

# Halloween project

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```
candy <- read.csv(url("https://raw.githubusercontent.com/fivethirtyeight/data/master/candy-project.csv"))
head(candy)
```

	chocolate	fruity	caramel	peanuty	almondy	nougat	crispedrice	wafer
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?*

```
nrow(candy)
```

[1] 85

```
ncol(candy)
```

[1] 12

85 different candies categorized in 12 descriptors

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

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

[1] 38

38

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

```
candy["Caramel Apple Pops", ]$winpercent
```

[1] 34.51768

Caramel Apple Pops winpercent is 34.517681

*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

```
library("skimr")
#skim(candy)
```

The skimr package was giving me issues with rendering; I ran it but had to take it out for rendering

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

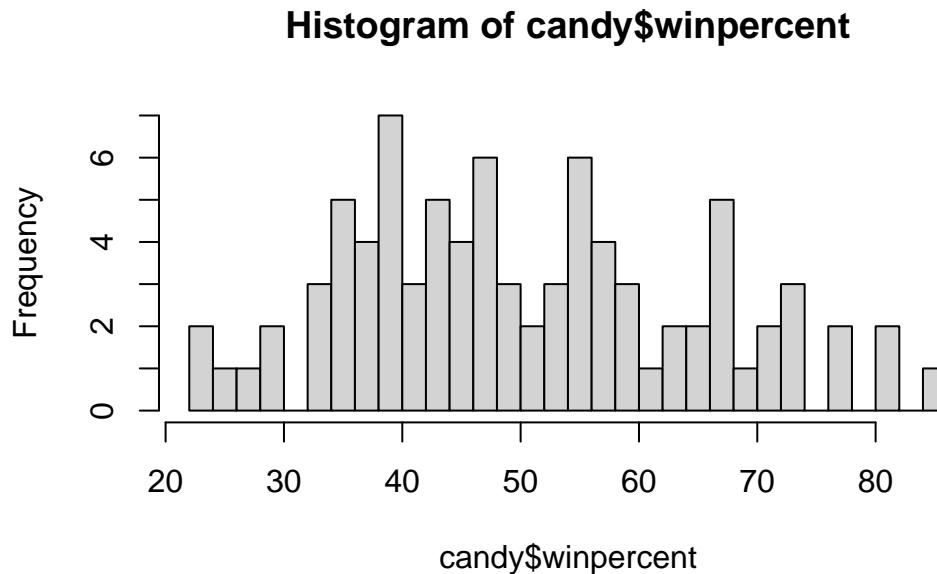
The last column, winpercent, is scaled based off of 100% versus a 0 or 1 value

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

0 means the candy is not classified as chocolate, 1 means it is

*Q8. Plot a histogram of winpercent values*

```
hist(candy$winpercent, 30)
```



*Q9. Is the distribution of winpercent values symmetrical?*

Skewed more towards the lower end than truly symmetrical.

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

Below 50%

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

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

[1] 44.11974

```
mean(candy$winpercent[as.logical(candy$chocolate)])
```

```
[1] 60.92153
```

Chocolate is on average ranked higher than fruity candy.

*Q12. Is this difference statistically significant?*

```
t.test(candy$winpercent[as.logical(candy$fruity)], candy$winpercent[as.logical(candy$chocolat
```

```
Welch Two Sample t-test

data: candy$winpercent[as.logical(candy$fruity)] and candy$winpercent[as.logical(candy$choco
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:
-22.15795 -11.44563
sample estimates:
mean of x mean of y
44.11974 60.92153
```

Yes, it is statistically significant

```
library(dplyr)
```

```
Warning: package 'dplyr' was built under R version 4.3.3
```

```
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
```

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

```
rownames(candy %>%
  arrange(winpercent) %>%
  head(5))
```

```
[1] "Nik L Nip"           "Boston Baked Beans" "Chiclets"
[4] "Super Bubble"        "Jawbusters"
```

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

