nip            22.44534
Boston Baked Beans   23.41782
Chiclets             24.52499
Super Bubble         27.30386
Jawbusters           28.12744
```

> Q14. What are the top 5 all time favorite candy types out of this set?

```
sort(play, decreasing=T)
```

```
[1] "d" "c" "a"
```

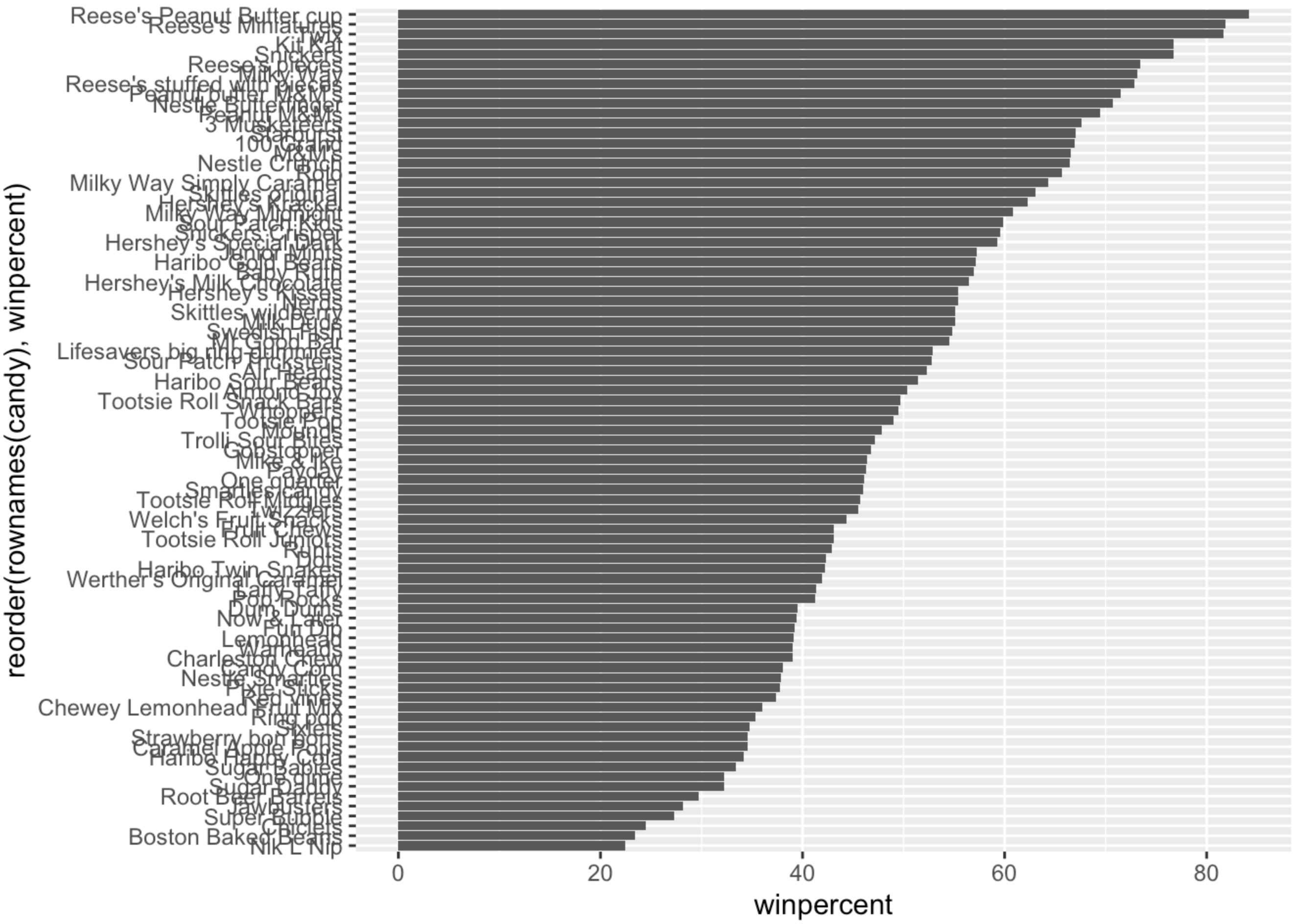
```
tail(candy[order(candy$winpercent),], 5)
```

