Class 10: Candy mini project

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Read the data

This comes from the 538 GitHub repo. They have lot's of interesting datasets.

```
url <- "https://raw.githubusercontent.com/fivethirtyeight/data/master/candy-power-ranking/candy-data.csv

candy <- read.csv(url, 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
```

```
gsub("Õ", "'", rownames(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"
```

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

```
nrow(candy)
```

```
## [1] 85
```

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

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

```
## [1] 38
```

```
sum(candy$chocolate)
```

```
## [1] 37
```

```
library(skimr)
skim(candy)
```

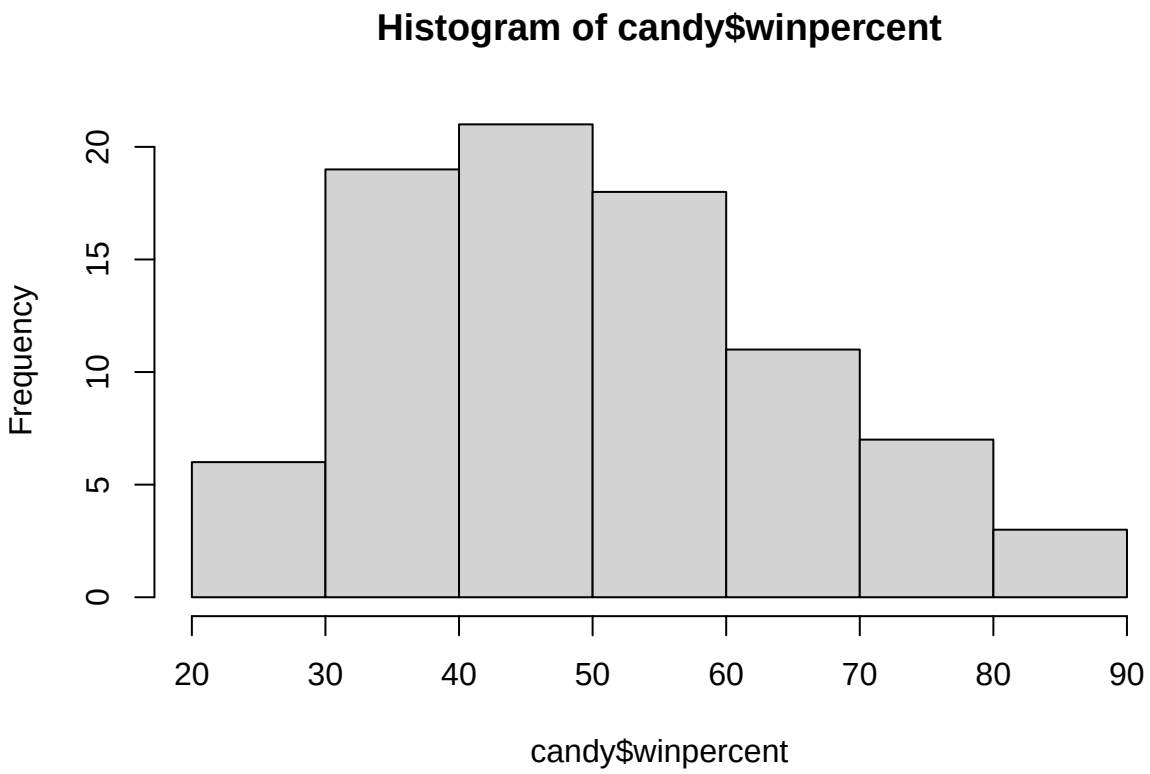
Table 1: Data summary

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	
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	

```
hist(candy$winpercent)
```



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

```
choclate <- candy[ as.logical(candy$chocolate), ]$winpercent
mean(choclate)
```

```
## [1] 60.92153
```

```
fruity <- candy[as.logical(candy$fruity),]$winpercent
mean(fruity)
```

```
## [1] 44.11974
```