```
rownames(candy %>%
  arrange(-winpercent) %>%
  head(5))
```

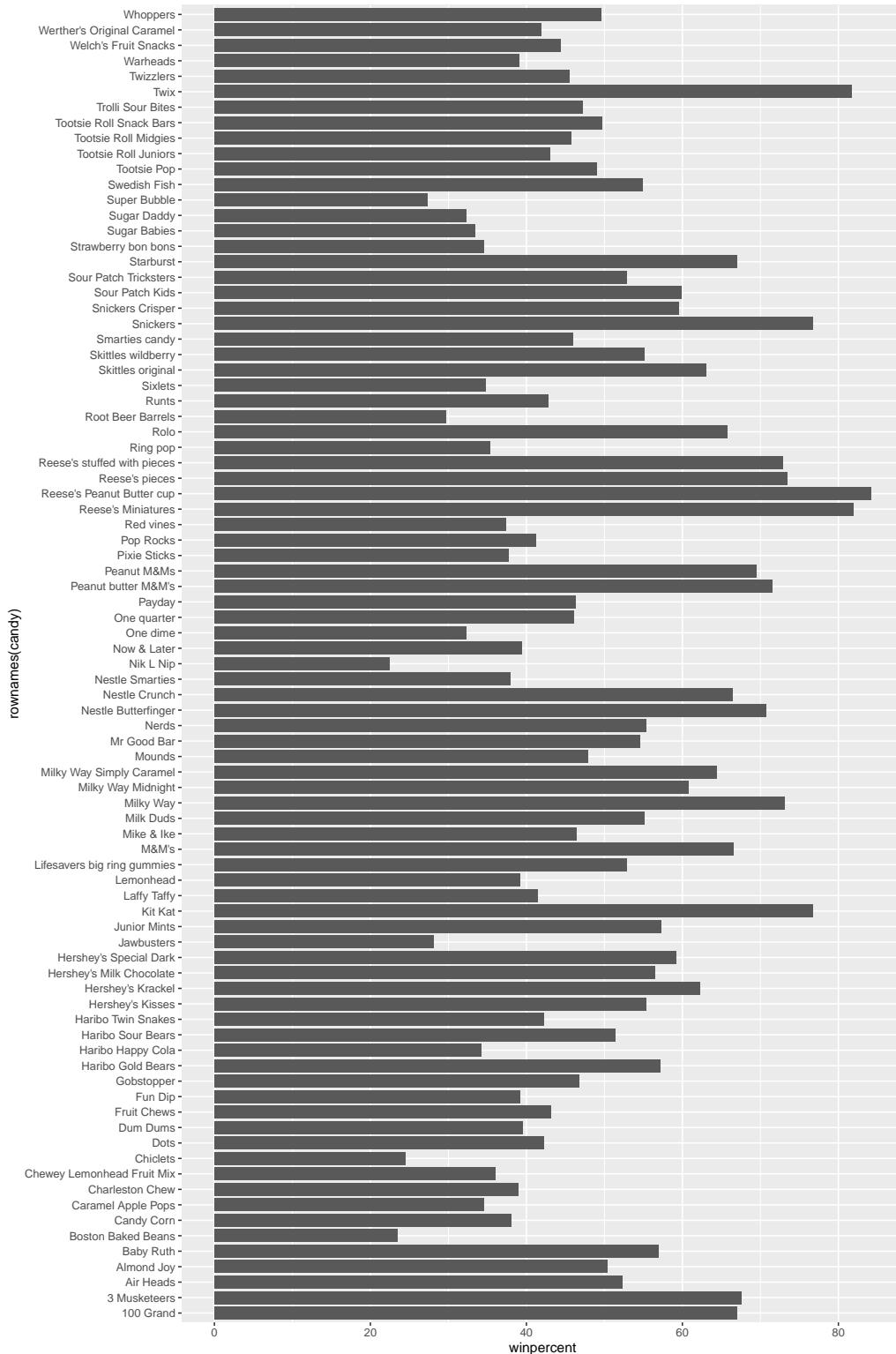
```
[1] "Reese's Peanut Butter cup" "Reese's Miniatures"
[3] "Twix"                      "Kit Kat"
[5] "Snickers"
```

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