```
                          chocolate fruity caramel peanutyalmondy nougat
Snickers                          1      0       1              1      1
Kit Kat                           1      0       0              0      0
Twix                              1      0       1              0      0
Reese's Miniatures                1      0       0              1      0
Reese's Peanut Butter cup         1      0       0              1      0
                          crispedricewafer hard bar pluribus sugarpercent
Snickers                                 0    0   1        0        0.546
Kit Kat                                  1    0   1        0        0.313
Twix                                     1    0   1        0        0.546
Reese's Miniatures                       0    0   0        0        0.034
Reese's Peanut Butter cup                0    0   0        0        0.720
                          pricepercent winpercent
Snickers                         0.651   76.67378
Kit Kat                          0.511   76.76860
Twix                             0.906   81.64291
Reese's Miniatures               0.279   81.86626
Reese's Peanut Butter cup        0.651   84.18029
```

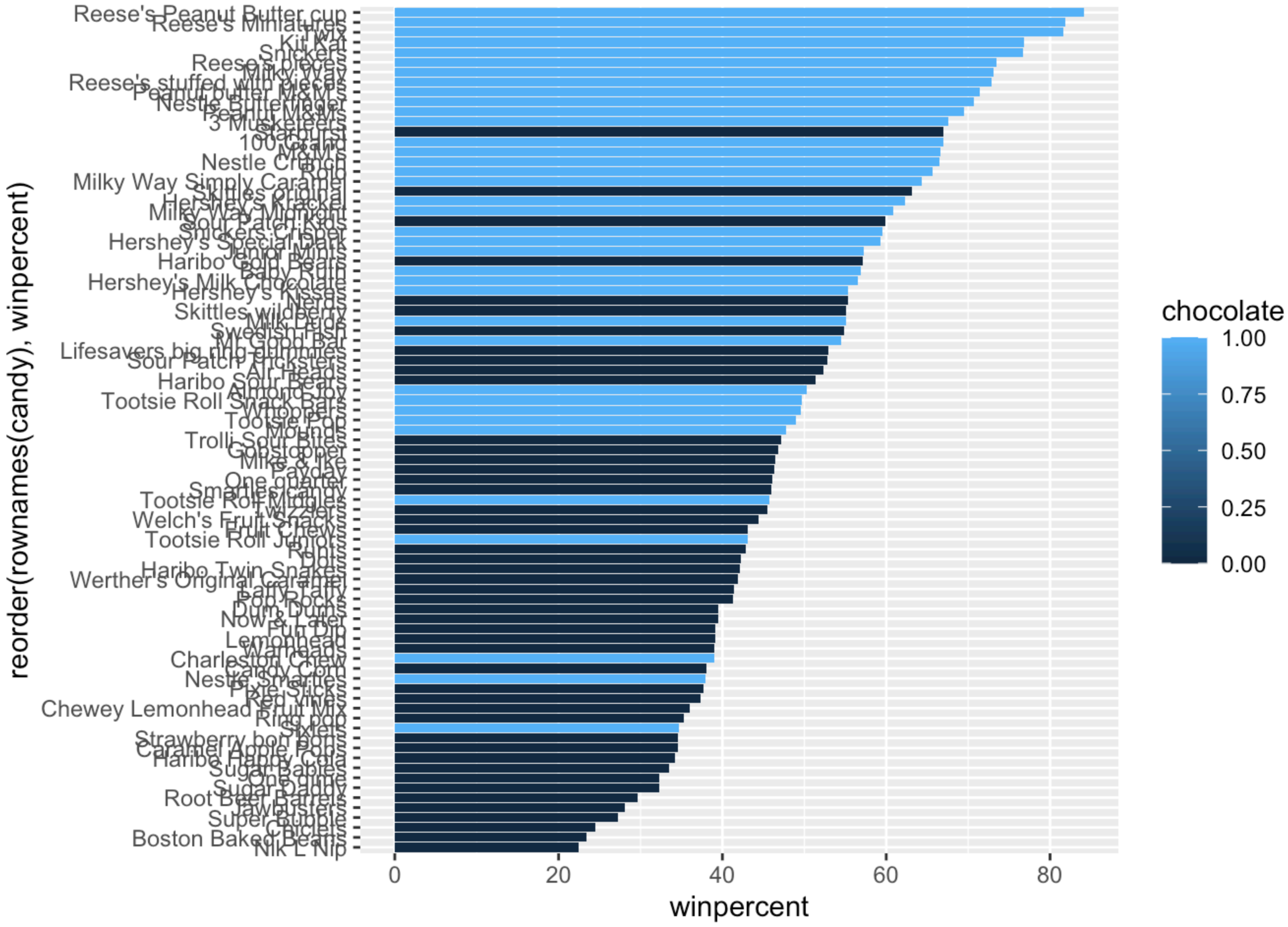
> Q15. Make a first barplot of candy ranking based on winpercent values.

Let’s do a barplot of winpercent values

```
ggplot(candy) +
  aes(winpercent, reorder(rownames(candy), winpercent)) +
  geom_col()
```