Q12. Is this difference statistically significant

Yes!

```
t.test(choclate, fruity)
```

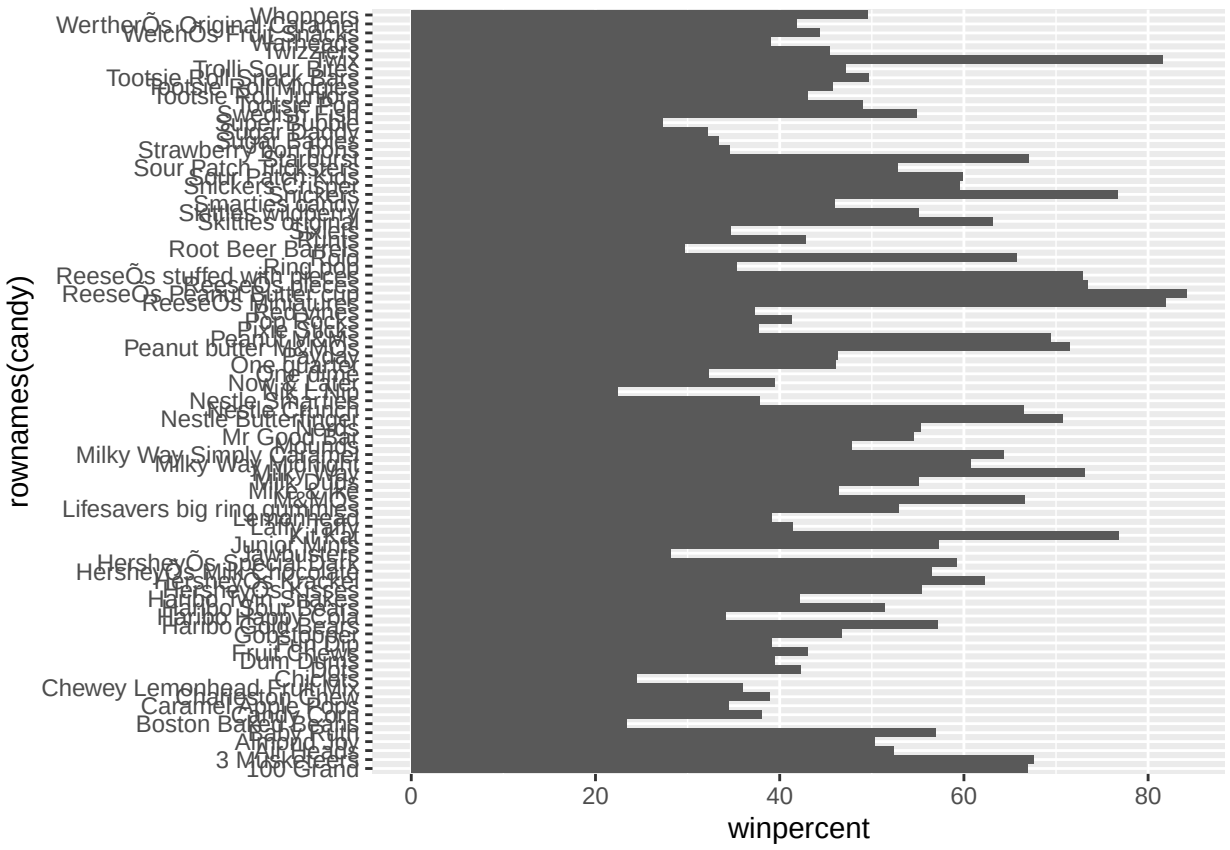
```
##
##  Welch Two Sample t-test
##
## data:  choclate and fruity
## t = 6.2582, df = 68.882, p-value = 2.871e-08
```

```
## 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
```

