

**EX:** A company manufacturing inexpensive analog function generators measures the frequency they produce when set to 1 kHz. They measure the following values in Hz:

$$f_1 = 998 \quad f_2 = 997 \quad f_3 = 1003 \quad f_4 = 1001 \quad f_5 = 999 \quad f_6 = 1001$$

$$f_7 = 998 \quad f_8 = 1002 \quad f_9 = 1000 \quad f_{10} = 1001 \quad f_{11} = 1000$$

Make a box and whisker plot of the data.

**SOL'N:** The box-and-whisker plot shows the following information:

- 1) A box whose left edge is the lower quartile (25th %-tile) and whose right edge is the upper quartile (75th %-tile),
- 2) A vertical line through the box at the median, and
- 3) A line from the left edge of the box to the minimum data value, and a line from the right edge of the box to the maximum data value.

We start by sorting the data values from lowest to highest and assigning an index to them for reference purposes:

$$997, 998, 998, 999, 1000, 1000, 1001, 1001, 1001, 1002, 1003$$

$$i = 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \quad 9 \quad 10 \quad 11$$

The median value, or the value in the middle of the list, is the 6th value: 1000. The lower quartile is the lowest  $11/4$  of the points. This is larger than 2 but less than 3, or part way through the 3rd data point. Thus, the lower quartile will be at 998. Similarly, the upper quartile is the upper  $11/4$  of the points. This falls at  $11 - 11/4$ . This is larger than 8 but less than 9, or part way through the 9th data point. Thus, the upper quartile will be at 1001. These are the values we need to make the plot:

