OVERVIEW

In this activity, students look at the shapes of data and learn to sketch distributions by quickly identifying prominent features. The activity begins by having students look at data collected from a group of Australian students. Students look at plots of different attributes that demonstrate differently shaped distributions. Students are then asked to sketch distributions and match their partners' sketches to the distribution that was displayed. This activity sets the stage for several other TinkerPlots activities in which it is important that students recognize and sketch general features of a distribution, rather than trying to sketch details that are often the result of chance variation.

If desired, students can then further explore the Australian student data using TinkerPlots, looking at distribution shapes for different numeric attributes. If students don't already know how to build a single-variable plot by fully separating data points and stacking, you'll need to show them that skill for Step 3. (See the movie "TinkerPlots Basics.")

Activity Time: One class period, or two class periods if you want students to explore the Australian student data

Objectives

- Describe the shape of a distribution.

- Identify and sketch the main features of a distribution.

Common Core Standards Addressed

Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

Grade 6, Statistics and Probability Standard 2

Summarize numerical data sets in relation to their context by giving quantitative measures of center (*median* and/or *mean*) and variability (*interquartile range* and/or *mean absolute deviation*), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.

Grade 6, Statistics and Probability Standard 5c

Prerequisites

None

Materials

- Sketching Distributions worksheet (one copy of "Set 1 Matching" and one copy of "Set 2 Matching" per pair of students)

- **Sketching Distributions.tp**

- Transparencies of Common Distributions A–E and 1–5 (blackline masters found at the end of these Notes)

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LESSON PLAN

Introduction (10 minutes)

Open **Sketching Distributions.tp**. These data are collected from a group of Australian students. Make a distribution of the students' heights by dragging the *Height* attribute onto the horizontal axis (a black rectangle will highlight when you're in the correct position to place the attribute), and then fully separating the data by clicking any case icon and dragging it to the right until all the bins disappear. Then click the vertical **Stack** button in the upper plot toolbar. (See the movie "TinkerPlots Basics" for more details.) Ask students to describe the shape of this distribution. Encourage them to describe the overall shape, and not the specific details of the distribution.

Next look at the distribution of the amount of money the students earn each week. (Drag the attribute *MoneyEarn* right on top of the *Height* attribute to replace it.) Ask students to describe how the two distributions are different. Then ask them if they can think of a reason the distribution is bunched up on the lower side. (Many students do not earn anything, and it is not possible to earn less than $0.)

The *Exercise* attribute, indicating the number of hours per week the student exercises, is also interesting to look at. Before displaying the distribution, explain that this is the number of hours per week students spend exercising and ask students what they expect the distribution to look like.

Sketching Distributions (10 minutes)

Show students transparencies of the common distribution types (distributions A, B, C, and E supplied at the end of these Notes), referring back to any similar distributions they saw in the Australian student data. Introduce these terms to describe the distributions: *mound-shaped, left-wall, right wall, uniform,* and *bimodal.* As you show examples of each, cover the title of the transparency.

One goal of this activity is to learn to sketch distributions quickly, capturing the significant features, but not reproducing the details. It is the significant features that are most important. If students capture only these significant features, they will be able to sketch a distribution in about five seconds. Show one of the mound-shaped distributions and ask students what important features they should capture in a sketch. Then direct them to sketch the distribution. After students have finished their sketches, make your own sketch to demonstrate what you are looking for, or use a student's work as an example. Students tend to try to draw all of the small details and spikes in the distribution, as shown here.
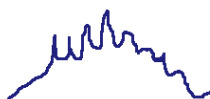
What you want to see is a sketch where the spikes are smoothed over, only the general mound is shown, and the range accurately reflects the graph as shown here.

Display the left-wall distribution and have students sketch it. Display the plot for only a short time to help students focus on the important features. Again, check what students have drawn and give them feedback, including an example of what you would like to see.
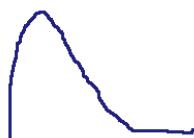
Repeat the process with the remaining distributions.

