# Graphics

In class, we measured the following variables:
height, weight, age, sex, smoking, drinking, electricity.

Which graphics would help us summarize these variables?   There are several choices, and no single correct choice. But some choices might be more suitable to some circumstances.
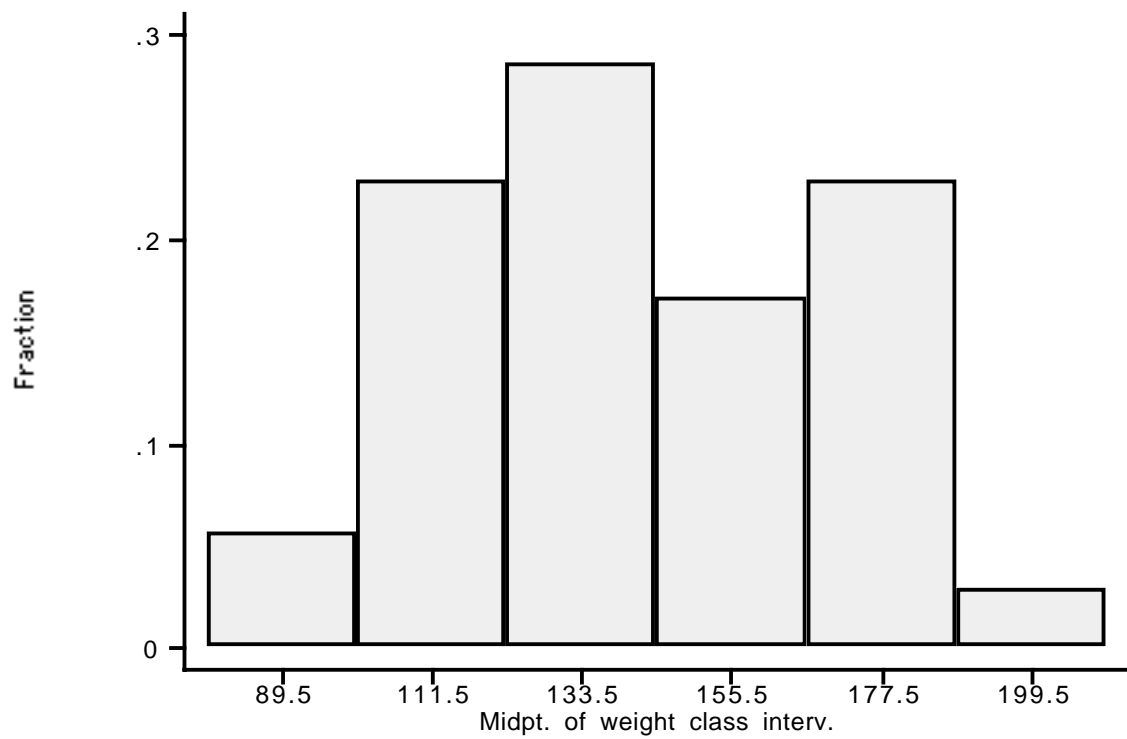
Here's a stem-and-leaf of the height:
62* | 00000
 63* | 005
 64* | 0000
 65* | 00005
 66* | 00
 67* | 00
 68* | 0000
 69* | 000
 70* | 0000
 71* |
 72* |
 73* |
 74* | 0
 75* |
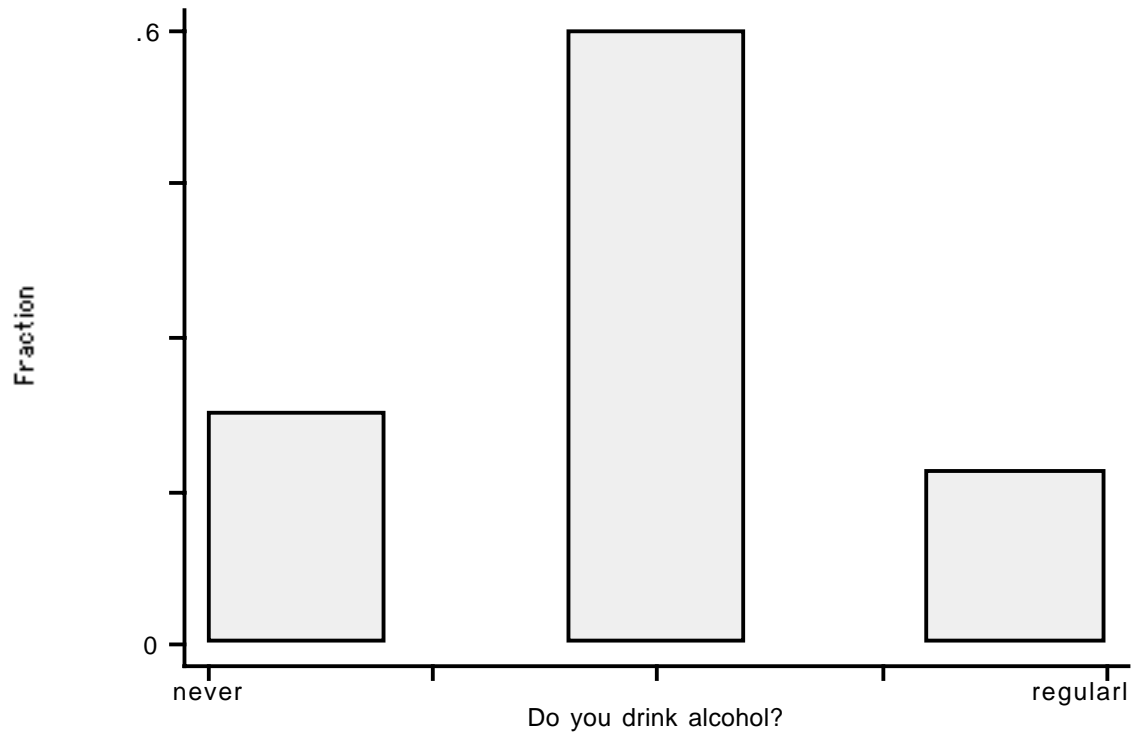 76* | 00