3. Candy rankings

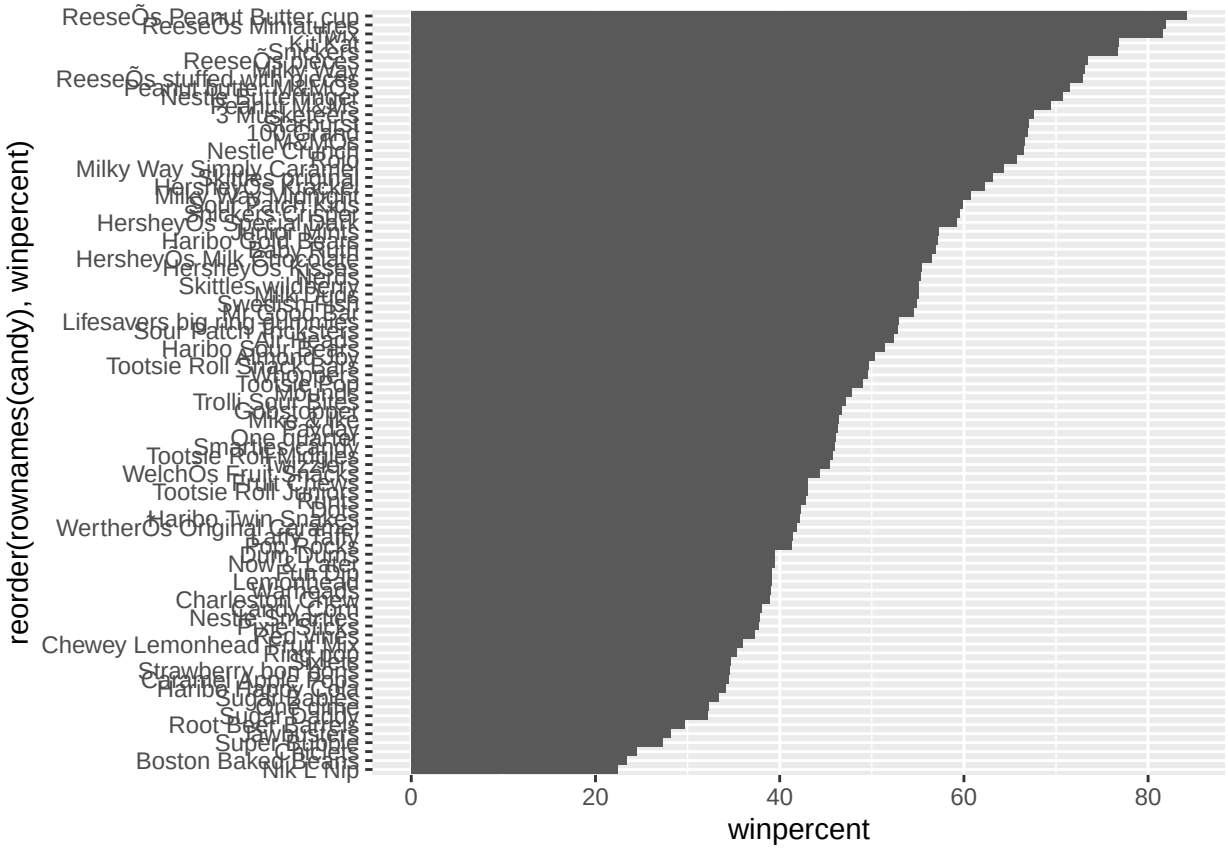
Let's make a barplot of the winpercent values for the variouys candy types

```
library(ggplot2)

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



We need to improve this to reorder the candy by the winpercent valeus

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



Time to add some color

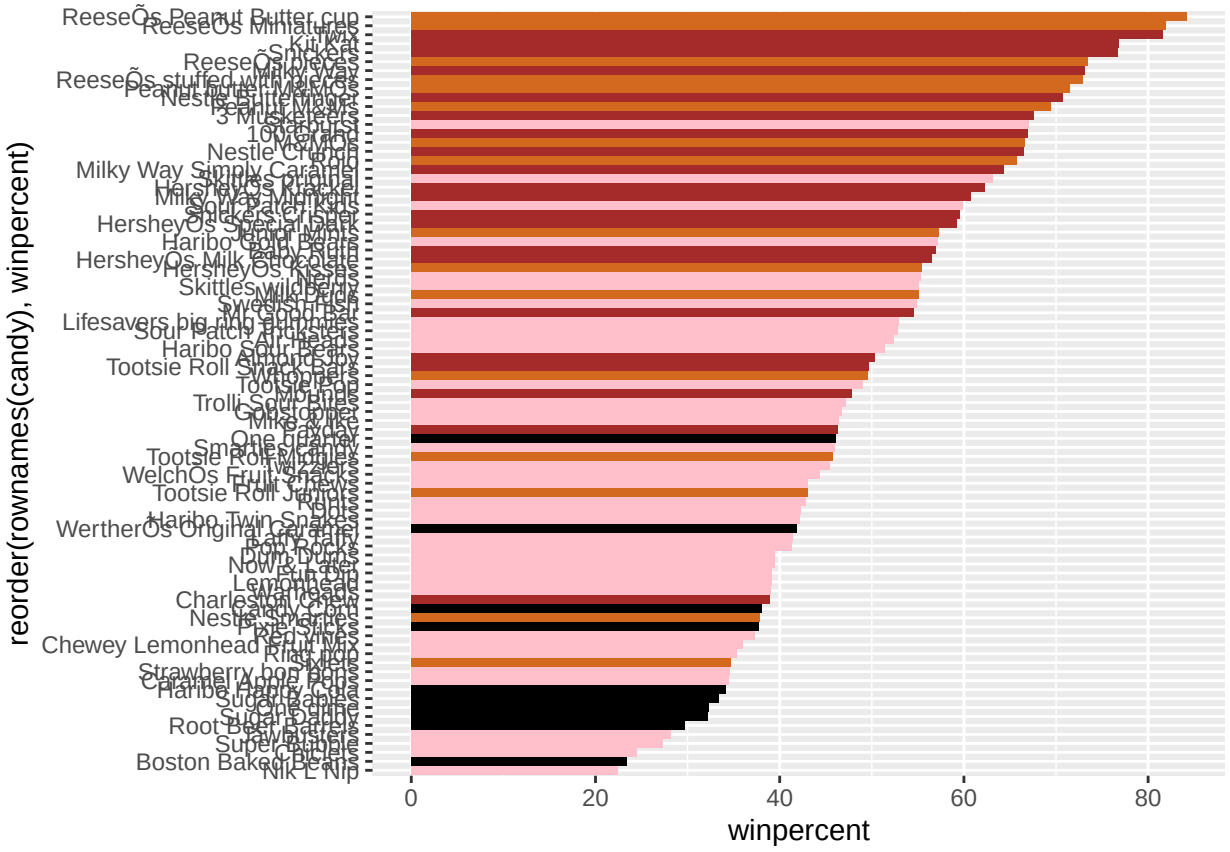
```
# Color vector (all black to start)
my_cols=rep("black", nrow(candy))