Matching Distributions (15 minutes)

Have students work in pairs. Hand out the Sketching Distributions worksheets—in each pair of students, one should have a copy of Set 1 Matching, and the other should have a copy of Set 2 Matching.

Display the five distributions in Set 1 for two or three seconds each. As you do this, the student with Set 1 Matching should turn his or her back to the screen, and the *other* student should sketch the distributions, labeled A–E, on a separate sheet of paper.

Display the five distributions in Set 2 for two or three seconds each. As you do this, the student with Set 2 Matching should turn his or her back to the screen, and the *other* student should sketch the distributions, labeled 1–5, on a separate sheet of paper.

Students should now give the sketches they've drawn (labeled A–E or 1–5) to their partner. Students will match their partner's sketches to the distributions on their worksheets (which are the same as the distributions you displayed).

Wrap-Up (10 minutes)

Discuss as a class what students looked for when making their sketches and when matching the sketches to the actual distributions. Use this as an opportunity to review descriptive terminology such as **mound-shaped, right wall, left wall, bimodal,** and **uniform,** helping students to describe distributions verbally.

Extension (optional, up to 45 minutes)

Have students work individually at computers with the TinkerPlots document **Sketching Distributions.tp.** Instruct them to make plots of various attributes, sketch each plot that interests them, and describe these plots verbally.
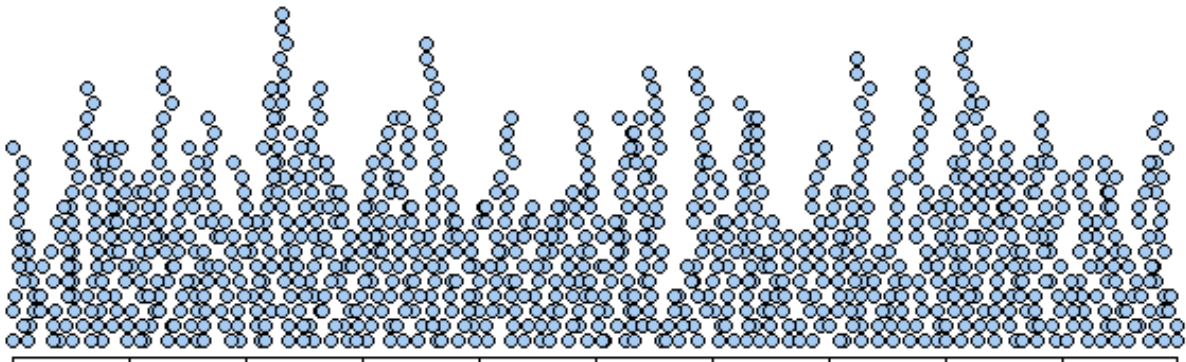
ANSWERS