Here's a dot-plot of height:
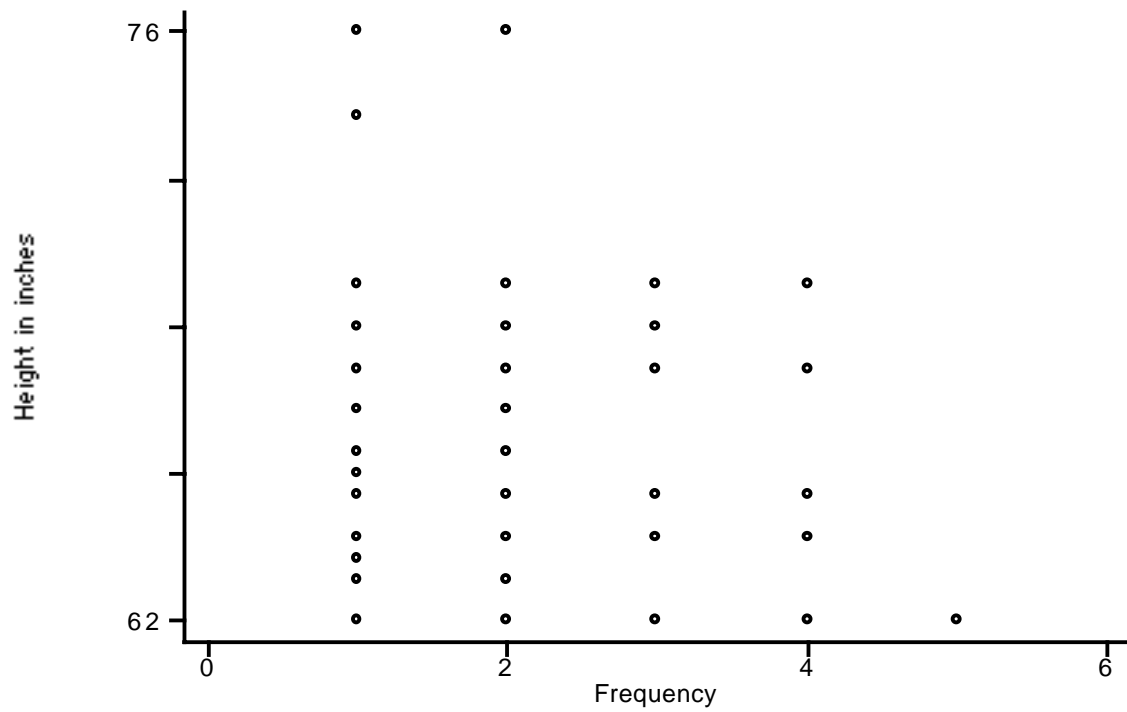
Here's a histogram of weight:

