Learning Goal: For the distribution of a quantitative variable, describe the overall pattern (shape, center, and spread) and striking deviations from the pattern.

Specific Learning Objective: Estimate and calculate the standard deviation from the mean.

Warm-up:

1) To estimate the standard deviation from the mean, we developed the idea of average deviation from the mean. To review, find the ADM of this data set.
   {5, 6, 10, 11, 18}

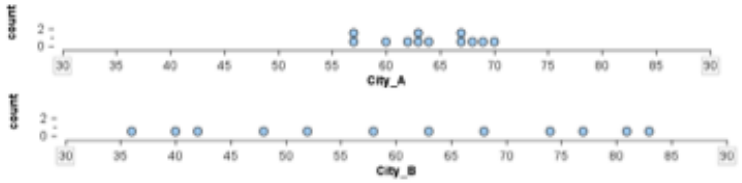
2) Here is the formula for standard deviation. (We know you have been wondering about this!). Compare and contrast the formula for ADM with the formula for standard deviation (SD).

$$ADM = \frac{\sum|x - \bar{x}|}{n} \qquad SD = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

3) The ADM will always be slightly smaller than the SD. Show that this is true for this set of data: {5, 6, 10, 11, 18}. Calculate the SD. Compare the SD to the ADM you calculated in (1).

Group work:
We will use technology to find the standard deviation of a data set, instead of calculating it by hand. So here we will practice problems that focus on the concept, instead of the mechanics.

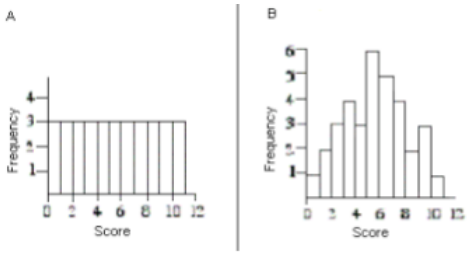
4) Recall the City A is San Francisco and City B is New York City. The data shown here is the average of the highest temperatures for each month over a period of 10 years. If we calculate the SD for each distribution, we get 4.4 and 16.6 degrees. Which is the SD for San Francisco? How do you know? (See if you can answer this without doing any calculations!)



5) Which do you think will have a larger standard deviation? Why?

   a. The amount that a random sample of 30 LMC students spend per unit.
   b. The amount that a random sample of 30 college students in the U.S. spend on per unit.

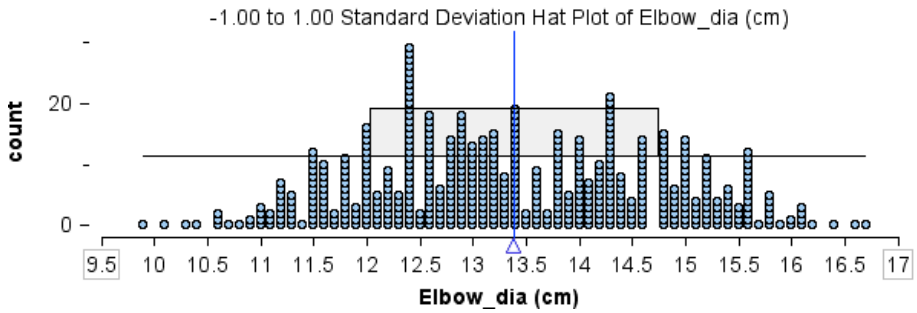
6) Which distribution has the smaller standard deviation? Explain how you made your decision.



7) If the standard deviation of quiz scores on the OLI Checkpoint is zero, what do we know? Jot down a few notes to capture your thinking.

a. everyone made a 100% on the quiz
b. everyone failed the quiz
c. everyone made the same score on the quiz
d. it is impossible to tell

8) Here is a dot plot of elbow girth measurements for 507 adults. In Tinkerplots, we can graph a standard deviation hat plot. The standard deviation hat plot consists of a box around the mean that captures all of the data that is within one standard deviation of the mean. In other words, the left edge of the box is Mean – SD; the right edge of the box is Mean + SD.



The mean elbow diameter is about 13.4 cm. Which of the following choices is the most reasonable estimate for the standard deviation? Why?

a. about 2.8cm
b. about 1.4cm
c. about 7cm

9) Describe in words what the standard deviation measures. (Think about how we have been estimating it in previous activities.)