

# DAY 13

## Making Friends with Standard Deviation

Students  
explore how  
changes in  
data affect  
mean and  
standard  
deviation.

### Mathematical Topics

- Comparing methods for measuring data spread
- Making geometrical interpretations of standard deviation
- Working with the idea of standard deviation

### Outline of the Day

#### In Class

1. Select presenters for tomorrow's discussion of *POW 13: Corey Camel*
2. Discuss *Homework 12: The Best Spread*
  - Be sure students know how to compute standard deviation
3. Discuss the connection between standard deviation and the change in concavity of the normal curve
4. *Making Friends with Standard Deviation*
  - Students explore how changes in data affect the mean and the standard deviation
5. Discuss *Making Friends with Standard Deviation*
  - Let students share any conclusions they reached, but do not push for specific results

#### At Home

*Homework 13: Deviations*

#### Special Materials Needed

- Overhead transparencies of the diagrams in the section "Geometric Interpretation of Standard Deviation" (see Appendix B)

## 1. POW Presentation Preparation

Presentations of *POW 13: Corey Camel* are scheduled for tomorrow. Choose three students to make POW presentations, and give them overhead transparencies and pens to take home to use in their preparations.

## 2. Discussion of *Homework 12: The Best Spread*

As students come in, have them check their calculations on Question 2a within their groups. If there seem to be disagreements, you can have four volunteers each present the calculation of standard deviation for one set of data.

After the presentations on Question 2 by heart card members, you can decide whether discussion of Question 3 seems needed.

A discussion of Question 4 is optional. If students got stuck trying to come up with these data sets, you need not push on this issue. But, for students who are interested, you can suggest the supplemental problem *Data for Dinky and Minky*, which poses a similar question for Dinky's and Minky's methods of measuring data spread.

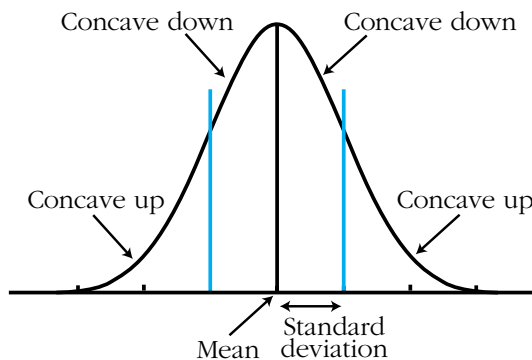
Make sure everyone in the class is clear on how to calculate standard deviation. If some students are having trouble, you can work with them while their groups begin the next activity.

## 3. Geometric Interpretation of Standard Deviation

As stated in *Standard Deviation Basics*, the standard deviation for a normal distribution is the distance along the horizontal axis between the mean and either horizontal coordinate for which the curve changes concavity. (The concept and language of concavity were discussed briefly on Day 7.)

*“Based on this diagram, what is the relationship between standard deviation and the concavity of the normal curve?”*

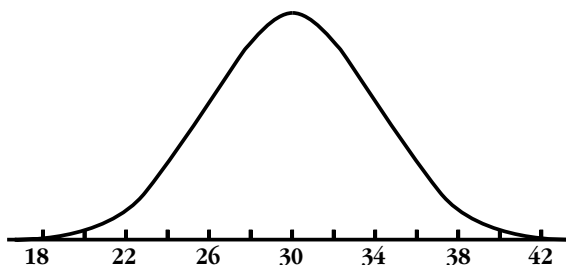
Ask students to look at the diagram “Visualizing the Standard Deviation” from *Standard Deviation Basics*. Have them describe in their own words the idea of concavity and its relationship to standard deviation.



### Visualizing the Standard Deviation

(Copies of this diagram and the next one are included in Appendix B for use in making overhead transparencies.)

As an illustration, have them estimate the standard deviation for the normal curve below, which has a horizontal scale marked on it.



## 4. Making Friends with Standard Deviation

(see next page)

You can introduce *Making Friends with Standard Deviation* by telling students that before they explore how standard deviation relates to the unit problem, they need to gain more familiarity with the concept and with the mechanics of working with it.

As students work, you may need to push them to get started and to experiment with examples. For instance, some groups may need assurance that they can use any set of five numbers in Question 1a, and can use any nonzero number to add to the numbers in Question 1b.

Students' explanations in Question 1d may take several forms. They may picture the data points on the number line, so that adding the same thing to each point just moves the points along and hence also moves the mean. Or, they may see the change in the mean algebraically, although you should not expect a full algebraic explanation involving the distributive law.



# Making Friends with Standard Deviation



You will be working with the concept of standard deviation in connection with the unit problem throughout the rest of the unit. Before you begin that work, it will be helpful for you to gain some more familiarity with the concept.

1. First, explore what happens to the mean and the standard deviation of a set of data when you add the same number to each member in the set.
  - a. As a group, make up a set of five numbers that are all different. Find the mean and the standard deviation of your set.
  - b. Now choose a nonzero number and add it to each member of your set. Find the mean and the standard deviation of your new set.

*Continued on next page*

Students may attribute the lack of change in standard deviation to the fact that the spread doesn't change when you move everything along. Or, they may see that the change in the mean cancels out the change in the data when you subtract.

The explanations for Question 2 should be similar. Question 3 is intended primarily as further work for groups that finish early.