And, finally, here's what the class said about alcohol:

Fraction

never   Do you drink alcohol?   regularl

II. Gas Efficiency for some 1978 models.

Below are the manufacturer's miles per gallon (mpg) ratings for some cars produced in 1978.   This is a slightly more complicated data set, and we'll try on different graphical summaries.

make	mpg
1. AMC Concord	22
2. AMC Pacer	17
3. AMC Spirit	22
4. Buick Century	20
5. Buick Electra	15
6. Buick LeSabre	18
7. Buick Opel	26
8. Buick Regal	20
9. Buick Riviera	16
10. Buick Skylark	19
11. Cad. Deville	14
12. Cad. Eldorado	14
13. Cad. Seville	21
14. Chev. Chevette	29
15. Chev. Impala	16
16. Chev. Malibu	22
17. Chev. Monte Carlo	22
18. Chev. Monza	24
19. Chev. Nova	19
20. Dodge Colt	30
21. Dodge Diplomat	18
22. Dodge Magnum	16

23.	Dodge St. Regis	17
24.	Ford Fiesta	28
25.	Ford Mustang	21
26.	Linc. Continental	12
27.	Linc. Mark V	12
28.	Linc. Versailles	14
29.	Merc. Bobcat	22
30.	Merc. Cougar	14
31.	Merc. Marquis	15
32.	Merc. Monarch	18
33.	Merc. XR-7	14
34.	Merc. Zephyr	20
35.	Olds 98	21
36.	Olds Cutl Supr	19
37.	Olds Cutlass	19
38.	Olds Delta 88	18
39.	Olds Omega	19
40.	Olds Starfire	24
41.	Olds Toronado	16
42.	Plym. Arrow	28
43.	Plym. Champ	34
44.	Plym. Horizon	25
45.	Plym. Sapporo	26
46.	Plym. Volare	18
47.	Pont. Catalina	18
48.	Pont. Firebird	18
49.	Pont. Grand Prix	19
50.	Pont. Le Mans	19
51.	Pont. Phoenix	19
52.	Pont. Sunbird	24
53.	Audi 5000	17
54.	Audi Fox	23
55.	BMW 320i	25
56.	Datsun 200	23
57.	Datsun 210	35
58.	Datsun 510	24
59.	Datsun 810	21
60.	Fiat Strada	21
61.	Honda Accord	25
62.	Honda Civic	28
63.	Mazda GLC	30
64.	Peugeot 604	14
65.	Renault Le Car	26
66.	Subaru	35
67.	Toyota Celica	18
68.	Toyota Corolla	31
69.	Toyota Corona	18
70.	VW Dasher	23
71.	VW Diesel	41
72.	VW Rabbit	25
73.	VW Scirocco	25
74.	Volvo 260	17