```
ggplot(candy) +
  aes(x=winpercent,
      y=reorder(rownames(candy), winpercent),
      fill=chocolate) +
  geom_col()
```



I want more custom color scheme where I can see both chocolate and bar and fruity ect. all from the one plot. To do this we can roll our own color vector....

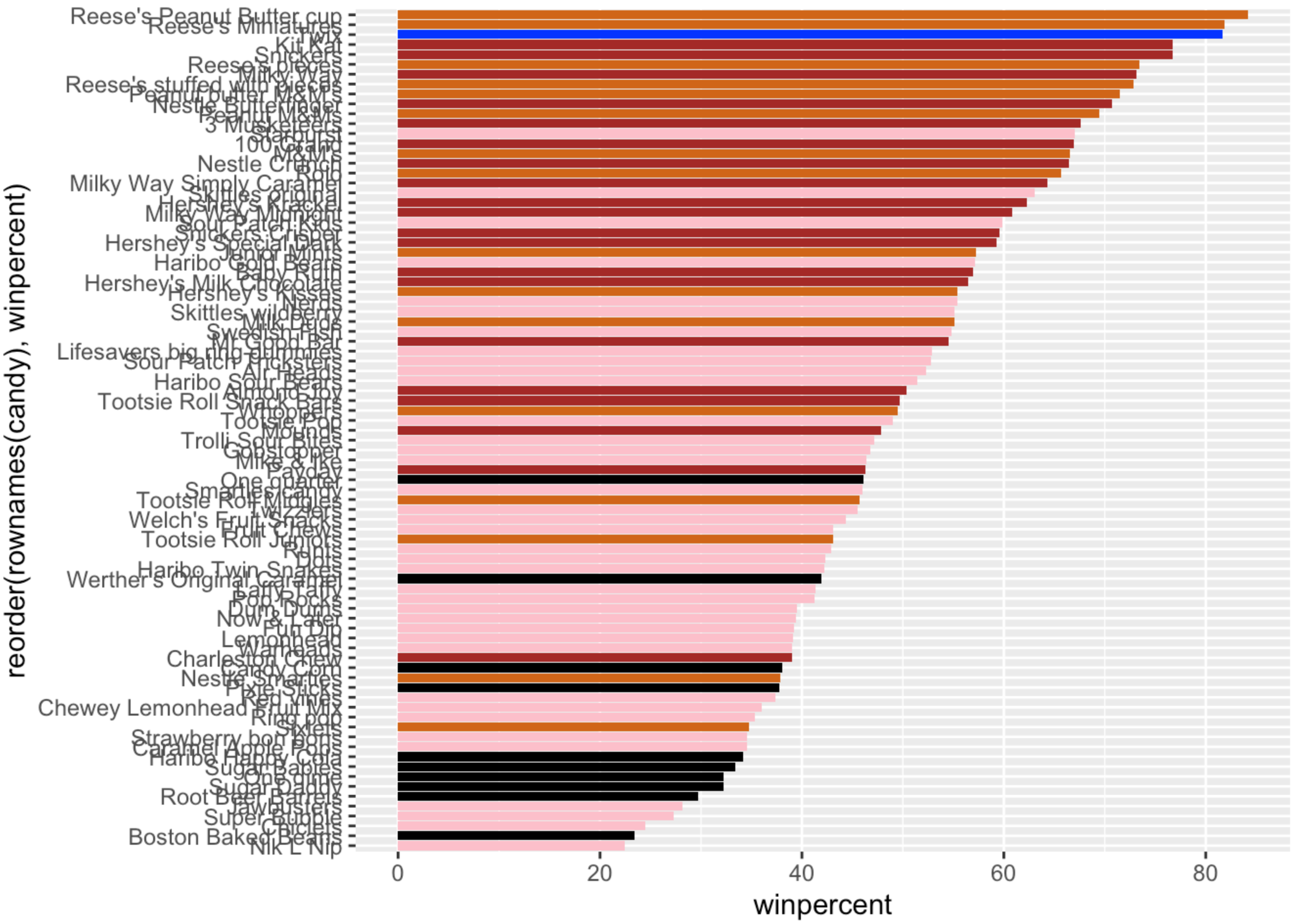
```
# place holder color vector
mycols <- rep("black", nrow(candy))
mycols[as.logical(candy$chocolate)] <- "chocolate"
mycols[as.logical(candy$bar)] <- "brown"
mycols[as.logical(candy$fruity)] <- "pink"

#favorite candy
mycols[ rownames(candy)=="Twix" ] <- "blue"

mycols
```

```
 [1] "brown"     "brown"     "black"     "black"     "pink"      "brown"    
 [7] "brown"     "black"     "black"     "pink"      "brown"     "pink"     
[13] "pink"      "pink"      "pink"      "pink"      "pink"      "pink"     
[19] "pink"      "black"     "pink"      "pink"      "chocolate" "brown"    
[25] "brown"     "brown"     "pink"      "chocolate" "brown"     "pink"     
[31] "pink"      "pink"      "chocolate" "chocolate" "pink"      "chocolate"
[37] "brown"     "brown"     "brown"     "brown"     "brown"     "pink"     
[43] "brown"     "brown"     "pink"      "pink"      "brown"     "chocolate"
[49] "black"     "pink"      "pink"      "chocolate" "chocolate" "chocolate"
[55] "chocolate" "pink"      "chocolate" "black"     "pink"      "chocolate"
```

```
[61] "pink"      "pink"      "chocolate" "pink"      "brown"     "brown"    
[67] "pink"      "pink"      "pink"      "pink"      "black"     "black"    
[73] "pink"      "pink"      "pink"      "chocolate" "chocolate" "brown"    
[79] "pink"      "blue"      "pink"      "pink"      "pink"      "black"    
[85] "chocolate"
```

> Q16. This is quite ugly, use the reorder() function to get the bars sorted by winpercent?