# Now overwrite the chocolate entries with "chocolate"
my_cols[as.logical(candy$chocolate)] = "chocolate"
my_cols[as.logical(candy$bar)] = "brown"
my_cols[as.logical(candy$fruity)] = "pink"
```

```
my_cols
```

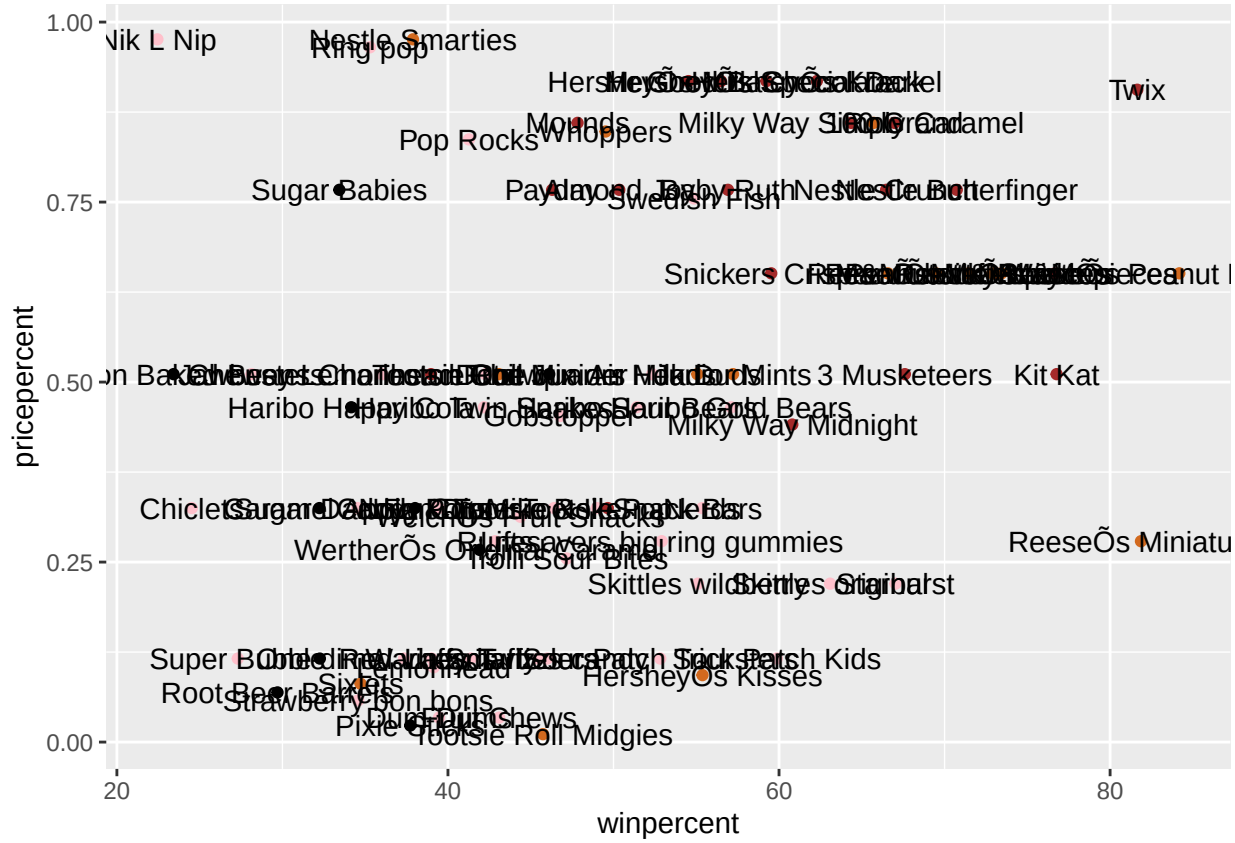
```
##  [1] "brown"     "brown"     "black"     "black"     "pink"      "brown"
##  [7] "brown"     "black"     "black"     "pink"      "brown"     "pink"
## [13] "pink"      "pink"      "pink"      "pink"      "pink"      "pink"
## [19] "pink"      "black"     "pink"      "pink"      "chocolate" "brown"
## [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"      "brown"     "pink"      "pink"      "pink"      "black"
## [85] "chocolate"
```

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



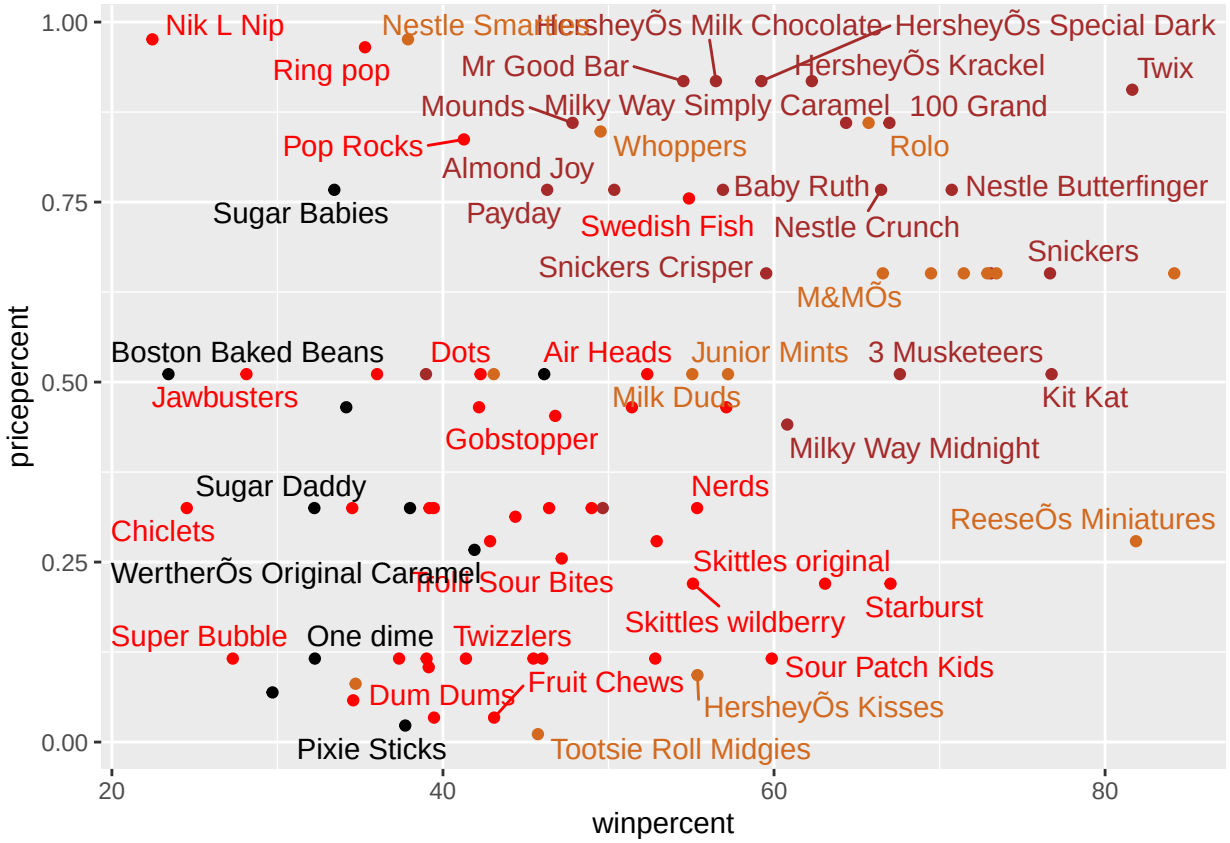

```
ggplot(candy) +
  aes(winpercent, pricepercent, label=rownames(candy)) +
  geom_point(col=my_cols) +
  geom_text()
```



These labels suck. Let's use the **ggrepl** package for better label placment.