```
library(ggplot2)
```

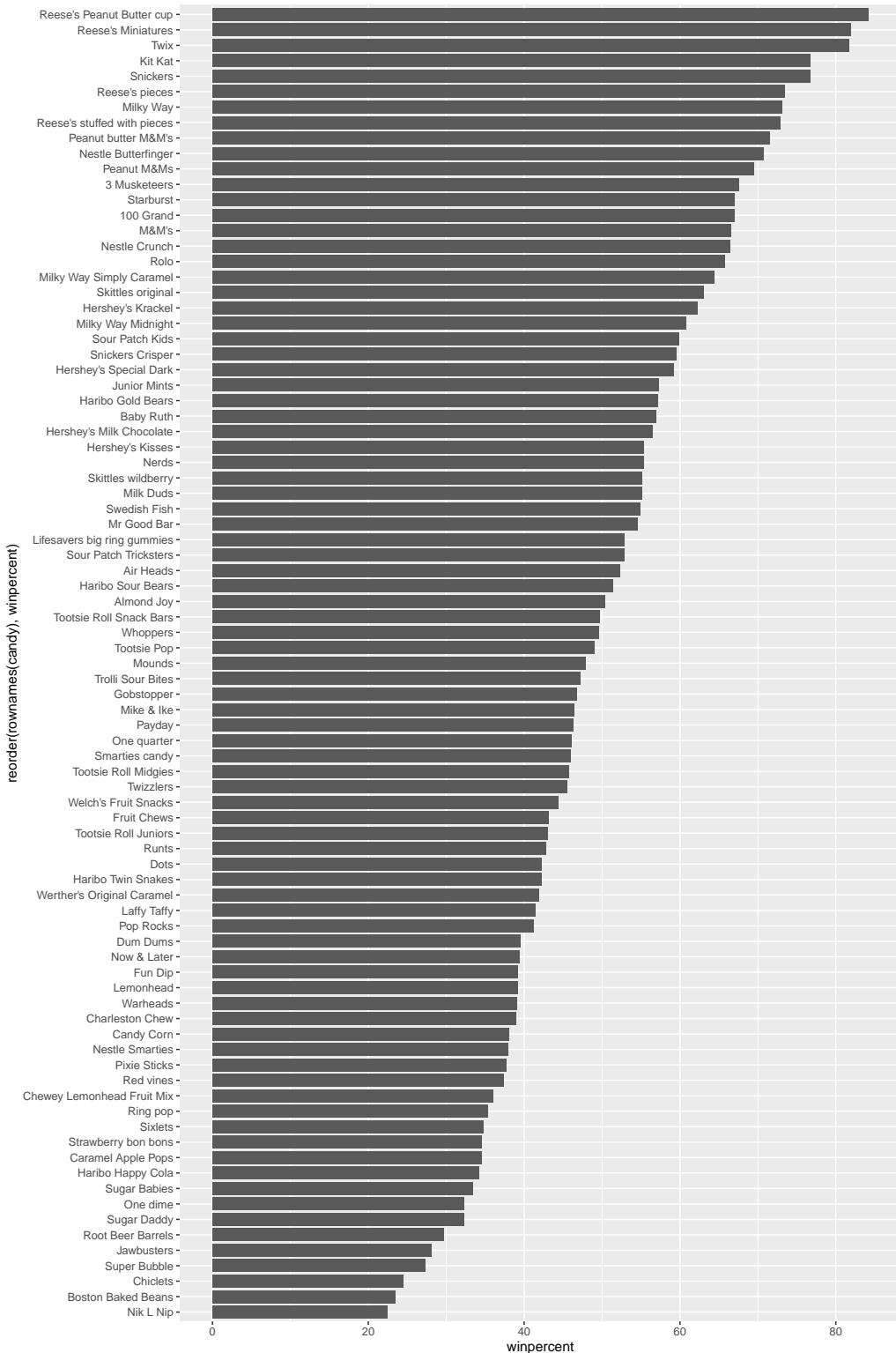
```
Warning: package 'ggplot2' was built under R version 4.3.3
```