```
ggplot(candy) +
  aes(x=winpercent,
      y=reorder(rownames(candy), winpercent)) +
  geom_col(fill=mycols)
```



> Q17. What is the worst ranked chocolate candy?

Nik L Nip

> Q18. What is the best ranked fruity candy?

Starburst

> Q19. Which candy type is the highest ranked in terms of winpercent for the least money - i.e. offers the most bang for your buck?

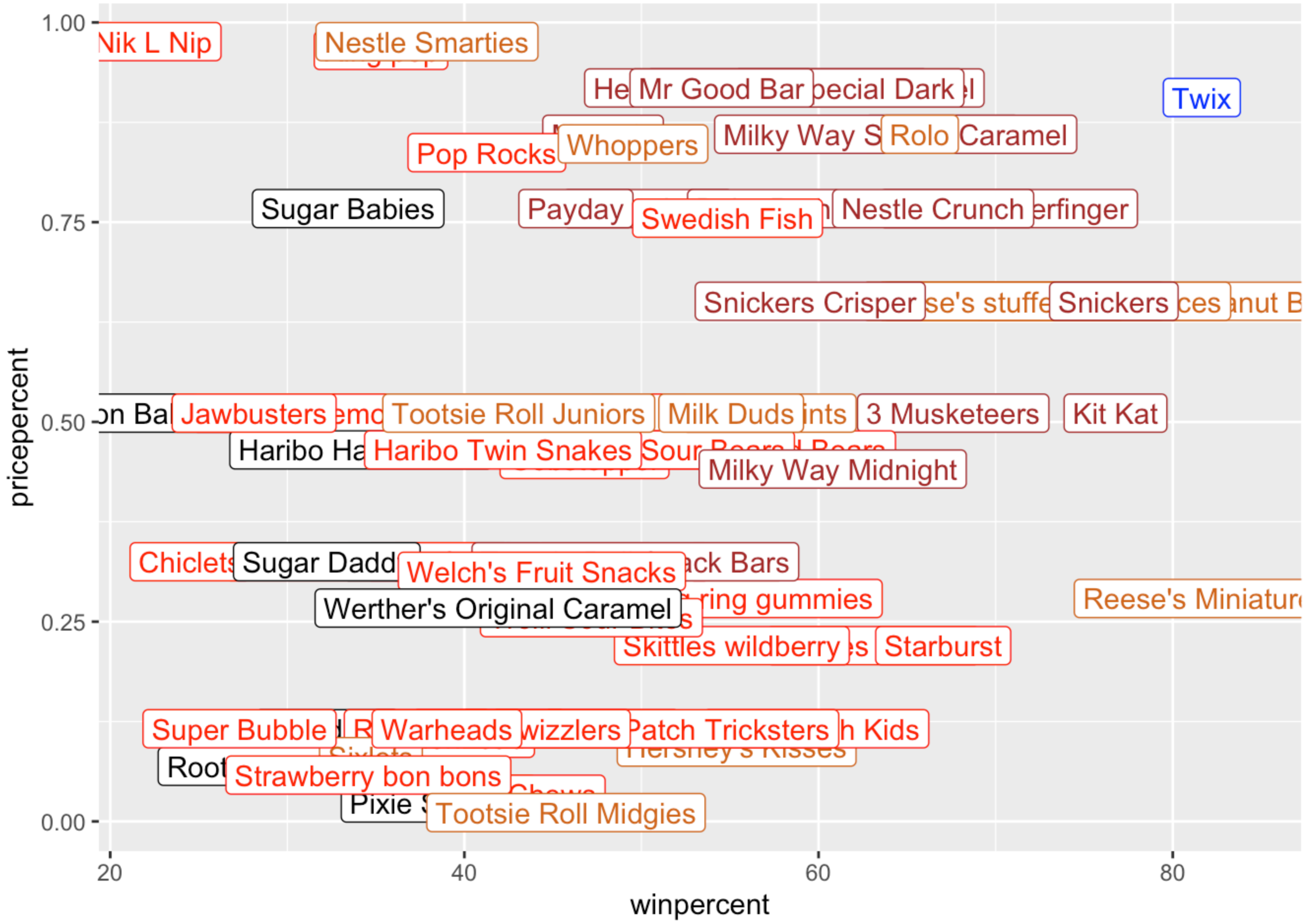
Reeses minatures

Plot of winpercent vs pricepercent to see what would be the best candy to buy

