Activity 6: Finger-Snapping Time

PURPOSE Display and compare data using box-and-whisker plots.

MATERIALS Scissors, three strips of one-centimeter graph paper (page A-49), and a clock or watch to measure elapsed time in seconds

GROUPING Work in pairs.

GETTING STARTED Snap your fingers as fast as you can for 15 seconds. Have your partner time you while you snap your fingers and count the number of snaps. Then do the same thing for your partner. Record the data in the table below.

Ask 13 other people how many times they snapped their fingers in 15 seconds and record the information in the table.

Finger Snaps I

Person	Finger Snaps in 15 sec	Person	Finger Snaps in 15 sec	Person	Finger Snaps in 15 sec
You		4		9	
Partner		5		10	
1		6		11	
2		7		12	
3		8		13	

Box-and-whisker plots provide a useful method for summarizing and comparing data such as the number of times people can snap their fingers.

- **Step 1 in constructing a box-and-whisker plot is to order the data values from least to greatest.**

1. Write the finger-snapping data in order from least to greatest on a strip of graph paper. Write one number in each square. Do not leave any blank squares between numbers. Cut off the unused squares on the end of the strip.

Example:

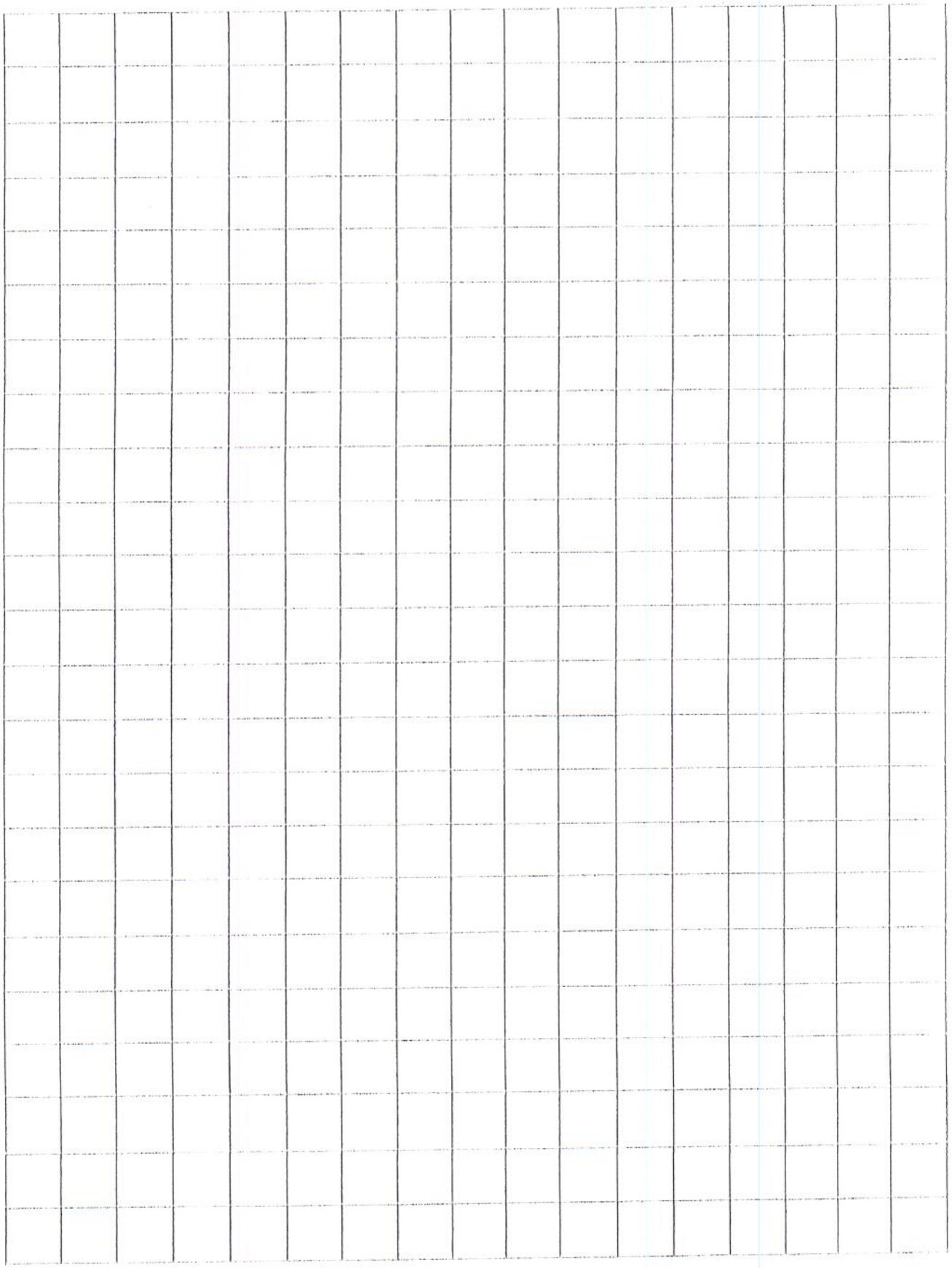
20	35	37	39	41	45	45	47	59

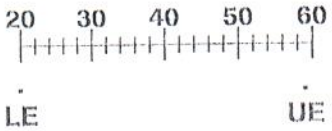
LE = 20; UE = 59

- **Step 2—find the extremes of the data.** The smallest data point is called the *lower extreme* (LE), and the largest data point is called the *upper extreme* (UE).