```
ggplot(candy) +
  aes(winpercent, rownames(candy)) +
  geom_col(width = .8)
```



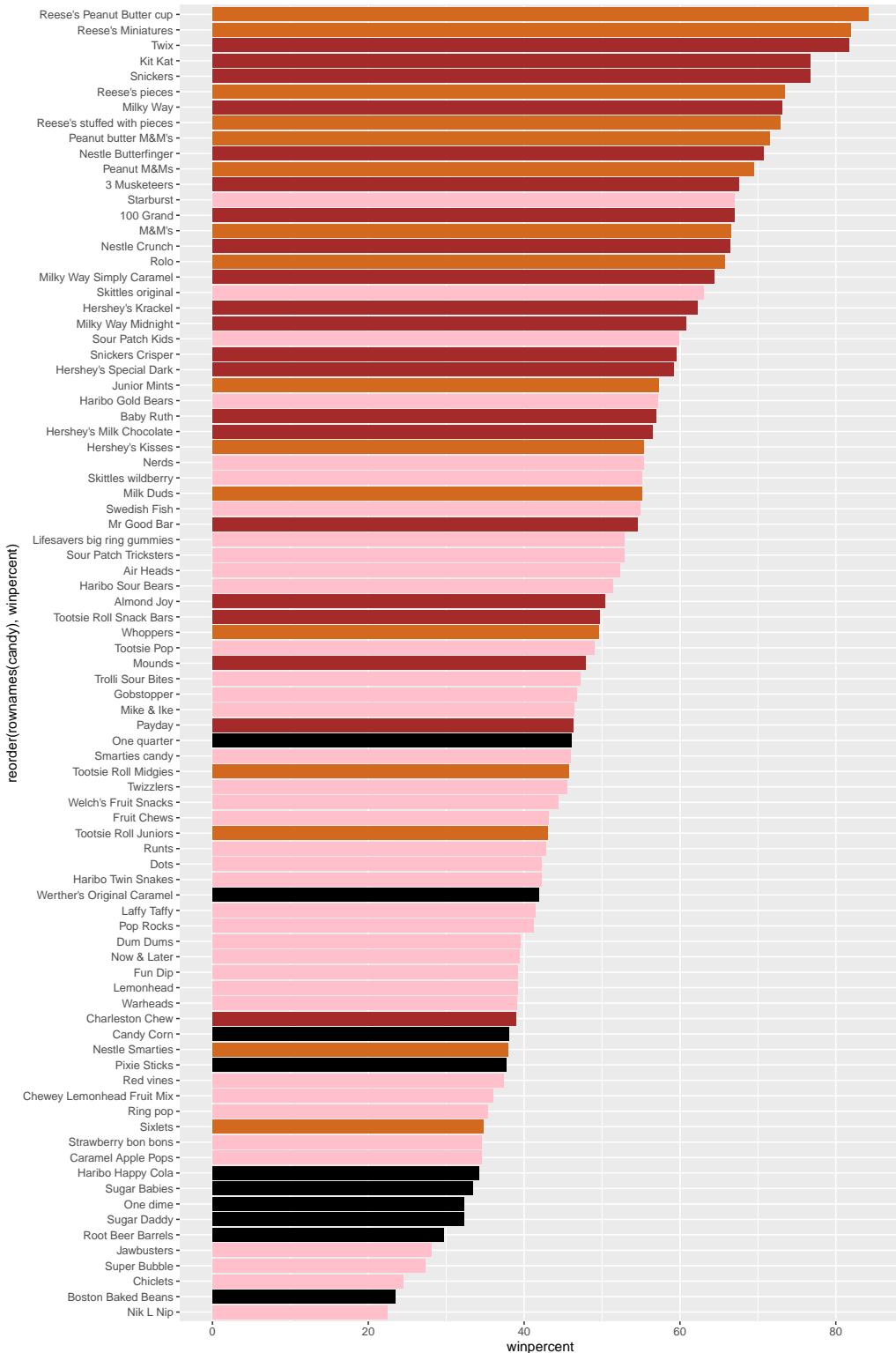
*Q16. This is quite ugly, use the reorder() function to get the bars sorted by winpercent?*

```
ggplot(candy) +  
  aes(winpercent, reorder(rownames(candy),winpercent)) +  
  geom_col(width = .8)
```



```
my_cols=rep("black", nrow(candy))
my_cols[as.logical(candy$chocolate)] = "chocolate"
my_cols[as.logical(candy$bar)] = "brown"
my_cols[as.logical(candy$fruity)] = "pink"