```
mycols[as.logical(candy$fruity)] <- "red"
```

Add labels

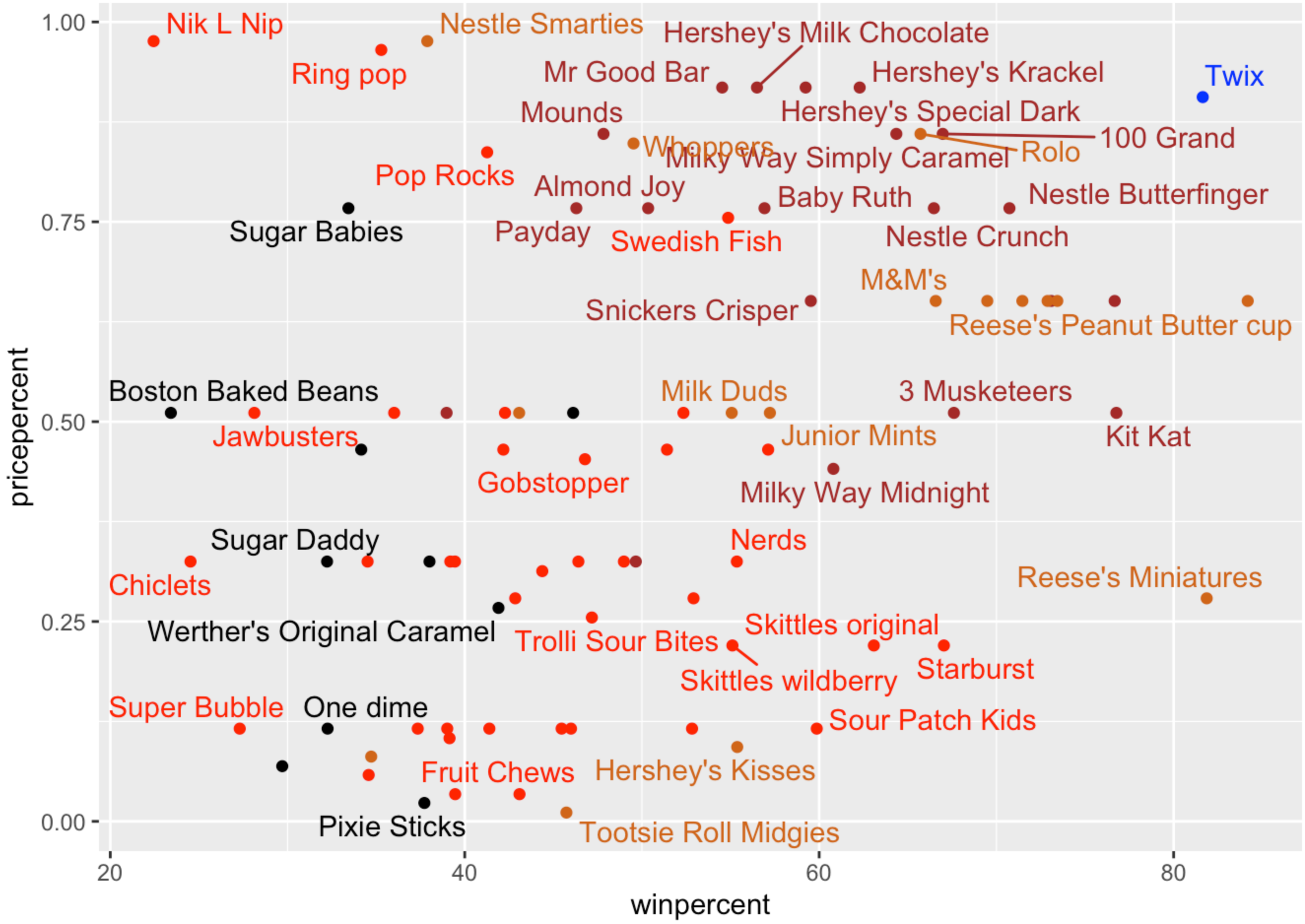
```
ggplot(candy) +
  aes(winpercent, pricepercent, label=rownames(candy)) +
  geom_point(col=mycols) +
  geom_label(col=mycols)
```



Make the labels non-overlapping

```
library(ggrepel)

ggplot(candy) +
  aes(winpercent, pricepercent, label=rownames(candy)) +
  geom_point(col=mycols) +
  geom_text_repel(col=mycols, max.overlaps = 8)
```