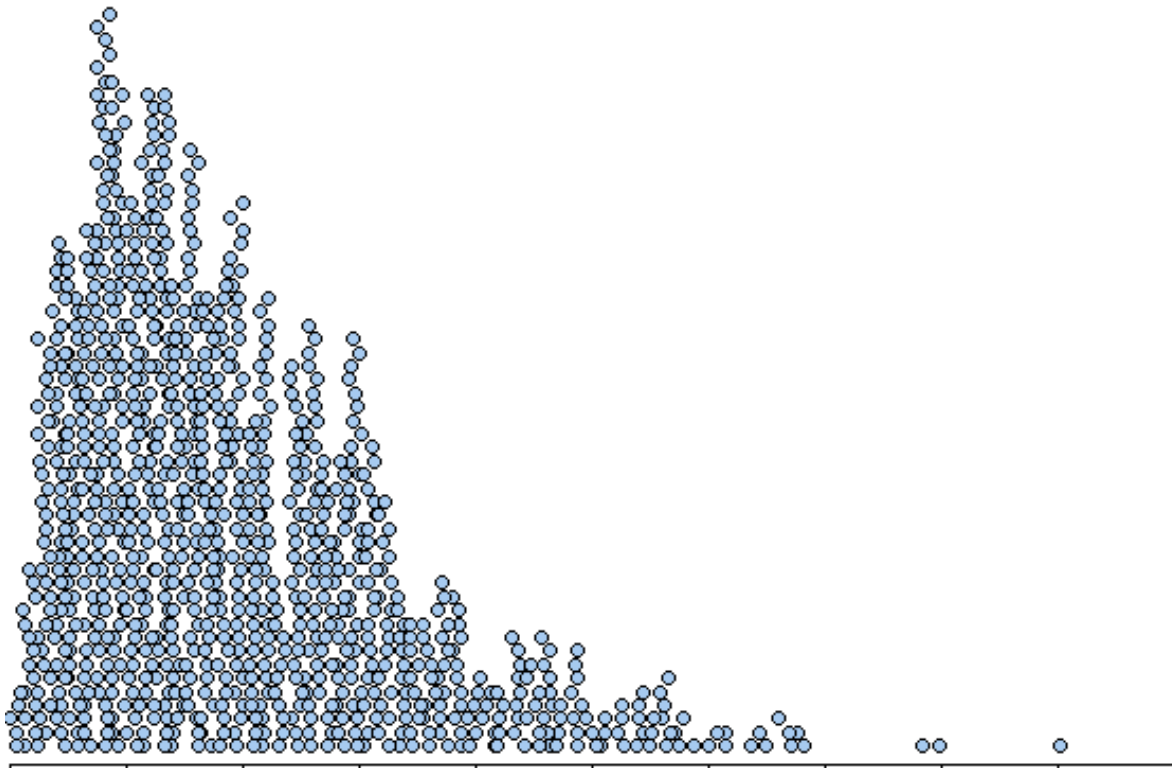**Set 1 Matching**

D, B, A, E, C

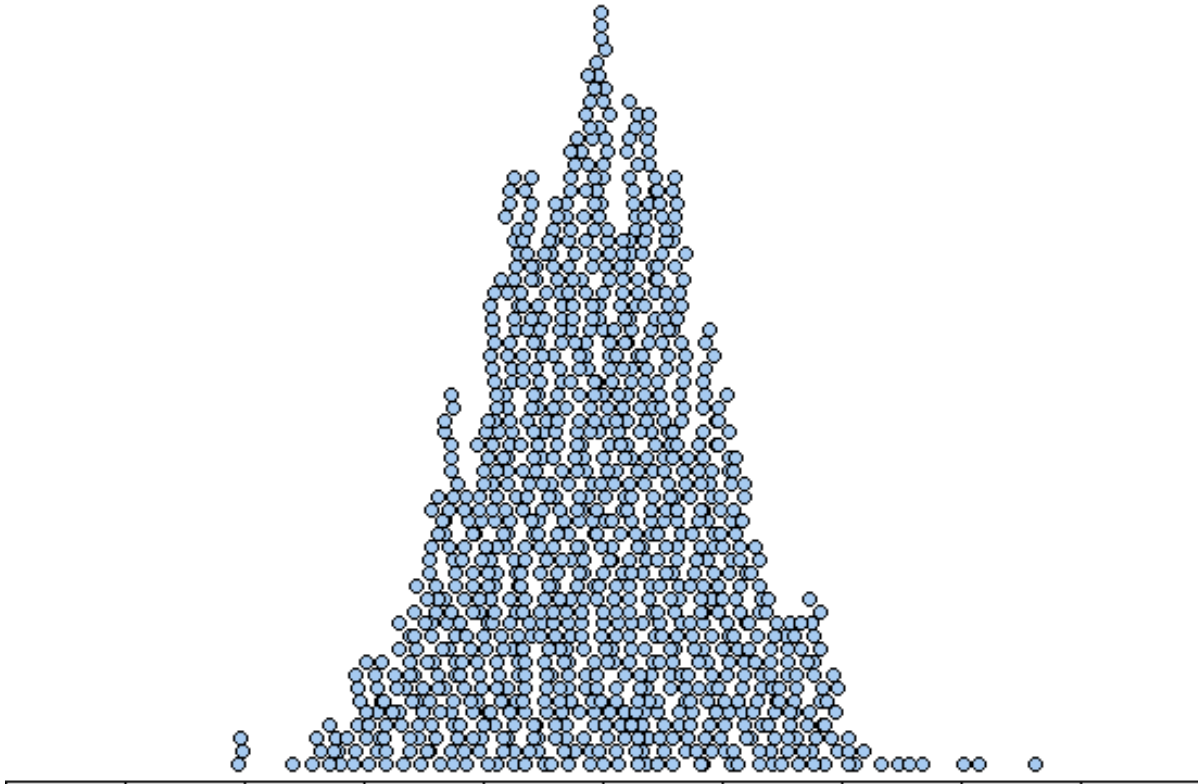**Set 2 Matching**