```
library(ggrepel)

# change my fruity color to red
my_cols[as.logical(candy$fruity)] <- "red"

ggplot(candy) +
  aes(winpercent, pricepercent, label=rownames(candy)) +
  geom_point(col=my_cols) +
  geom_text_repel(col=my_cols)
```

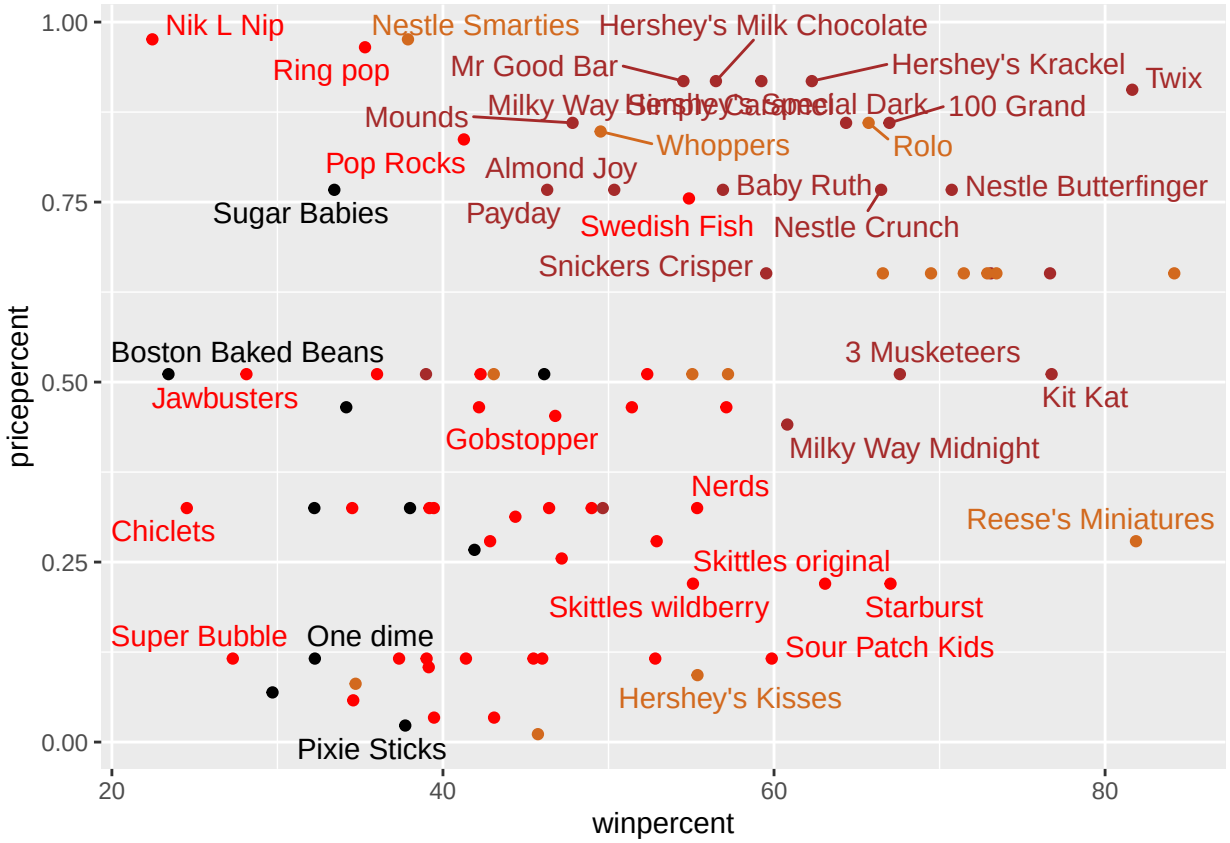
```
## Warning: ggrepel: 33 unlabeled data points (too many overlaps). Consider
## increasing max.overlaps
```




```
rownames(candy) <- gsub("Õ", "'", rownames(candy))
```

```
ggplot(candy) +
  aes(winpercent, pricepercent, label=rownames(candy)) +
  geom_point(col=my_cols) +
  geom_text_repel(col=my_cols, max.overlaps = 7)
```

```
## Warning: ggrepel: 46 unlabeled data points (too many overlaps). Consider
## increasing max.overlaps
```

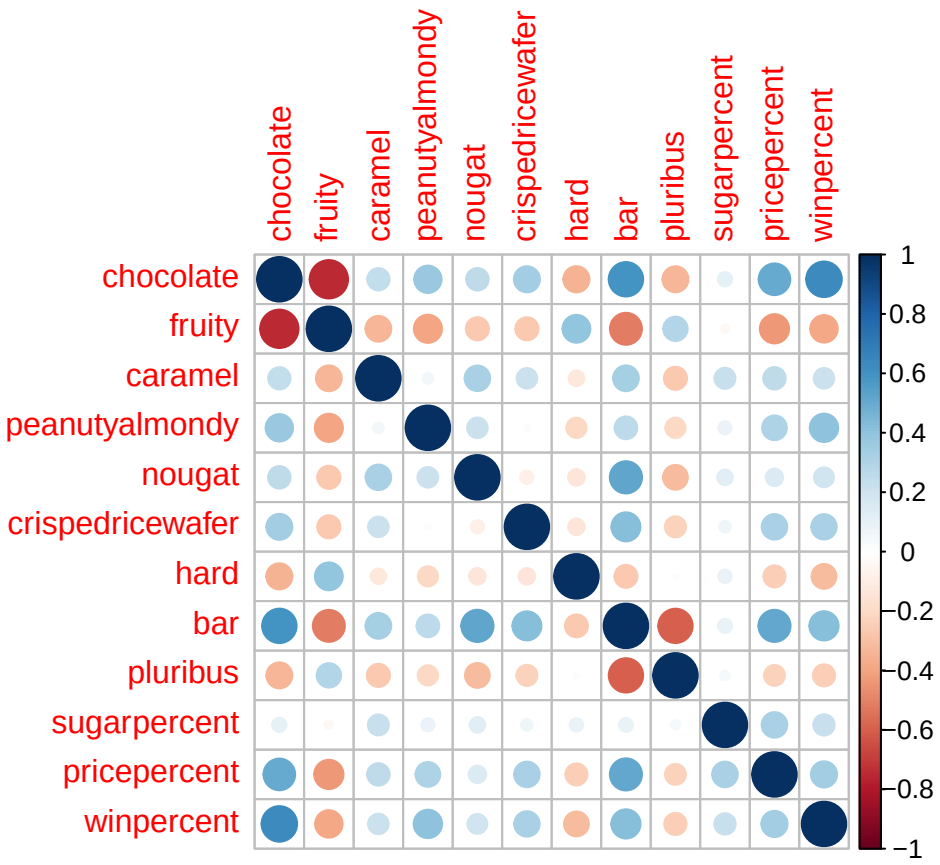


Correlation Analysis

```
library(corrplot)
```

```
## corrplot 0.90 loaded
```

```
cij <- cor(candy)
corrplot(cij)
```



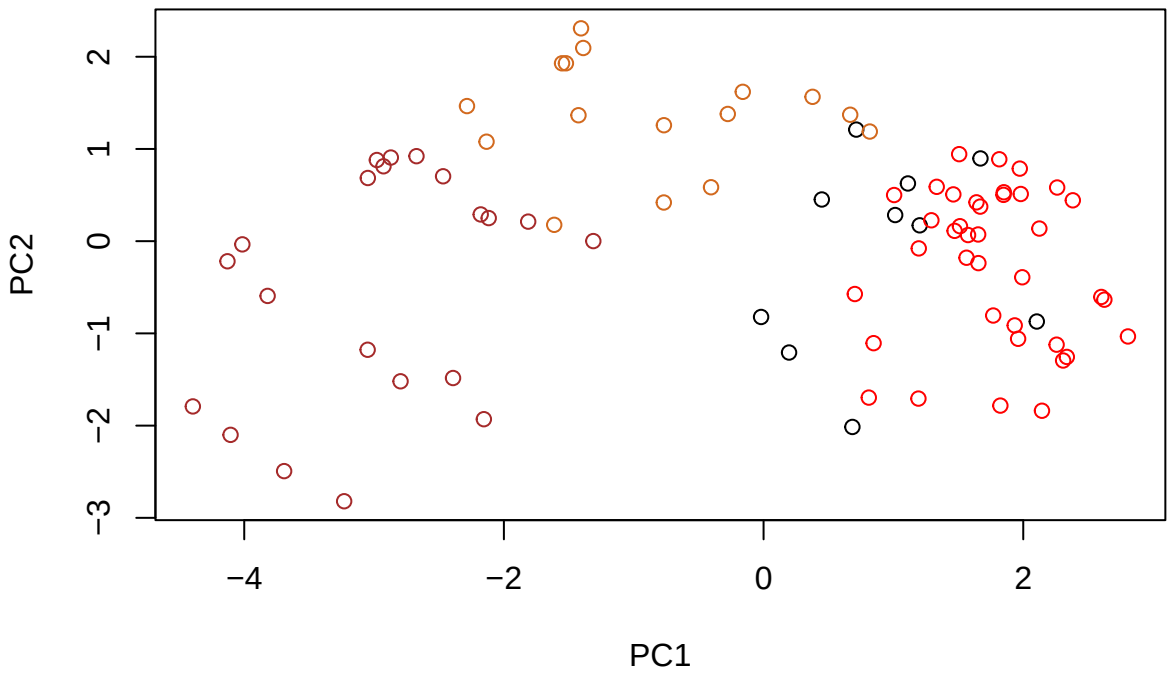
Principla Componet analysis