```
Warning: ggrepel: 37 unlabeled data points (too many overlaps). Consider
increasing max.overlaps
```



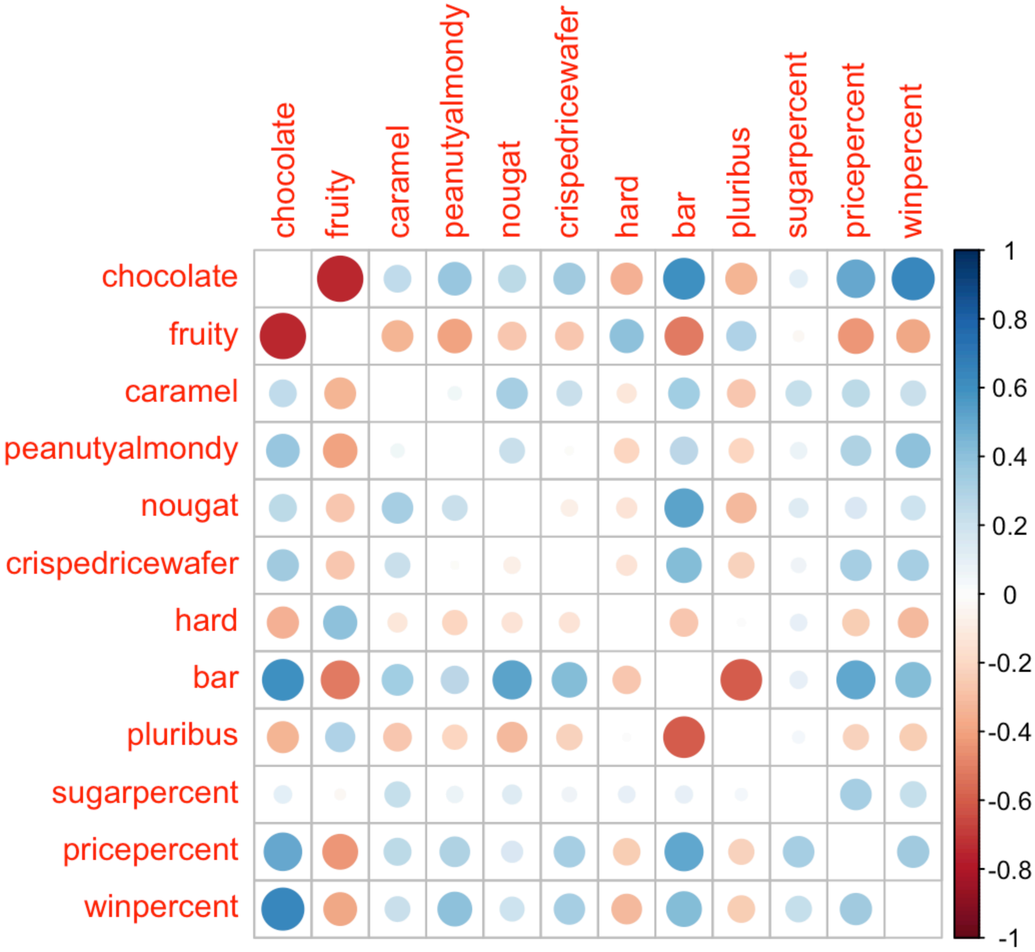
> Q20. What are the top 5 most expensive candy types in the dataset and of these which is the least popular?

Nik L Nip, Ring Pop, Sugar Babies, Pop Rocks, and Nestle Smarties

```
library(corrplot)
```

```
corrplot 0.95 loaded
```

```
cij <- cor(candy)
corrplot(cij, diag=F)
```



> Q22. Examining this plot what two variables are anti-correlated (i.e. have minus values)?

chocolate and fruit

> Q23. Similarly, what two variables are most positively correlated?

winpercent and chocolate

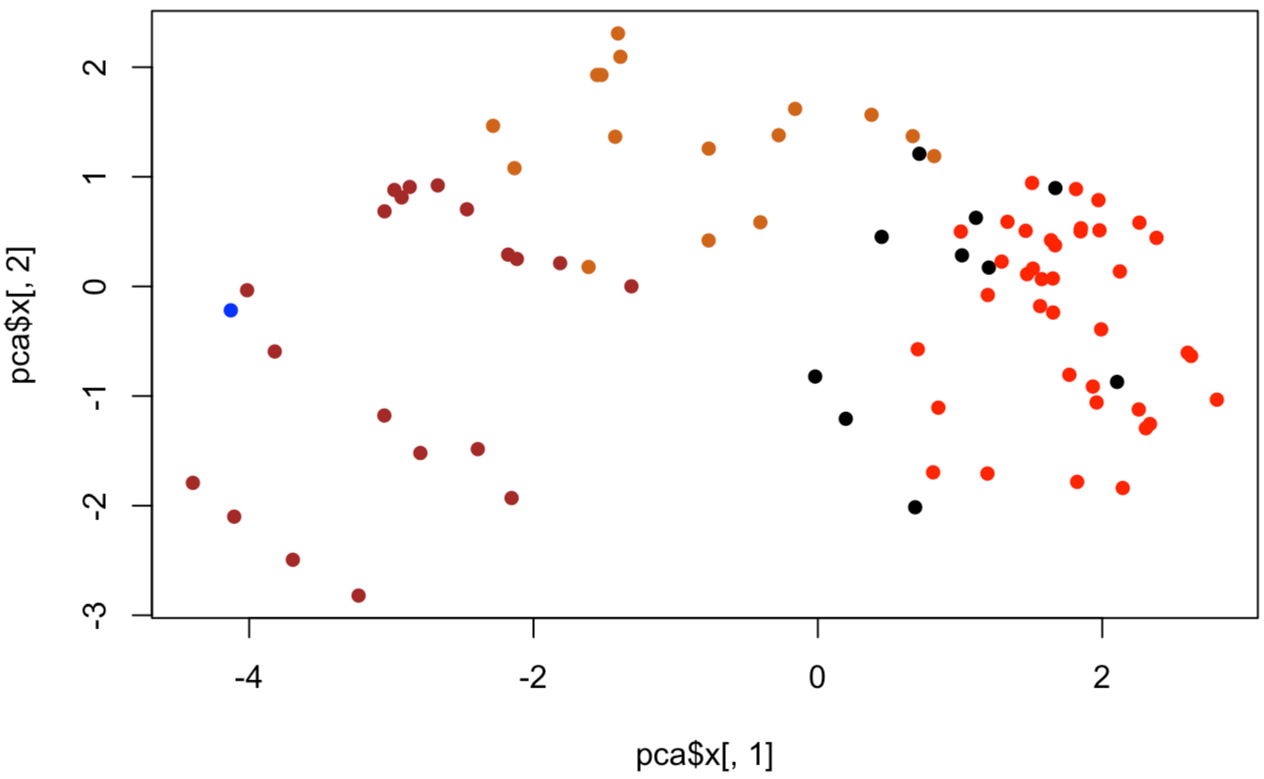
Principal Component Analysis