We'll demonstrate some graphical summaries of these data.
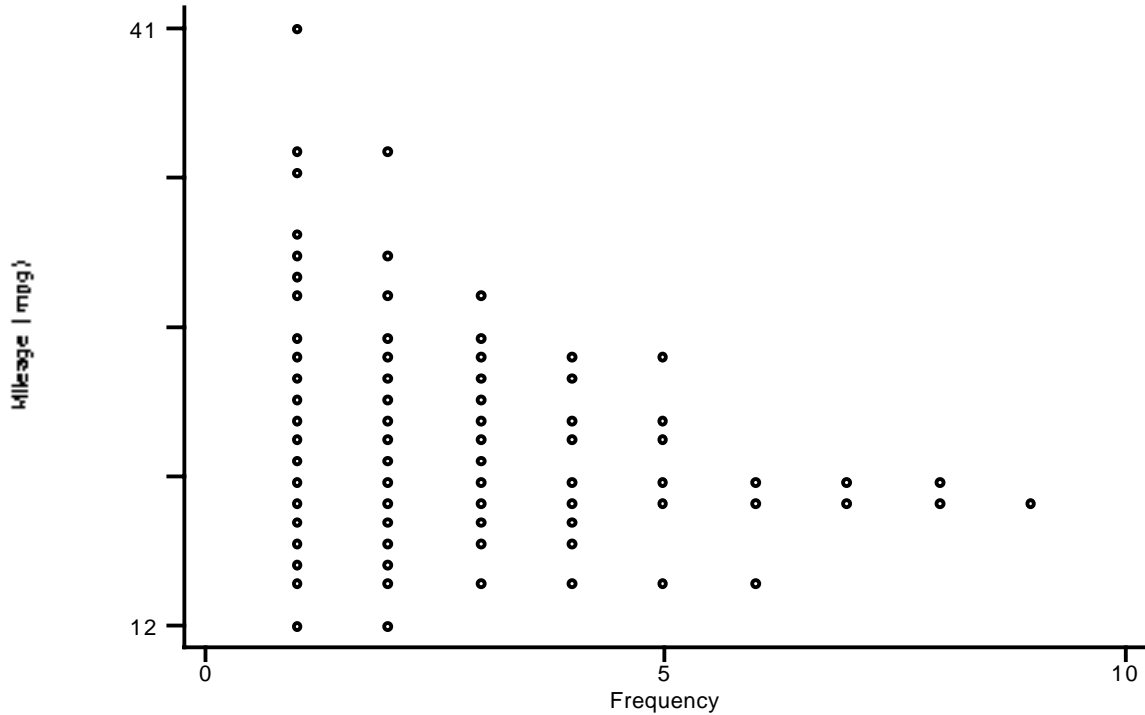
Dotplot
One dot for each observation. The vertical axis gives you the values of mpg. The horizontal axis (labeled "frequency") just tells you how often each value occurs.

We get the sense that mpg's range from a low of 12 to