

Authors Identified

In 1787–88 Alexander Hamilton, John Jay, and James Madison anonymously published the famous *Federalist Papers* in an attempt to convince New Yorkers that they should ratify the Constitution. The identity of most of the papers' authors became known, but the authorship of 12 of the papers was contested. Through statistical analysis of the frequencies of various words, we can now conclude that James Madison is *likely* to have been the author of these 12 papers. For many of the disputed papers, the evidence in favor of Madison's authorship is overwhelming to the degree that we can be almost certain of being correct.



2. Calculate the class width.

$$\text{Class width} \approx \frac{(\text{maximum data value}) - (\text{minimum data value})}{\text{number of classes}}$$

Round this result to get a convenient number. (It's usually best to round *up*.) Using a specific number of classes is not too important, and it's usually wise to change the number of classes so that they use convenient values for the class limits.

- Choose the value for the first lower class limit by using either the minimum value or a convenient value below the minimum.
- Using the first lower class limit and the class width, list the other lower class limits. (Add the class width to the first lower class limit to get the second lower class limit. Add the class width to the second lower class limit to get the third lower class limit, and so on.)
- List the lower class limits in a vertical column and then determine and enter the upper class limits.
- Take each individual data value and put a tally mark in the appropriate class. Add the tally marks to find the total frequency for each class.

When constructing a frequency distribution, be sure the classes do not overlap. Each of the original values must belong to exactly one class. Include all classes, even those with a frequency of zero. Try to use the same width for all classes, although it is sometimes impossible to avoid open-ended intervals, such as "65 years or older."

Example 1 IQ Scores of Low Lead Group

Using the IQ scores of the low lead group in Table 2-1, follow the above procedure to construct the frequency distribution shown in Table 2-2. Use five classes.

Solution

Step 1: Select 5 as the number of desired classes.

Step 2: Calculate the class width. Note that we round 18.2 up to 20, which is a much more convenient number.

$$\begin{aligned}\text{Class width} &\approx \frac{(\text{maximum data value}) - (\text{minimum data value})}{\text{number of classes}} \\ &= \frac{141 - 50}{5} = 18.2 \approx 20 \text{ (rounded up to a convenient number)}\end{aligned}$$

Step 3: The minimum data value is 50 and it is a convenient starting point, so use 50 as the first lower class limit. (If the minimum value had been 52 or 53, we would have rounded down to the more convenient starting point of 50.)

Step 4: Add the class width of 20 to 50 to get the second lower class limit of 70. Continue to add the class width of 20 until we have five lower class limits. The lower class limits are therefore 50, 70, 90, 110, and 130.

Step 5: List the lower class limits vertically as shown in the margin. From this list, we identify the corresponding upper class limits as 69, 89, 109, 129, and 149.

Step 6: Enter a tally mark for each data value in the appropriate class. Then add the tally marks to find the frequencies shown in Table 2-2.

50—
70—
90—
110—
130—