```r
pca <- prcomp(candy, scale = TRUE)
summary(pca)
```

```
Importance of components:
                          PC1    PC2    PC3     PC4    PC5     PC6     PC7
Standard deviation     2.0788 1.1378 1.1092 1.07533 0.9518 0.81923 0.81530
Proportion of Variance 0.3601 0.1079 0.1025 0.09636 0.0755 0.05593 0.05539
Cumulative Proportion  0.3601 0.4680 0.5705 0.66688 0.7424 0.79830 0.85369
                           PC8     PC9    PC10    PC11    PC12
Standard deviation     0.74530 0.67824 0.62349 0.43974 0.39760
```

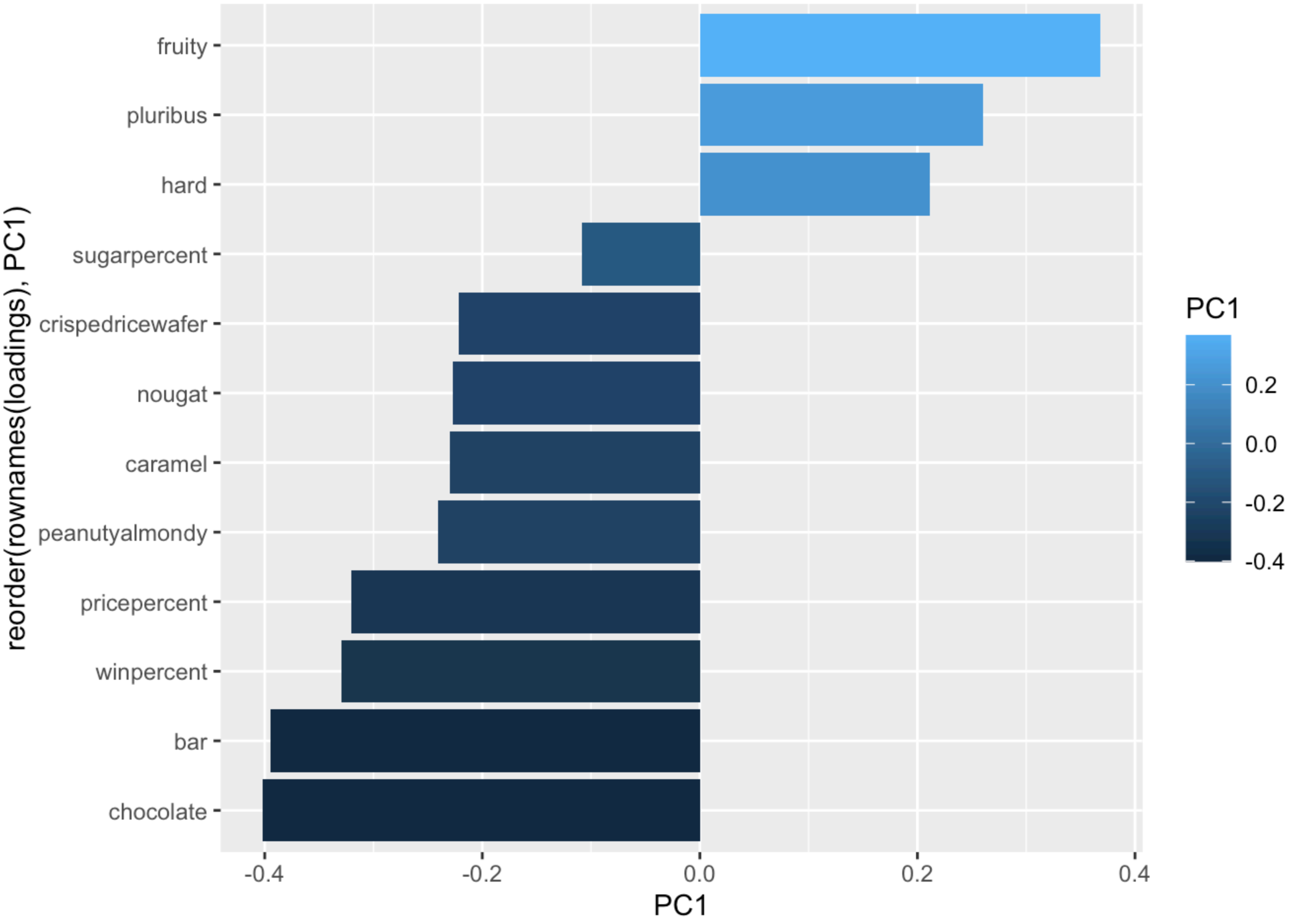
```
Proportion of Variance 0.04629 0.03833 0.03239 0.01611 0.01317
Cumulative Proportion  0.89998 0.93832 0.97071 0.98683 1.00000
```