```
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
```

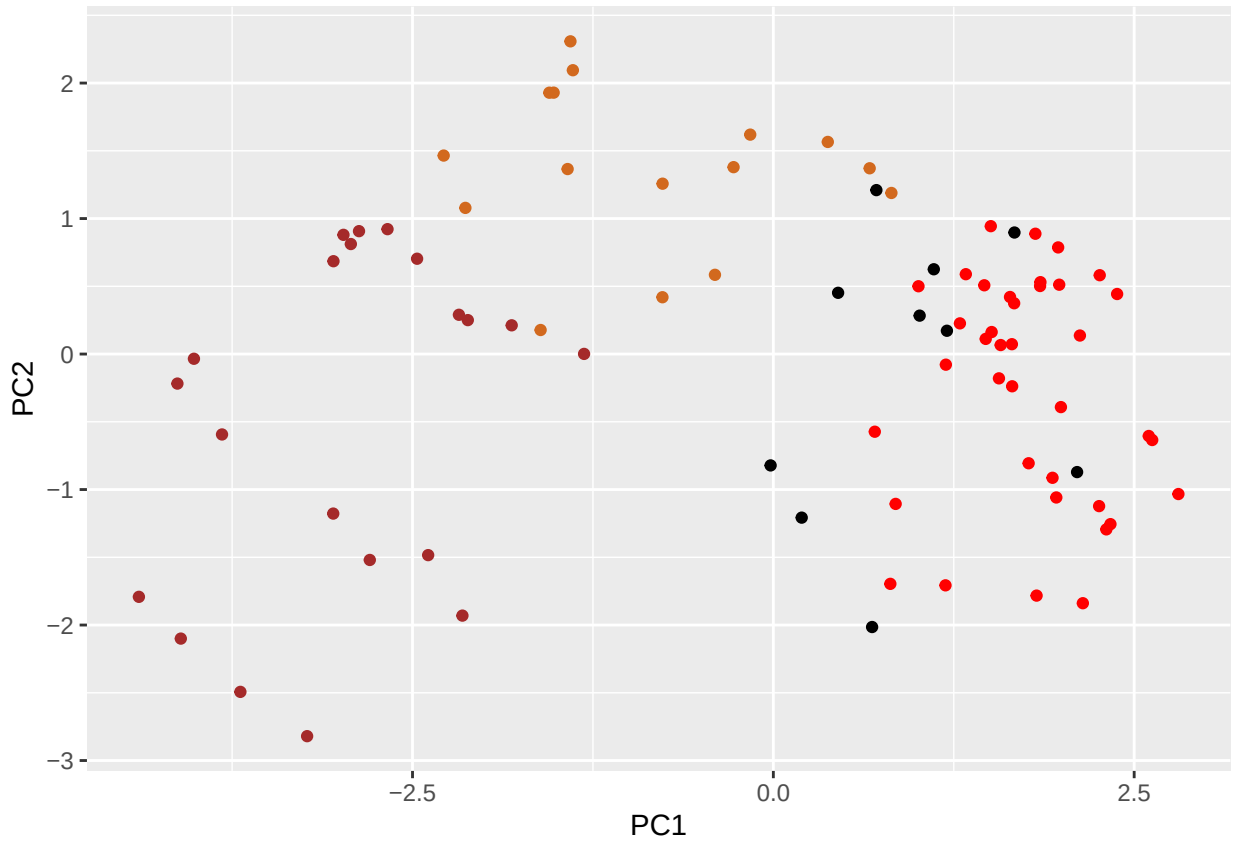
PCA score plot

```
plot(pca$x[,1:2], col=my_cols)
```



ggplot version

```
# Make a new data-frame with our PCA results and candy data
my_data <- cbind(candy, pca$x[,1:3])

ggplot(my_data) +
  aes(PC1, PC2) +
  geom_point(col=my_cols)
```


2
1
0
−1
−2
−3
PC2
−2.5
0.0
2.5
PC1