2. Find and record the lower extreme and the upper extreme of the finger-snapping data.

LE = _____ UE = _____

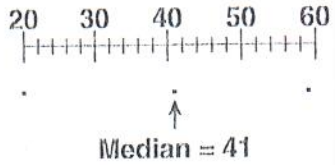




3. Use the extremes to select an appropriate scale and label the number line below.

4. Locate the lower and upper extremes by marking a dot under their coordinates on the scale, as in the example.

- **Step 3—find the median of the data.**



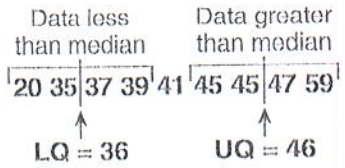
5. To find the median of the finger-snapping data, fold the strip in half by folding the ends together. The median is the number the fold passes through or, if the fold falls on the line between two numbers, the median is the mean of these two numbers.

6. Record the median and mark its location by making a dot under its coordinate on the scale.

   Median = _____

- **Step 4—find the quartiles for the data.**

The *lower quartile* (LQ) is the median of the data values that are less than the median.



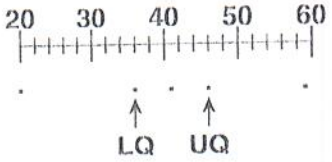
7. Look at the part of the strip that contains data values that are less than the median. Find the median of these values by folding this part of the strip in half. This is the lower quartile of the data.

   Lower Quartile = _____

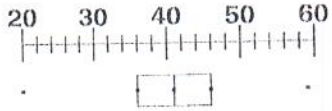
The *upper quartile* (UQ) is the median of the data values that are greater than the median of the data.

8. Look at the part of the strip that contains data values that are greater than the median. Find the median of these values by folding this part of the strip in half. This is the upper quartile of the data.

   Upper Quartile = _____



9. Mark the locations of the upper and lower quartiles by making a dot for each below its coordinate on the scale.



10. Form a box by drawing vertical segments through the dots for the upper and lower quartiles and connecting the endpoints of the segments, as in the example. Then draw a vertical segment through the median as shown.

- **The final step is to identify and plot any outliers in the data.**

IQR = 46 − 36 = 10

11. Find the difference between the upper and lower quartiles. This difference is known as the *interquartile range* (IQR).

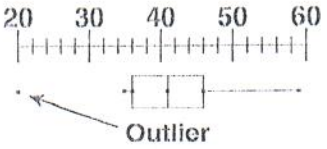
    Interquartile Range = UQ − LQ = _____

If a data point is more than 1.5 interquartile ranges greater than the upper quartile or more than 1.5 interquartile ranges less than the lower quartile, it is called an *outlier*.

In the example, LQ − 1.5 × IQR = 36 − 1.5 × 10 = 36 − 15 = 21.

Thus 20 is an outlier, since 20 < LQ − 1.5 × IQR.

12. Identify any outliers in your data. Mark their locations by making a dot for each one below its coordinate on the scale.



13. Complete the plot by drawing segments from the least data point that is not an outlier to the lower quartile and from the upper quartile to the greatest data point that is not an outlier. These segments are the whiskers.

14. Study the completed box-and-whisker plot. About what percent of the data points lie between the

    a. lower extreme and the lower quartile?

    b. upper extreme and the upper quartile?

    c. lower quartile and the median?

    d. median and the upper quartile?

15. About what percent of the data points lie in the box?

16. Repeat the finger-snapping experiment, only this time snap your fingers as fast as you can for 30 seconds. Divide the number of snaps by 2 to get your rate per 15 seconds Record your rate, your partner's rate, and the rates for 13 other people in the table below.

Finger Snaps II

Person	Sex	Finger Snaps per 15 sec	Person	Sex	Finger Snaps per 15 sec	Person	Sex	Finger Snaps per 15 sec
You			4			9		
Partner			5			10		
1			6			11		
2			7			12		
3			8			13		

17. a. Construct a box-and-whisker plot for the data in the table Finger Snaps II.

b. In the space below the plot constructed in 17a, re-construct a box-and-whisker plot using the data for Finger Snaps I, page 174, and the scale in 17a.

18. a. How do the medians of the two sets of data compare?

b. The extremes?

c. The interquartile ranges?

d. The upper quartiles?

e. The lower quartiles?

19. Based on your observations in Exercise 18, how do the finger-snapping rates in the first experiment compare to the rates in the second experiment? How would you explain any similarities or differences?

EXTENSIONS

1. a. Separate the data in the Finger Snaps II table into rates for males and rates for females. Construct box-and-whisker plots for the male and female rates using the same scale for both.

b. Based on your graphs, do you think there is any difference between the finger-snapping rates for males and for females? Explain your answers.

2. a. Construct a stem-and-leaf plot for the data for Finger Snaps I.

b. What can you learn about the distribution of the data (gaps, clusters, extremes, outliers, etc.) and the averages **from both** the box-and-whisker plot and the stem-and-leaf plot of the data?

c. What information can you get about the distribution of the data and the averages from a box-and-whisker plot **but not from** a stem-and-leaf plot?

d. What information can you get about the distribution of the data and the averages from a stem-and-leaf plot **but not from** a box-and-whisker plot?