```
plot(pca$x[,1], pca$x[,2], col=mycols, pch=16)
```



How do the original variables (columns) contribute to the new PCs. I will look at PC1 here

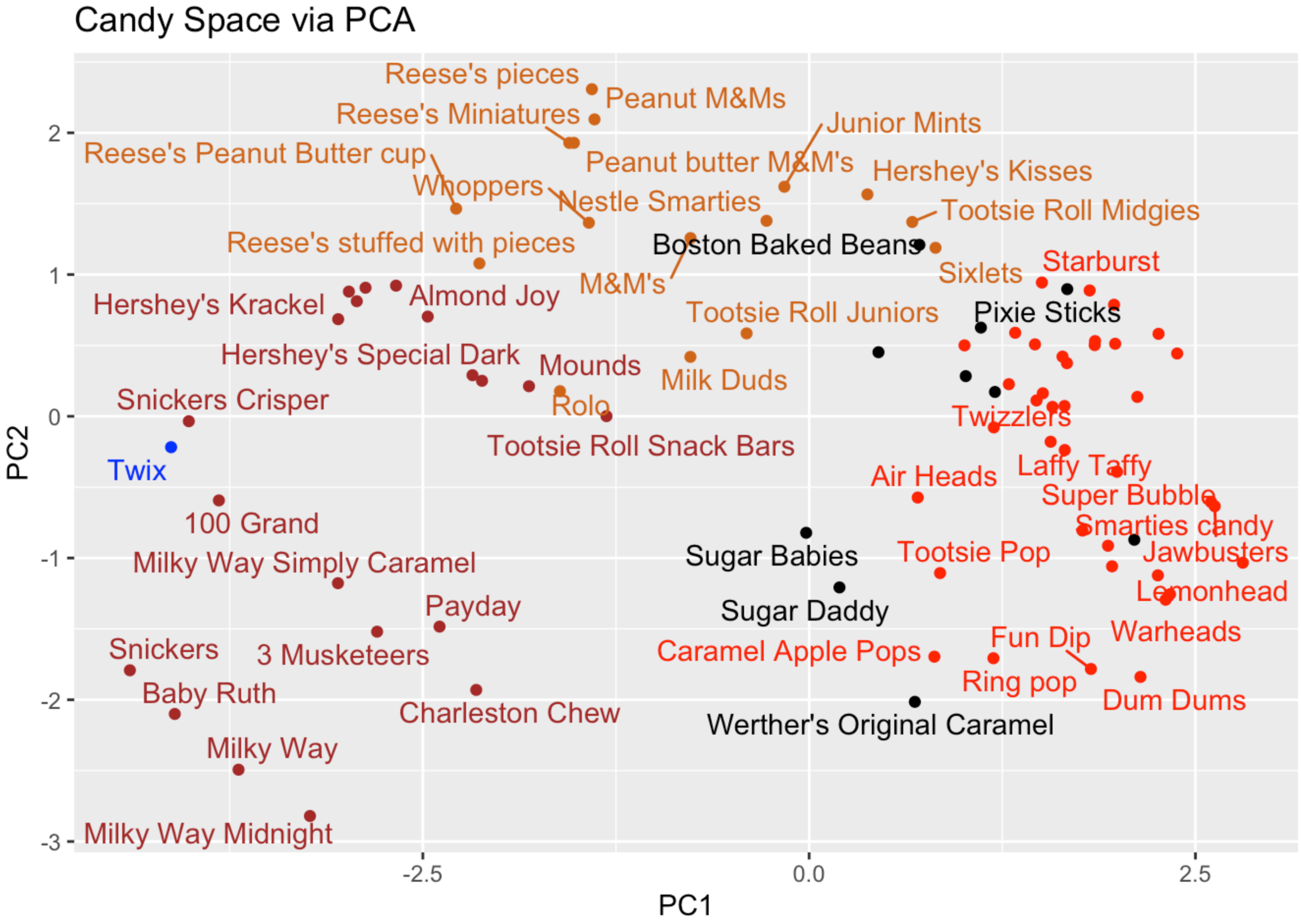
```
loadings <- as.data.frame(pca$rotation)

ggplot(loadings) +
  aes(PC1, reorder(rownames(loadings),PC1), fill=PC1) +
  geom_col()
```



Let’s make a nicer score plot with ggplot. Again I need ‘data.frame’ with all the stuff (PC results and candy data) for my plot as input

```r
pc.results <- cbind(candy, pca$x)

ggplot(pc.results) +
  aes(PC1, PC2, label=rownames(pc.results)) +
  geom_point(col=mycols) +
  geom_text_repel(col=mycols, max.overlaps=8) +
  labs(title="Candy Space via PCA")
```

```
Warning: ggrepel: 34 unlabeled data points (too many overlaps). Consider
increasing max.overlaps
```



> Q24. What original variables are picked up strongly by PC1 in the positive direction? Do these make sense to you?

Most positive is fruity, which makes sense