a high of 41, and that "typical" values are somewhere closer to 12, maybe around 19 or 20.
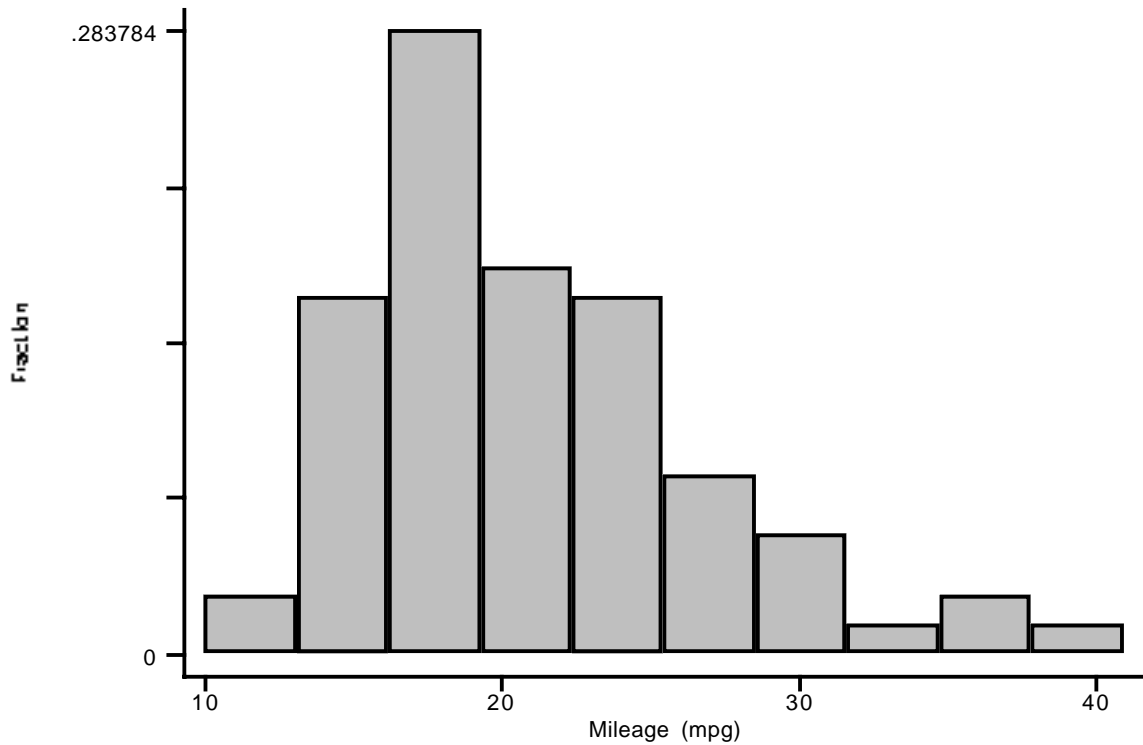
Stem & Leaf

```
1t │ 22
1f │ 44444455
1s │ 66667777
1. │ 88888888899999999
2* │ 00011111
2t │ 22222333
2f │ 444455555
2s │ 666
2. │ 8889
3* │ 001
3t │
3f │ 455
3s │
```

```
3.  |
4*  | 1
```

