4.32 (a) (Hand Calculation) (median = 50\(^{\text{th}}\) percentile, Q1 = 25\(^{\text{th}}\) percentile, Q3 = 75\(^{\text{th}}\) percentile) median = 66 inches, IQR = 5 inches (Q1 = 65 inches, Q3 = 70 inches).

(b) (Write down the formula, then use a Calculator) mean = 67.12 inches, SD = 3.79 inches.

(c) (Draw with Hand or Program)

(d) (Center, Spread, Shape, Outlier) The distribution is centered near 66-67 inches, with median 66 inches and mean 67.12 inches. The IQR is 5 inches, with the middle 50% of heights between 65 and 70 inches, and the SD is 3.79 inches. The distribution appears to be unimodal and symmetric, but skewed slightly to the right. There are no outliers.

5.20 (a) Aprial
(b) February
(c) August

(d) (Center, Spread, Outlier) (we don’t know much about Shape) The median ozon level in June is slightly higher than in January, but June’s readings are much more consistent. June does show two outliers, one low and one high.

(e) Strong seasonal pattern with low (Center) consistent (Spread) ozone concentrations in later summer/early fall and high (Center) variable (Spread) concentrations in early spring. (General Pattern) The medians follow a cyclic patern, rising from January to April, then falling to October and rising again from October to December. (More Specific)

6.18 (a) The \(z\)-score for 20 mph is \((20 - 23.84)/3.56 = -1.08\). So it is 1.08 SD from the mean speed.

(b) The \(z\)-score for 34 mph is \((34 - 23.84)/3.56 = 2.85\). For 10 mph, it’s \((10 - 23.84)/3.56 = -3.89\). \(|-3.89| > |2.85|\), so 10 mph is further away from the mean and therefore is more unusual. (SD as a ruler)

7.12 (a) \(-0.977\) (very like a line, negative slope)
(b) \(0.736\) (like a line, positive slope)
(c) \(0.951\) (very like a line, positive slope)
(d) \(-0.021\) (irregular)

7.32 (a) Quantitative variable, straight enough, outlier conditions are all met. So the correlation makes sense. The correlation is negative and quite strong (close to \(-1\)).

(b) Correlation can be defined through standardize data. So still the same.

(c) Scaling does not change standardize data, means scaling does not change correlation. So still the same.

(d) That year would have a very high mortgage amount for an interest rate that high. That would tend to bring the correlation toward the +1 side.

(e) No, correlation is not causality. We can only say that lower interest rates are associated with larger mortgage amounts, but we don’t know why. There may be other economic variables at work.