4, 3, 1, 5, 2

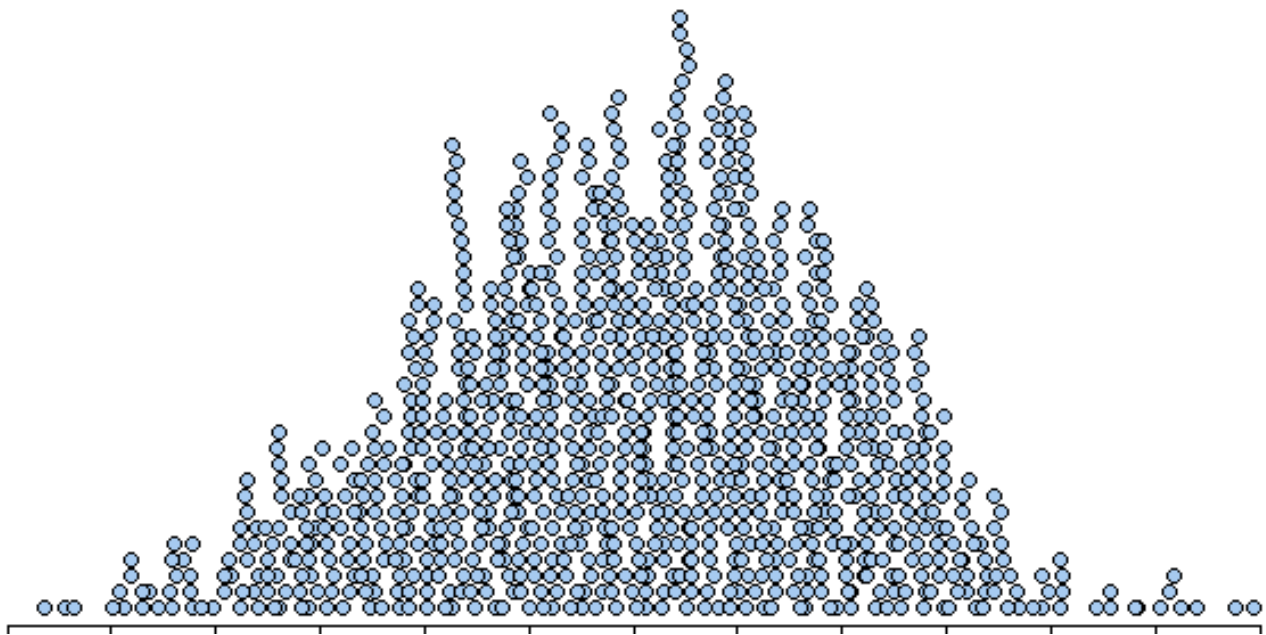**Set 1: Common Distribution A**

Set 1: Common Distribution B

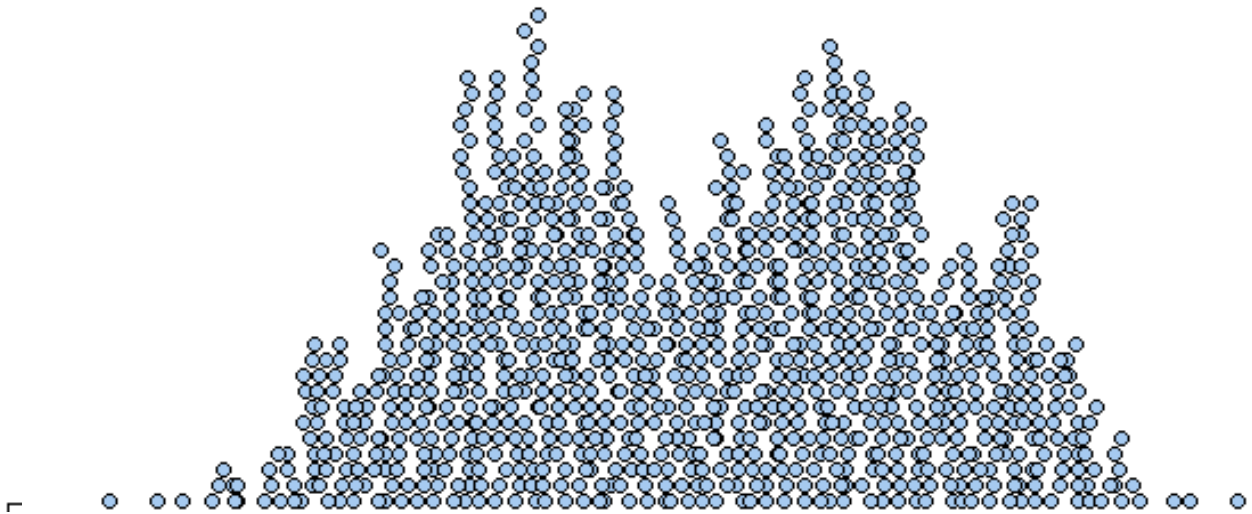**Set 