This is a little more complicated than the "basic" stem and leaf plot, but gives the same information. We see most common value is 18 or 19, values tend to be clustered around here, but a few larger mpgs also occur.
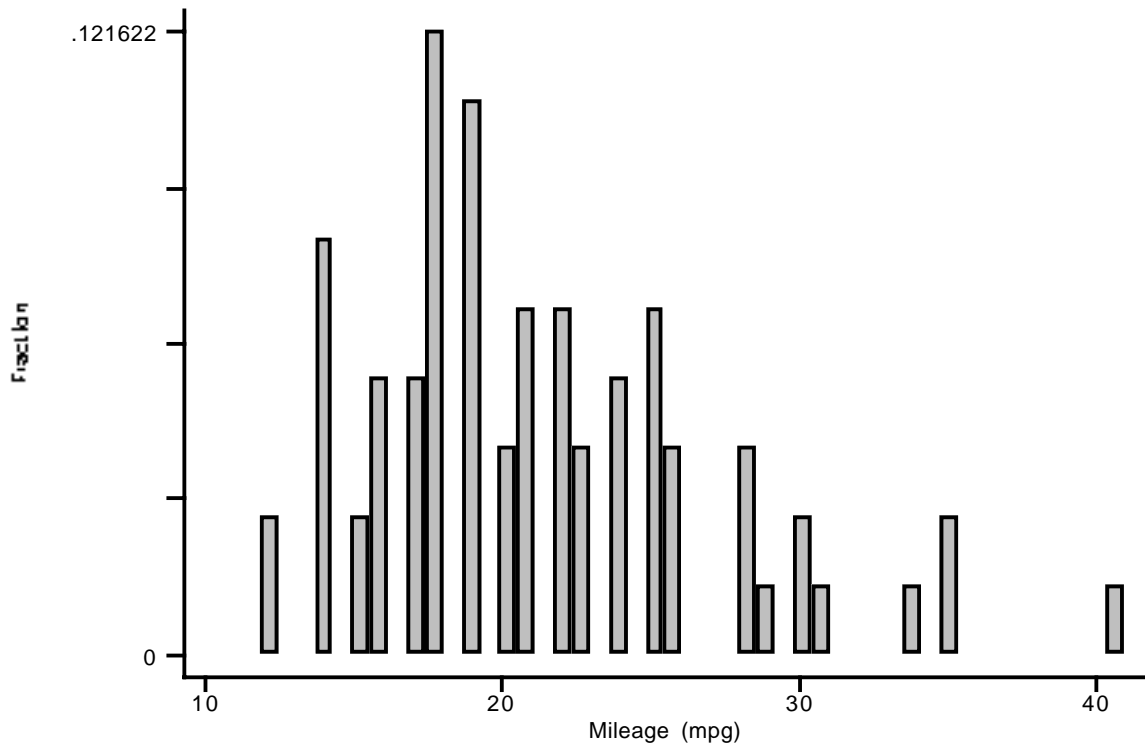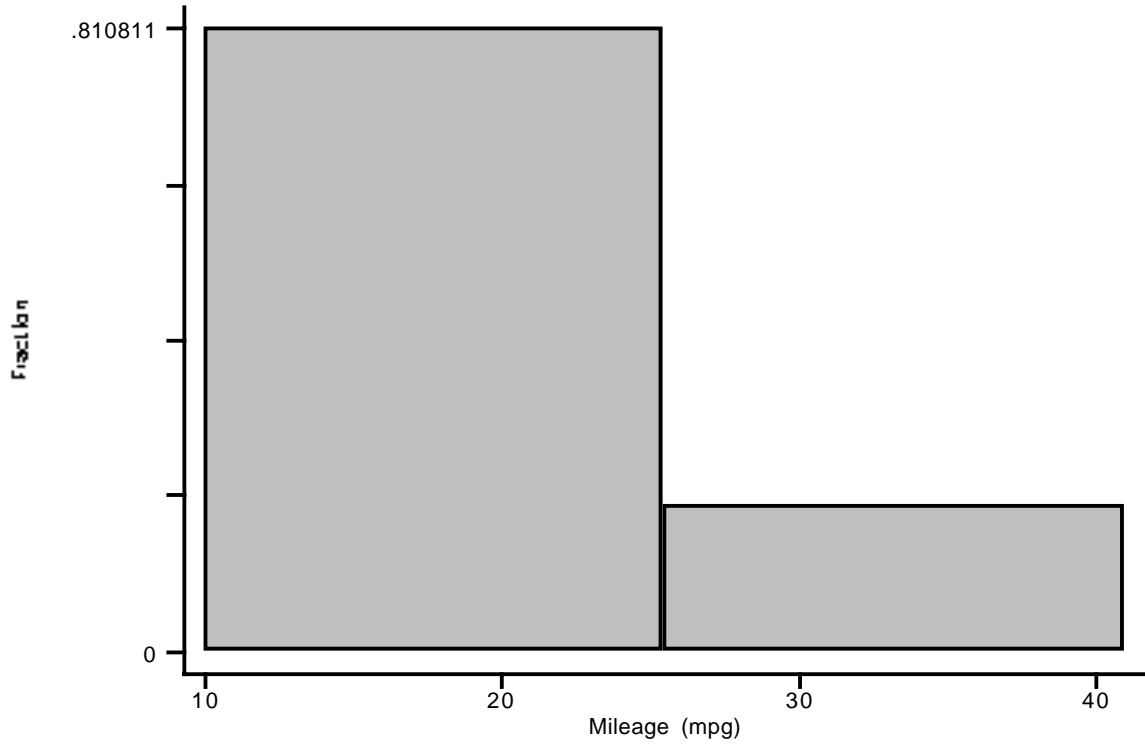
Histogram