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



*Q17. What is the worst ranked chocolate candy?*

Sixlets

*Q18. What is the best ranked fruity candy?*

Starburst

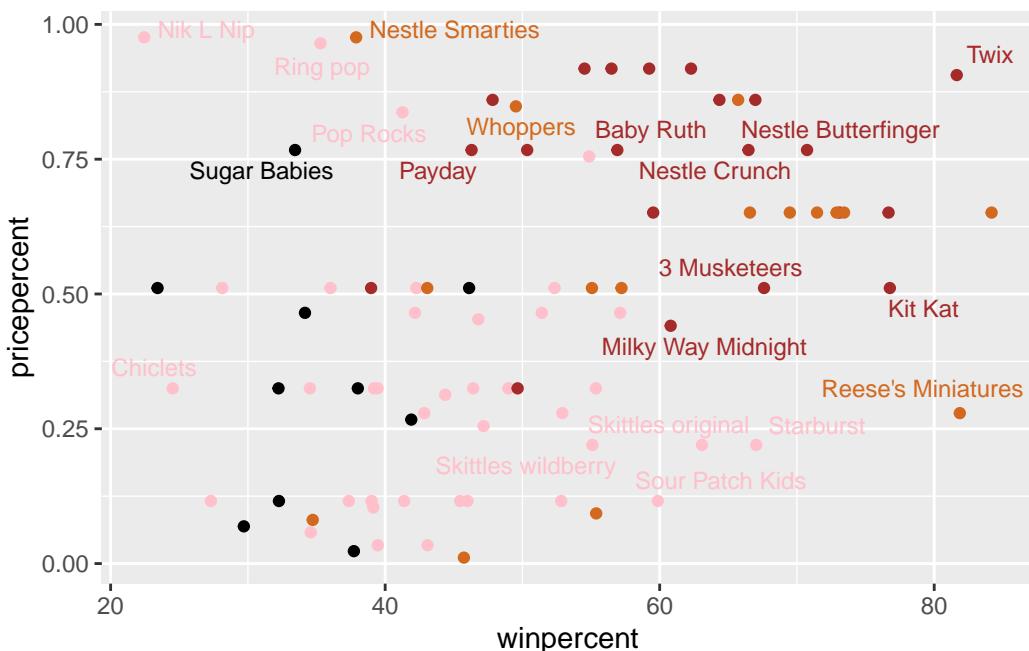
### Price Percent

```
library(ggrepel)
```

Warning: package 'ggrepel' was built under R version 4.3.3

```
# How about a plot of price vs win
ggplot(candy) +
  aes(winpercent, pricepercent, label=rownames(candy)) +
  geom_point(col=my_cols) +
  geom_text_repel(col=my_cols, size=3.3, max.overlaps = 5)
```

Warning: ggrepel: 65 unlabeled data points (too many overlaps). Consider increasing max.overlaps



*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?*

```
ord <- order(candy$winpercent, decreasing = TRUE)
head( candy[ord,c(11,12)], n=5 )
```

	pricepercent	winpercent
Reese's Peanut Butter cup	0.651	84.18029
Reese's Miniatures	0.279	81.86626
Twix	0.906	81.64291
Kit Kat	0.511	76.76860
Snickers	0.651	76.67378

Reese's Mini's are the cheapest among the most popular (But I would argue less bang for your buck overall, since its a miniature size of Reese)

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

```
ord <- order(candy$pricepercent, decreasing = TRUE)
head( candy[ord,c(11,12)], n=5 )
```

	pricepercent	winpercent
Nik L Nip	0.976	22.44534
Nestle Smarties	0.976	37.88719
Ring pop	0.965	35.29076
Hershey's Krackel	0.918	62.28448
Hershey's Milk Chocolate	0.918	56.49050

Nik L Nip is the least liked out of the most expensive.

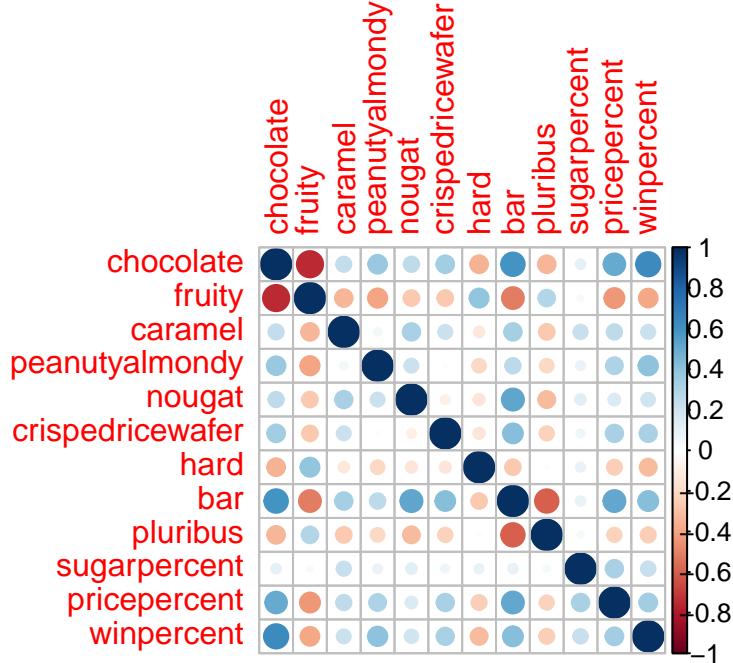
## Correlation

```
library(corrplot)
```

Warning: package 'corrplot' was built under R version 4.3.3

corrplot 0.95 loaded

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



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

Chocolate and fruity are anti-correlated, as well as bar and fruity, and bar and pluribus. (I like chocolate fruit candies, like chocolate covered cherries!)