1: Common Distribution C**
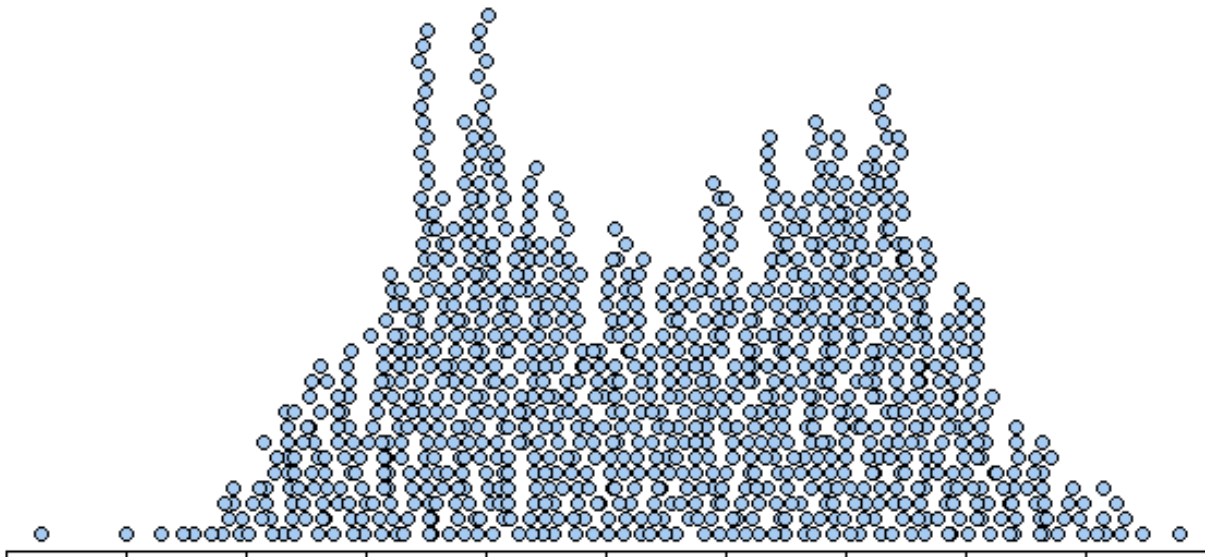
Set 1: Common Distribution D
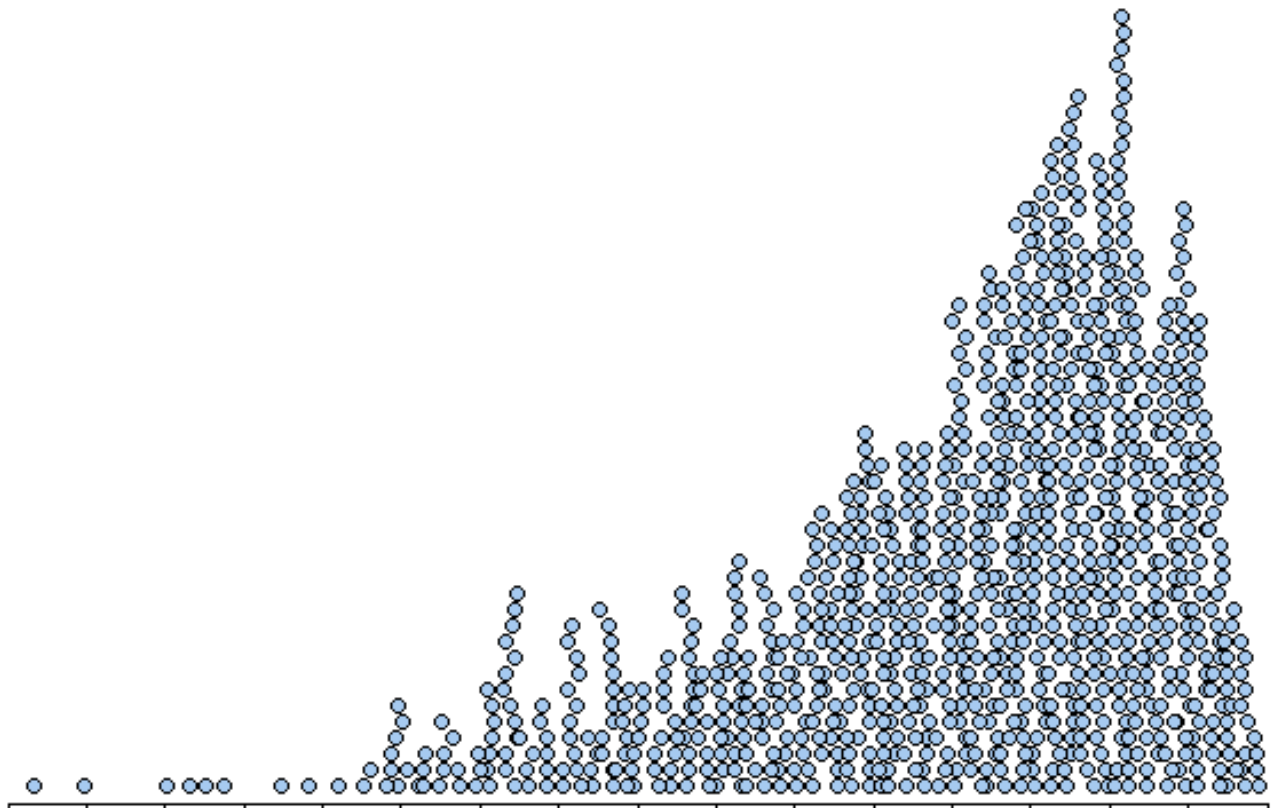