Now we lose some information; we can't see precisely which values are in each bin. But we gain a feeling for the overall shape of the distribution of mpgs.
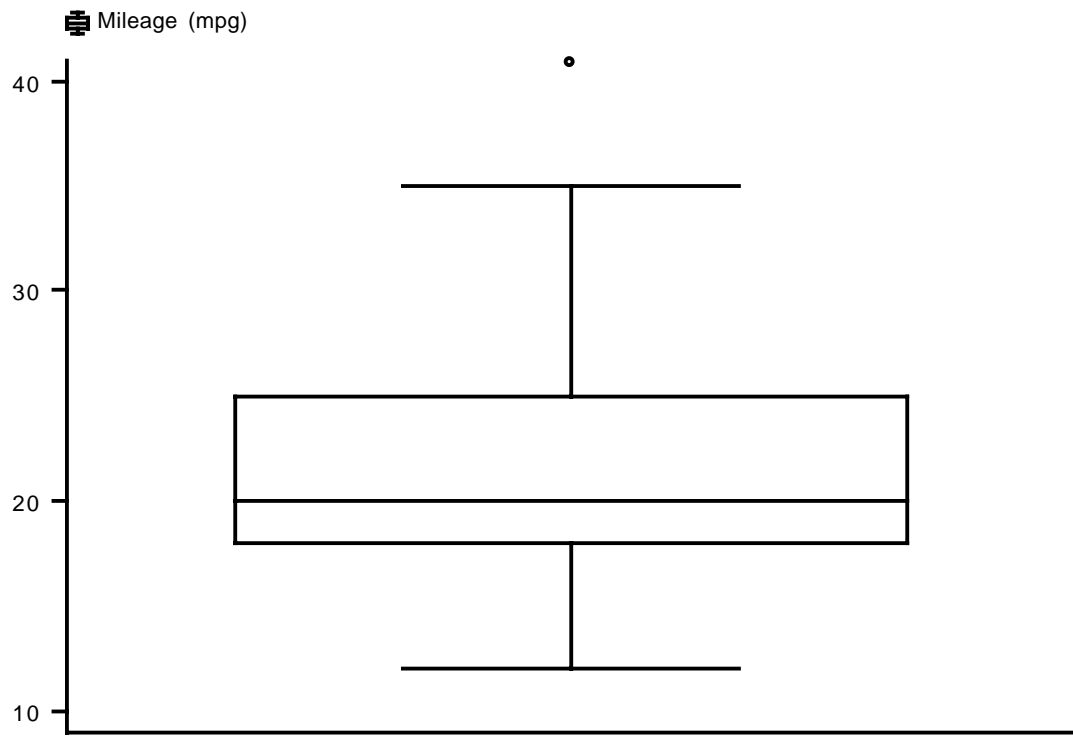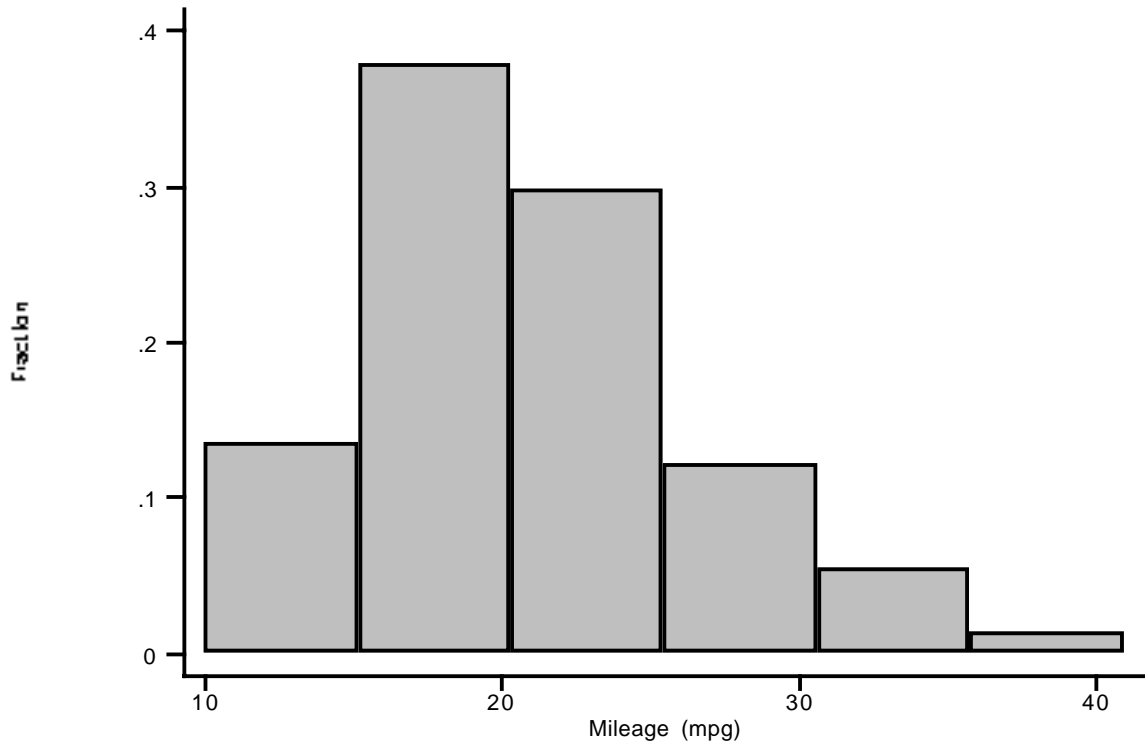
This histogram has a shape we call "right skewed". "Skewed" because it is not symmetric but instead has a "tail". The "right" means that the tail extends to the right.

Histogram with 2 bins:

Histogram with 50 bins:

Histogram with 6 bins:

Boxplot

We'll learn more about this after we've talked about numerical summaries. I include it here for completeness. The line in the middle of the box is the value that divides the histogram in half (so the fraction would be .5). The inside of the box contains the middle 50% of the observations, and the "whiskers" show where the upper and lower 25% are, roughly. The "dot" is an outlier -- an extreme observation.