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

Bar and chocolate or chocolate and winpercent

## PCA

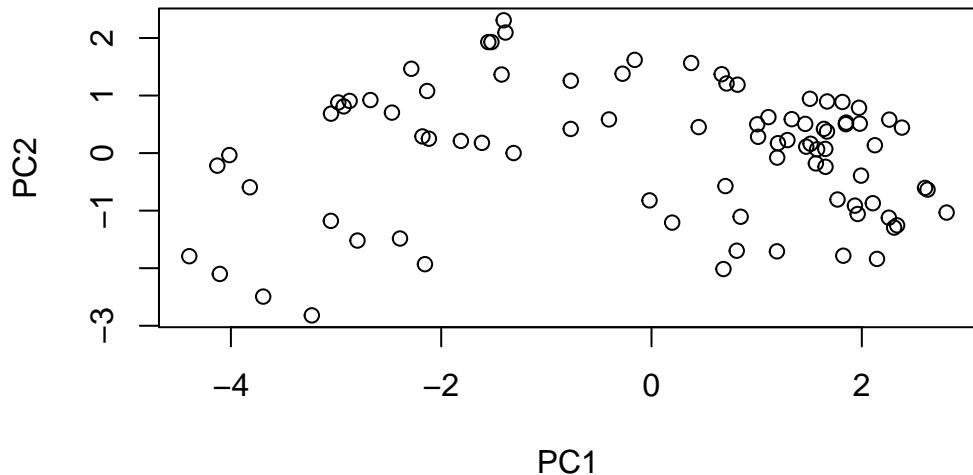
```
pca <- prcomp(candy, scale = TRUE)
summary(pca)
```

Importance of components:

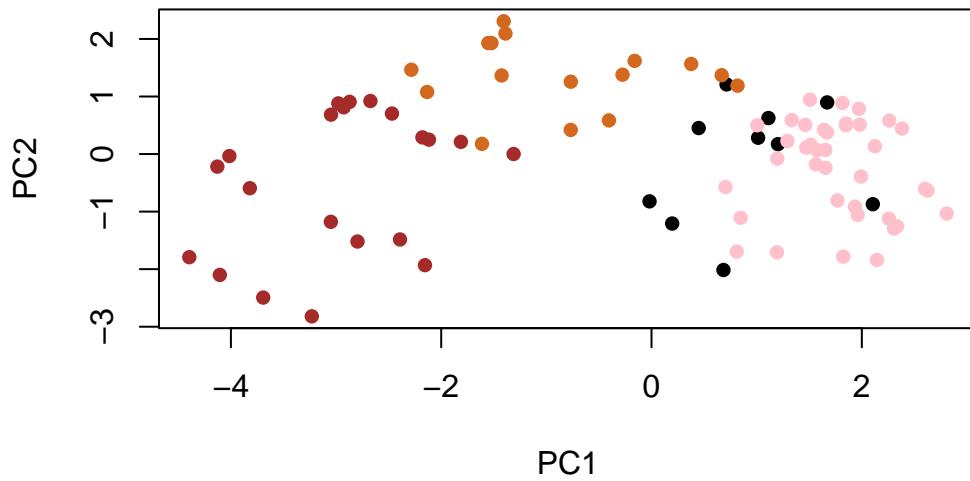
	PC1	PC2	PC3	PC4	PC5	PC6	PC7
Standard deviation	2.0788	1.1378	1.1092	1.07533	0.9518	0.81923	0.81530
Proportion of Variance	0.3601	0.1079	0.1025	0.09636	0.0755	0.05593	0.05539

```
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[, 1:2])
```