Set 1: Common Distribution E
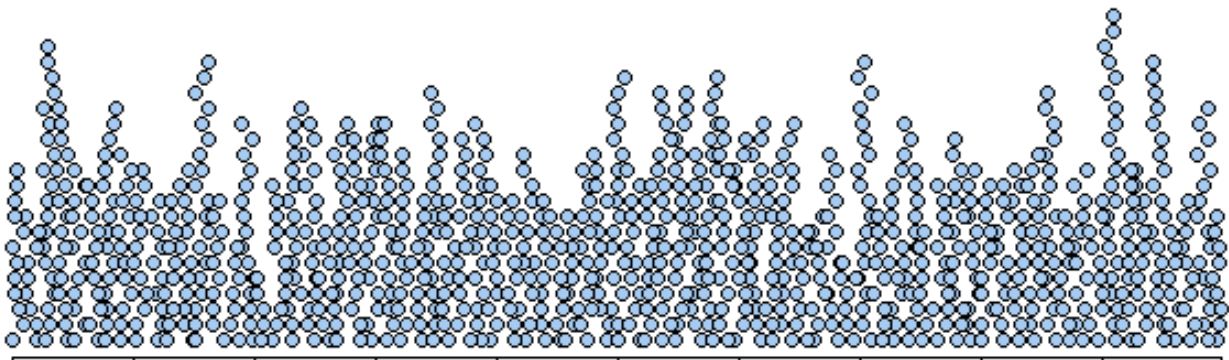
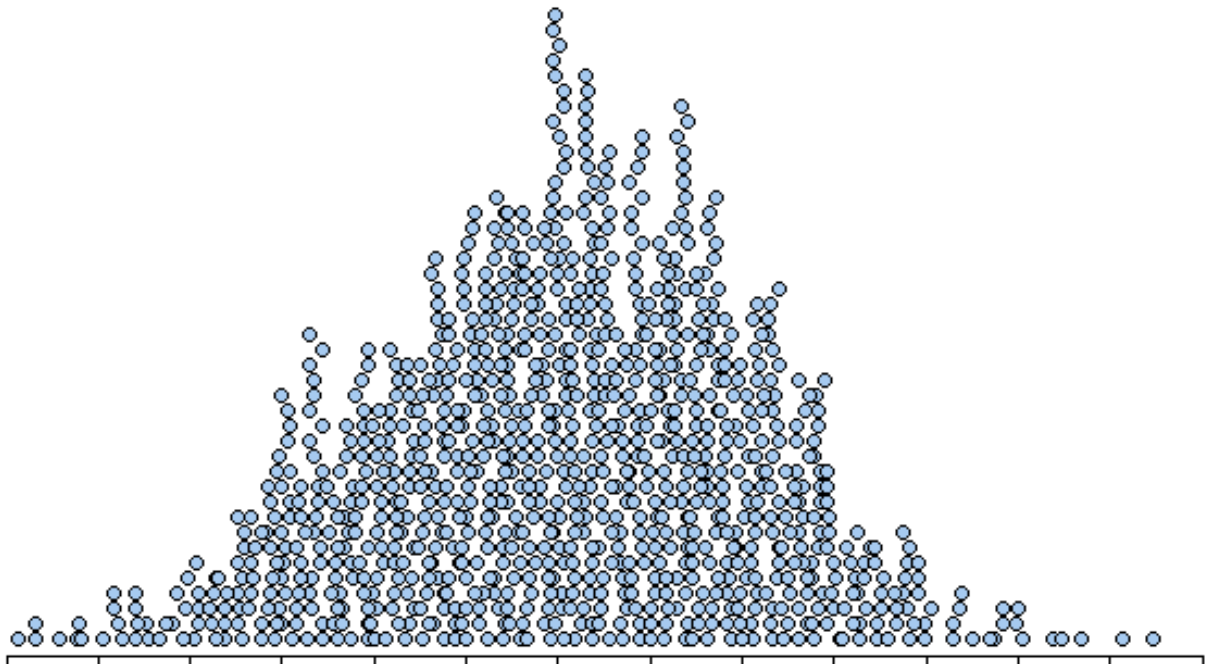**Set 2: Common Distribution 1**

Set 2: Common Distribution 2

Set 2: Common Distribution 3

Set 2: Common Distribution 4

Set 2: Common Distribution 5