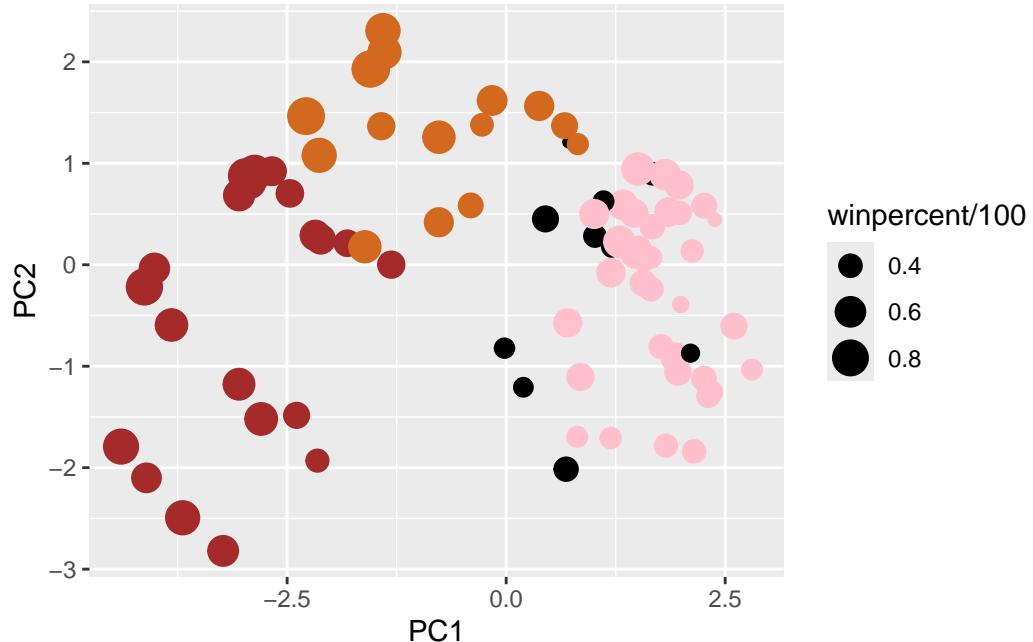


```
plot(pca$x[, 1:2], col=my_cols, pch=16)
```

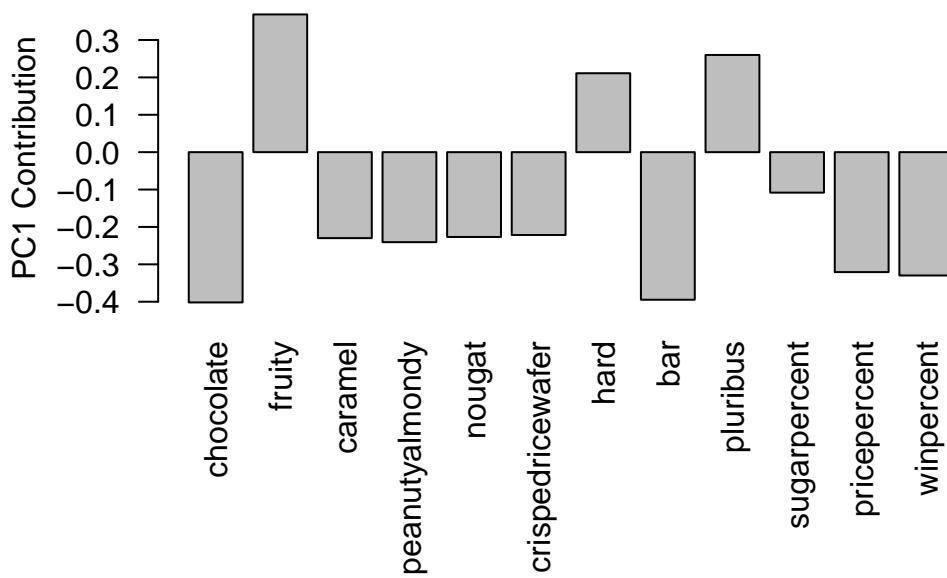


```
pc3 <- cbind(candy, pca$x[,1:3])
p <- ggplot(pc3) +
  aes(x=PC1, y=PC2,
      size=winpercent/100,
      text=rownames(pc3),
      label=rownames(pc3)) +
  geom_point(col=my_cols)

p
```



```
par(mar=c(8,4,2,2))
barplot(pca$rotation[,1], las=2, ylab="PC1 Contribution")
```



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

Fruity and pluribus. I thought chocolate and bar would be picked up more, but the fruity candies cluster strongly on the plot so this makes sense.