# Activity 8: Are Women Catching Up?

PURPOSE Display and analyze data using line graphs, scatter plots, and median fit lines. Make conjectures based on data and defend the conjectures.

GROUPING Work individually or in pairs.

GETTING STARTED In 1992, researchers at the University of California, Los Angeles, School of Medicine published an analysis of data indicating that within 65 years, top female and male runners might perform equally well in the 200-m, 400-m, 800-m, and 1500-m runs. Other researchers disputed the claim. What do you think? Let's look at some of the data.
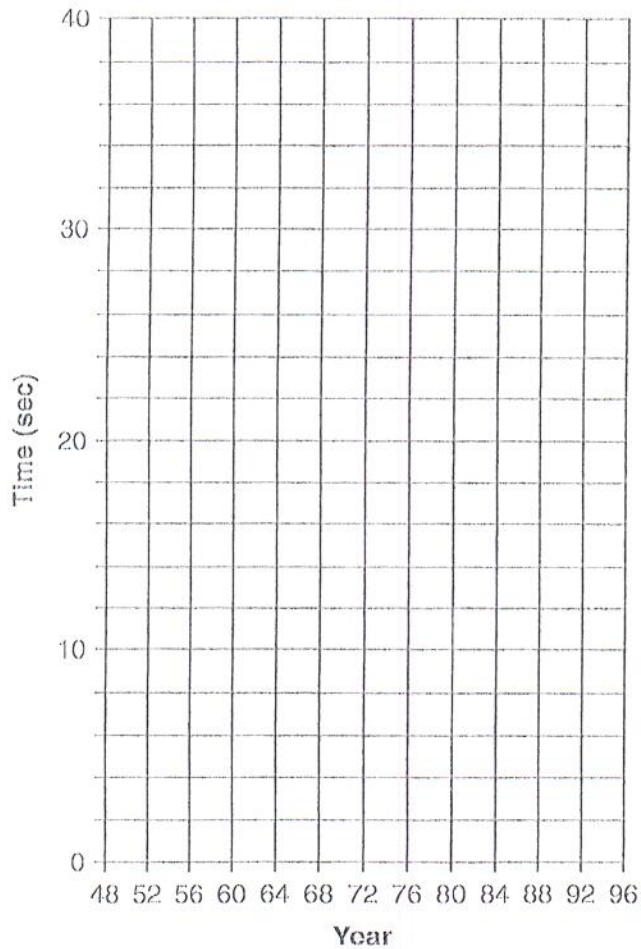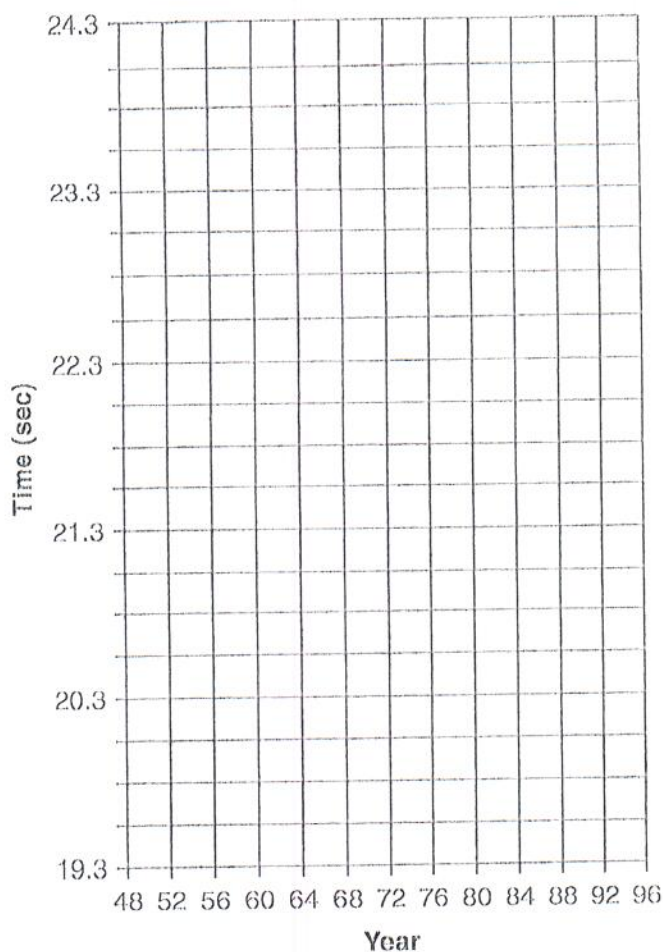
Olympic Track Records: 200-m Run

Year	Men's Time (sec)	Women's Time (sec)
1948	21.1	24.4
1952	20.7	23.7
1956	20.6	23.4
1960	20.5	24.0
1964	20.3	23.0
1968	19.83	22.5
1972	20.00	22.40
1976	20.23	22.37
1980	20.19	22.03
1984	19.80	21.81
1988	19.75	21.34
1992	20.01	21.81
1996	19.32	22.12

SOURCE: The New York Times ALMANAC 1999.

1. Draw line graphs for the men's and the women's record times for the 200-m run on the grid at the left.

2. Based on the graphs, do you agree with the conclusion of the UCLA researchers about the men's and women's record times for the 200-m run? Why or why not?

Time (sec) (vertical axis)

24.3

23.3

22.3

21.3

20.3

19.3

48 52 56 60 64 68 72 76 80 84 88 92 96

Year

3. Redraw the line graphs for the men's and the women's record times for the 200-m run on the grid at the left.

4. Based on these graphs, what might you conclude about the men's and women's record times for the 200-m run? Why?

5. Is your conclusion in Exercise 4 the same as that in Exercise 2? Explain.

6. Both pairs of graphs present the same data on the same-sized grid. Why do they look so different?

When data appear to lie roughly along a straight line, it is often possible to fit a line to the data and use the line to make predictions. The following exercises develop one technique for doing this. *Note:* You must always be cautious about fitting a line to data, because the data may actually fall near a curve or be clustered in two or more regions.

7. The grid on page 184 contains a scatter plot of the women's record times for the 200-m run. Draw two vertical lines that divide the data into three groups with approximately the same number of data points in each group. If the data cannot be divided evenly, the two outer groups should contain the same number of data points.

8. The group on the left contains four data points: (1948, 24.4), (1952, 23.7), (1956, 23.4), and (1960, 24.0). The median of the years is 1954, and the median of the times is 23.85 sec. Use a plus symbol (+) to mark the point (54, 23.85) on the grid.

9. Find the median of the years and the median of the times for the data points in each of the other two groups, as in Exercise 8. Use a plus symbol (+) to mark the corresponding points on the grid.

10. Place a ruler so that it passes through the two plus marks (+) in the outside groups. Then, keeping the ruler parallel to the line through the two outer plus marks (+), slide it one-third of the way to the middle symbol (+) and draw a line. This is the *median fit line* for the data.

11. Make a scatter plot for the men's times on the grid. Repeat Exercises 7--10 to construct the median fit line for this data.
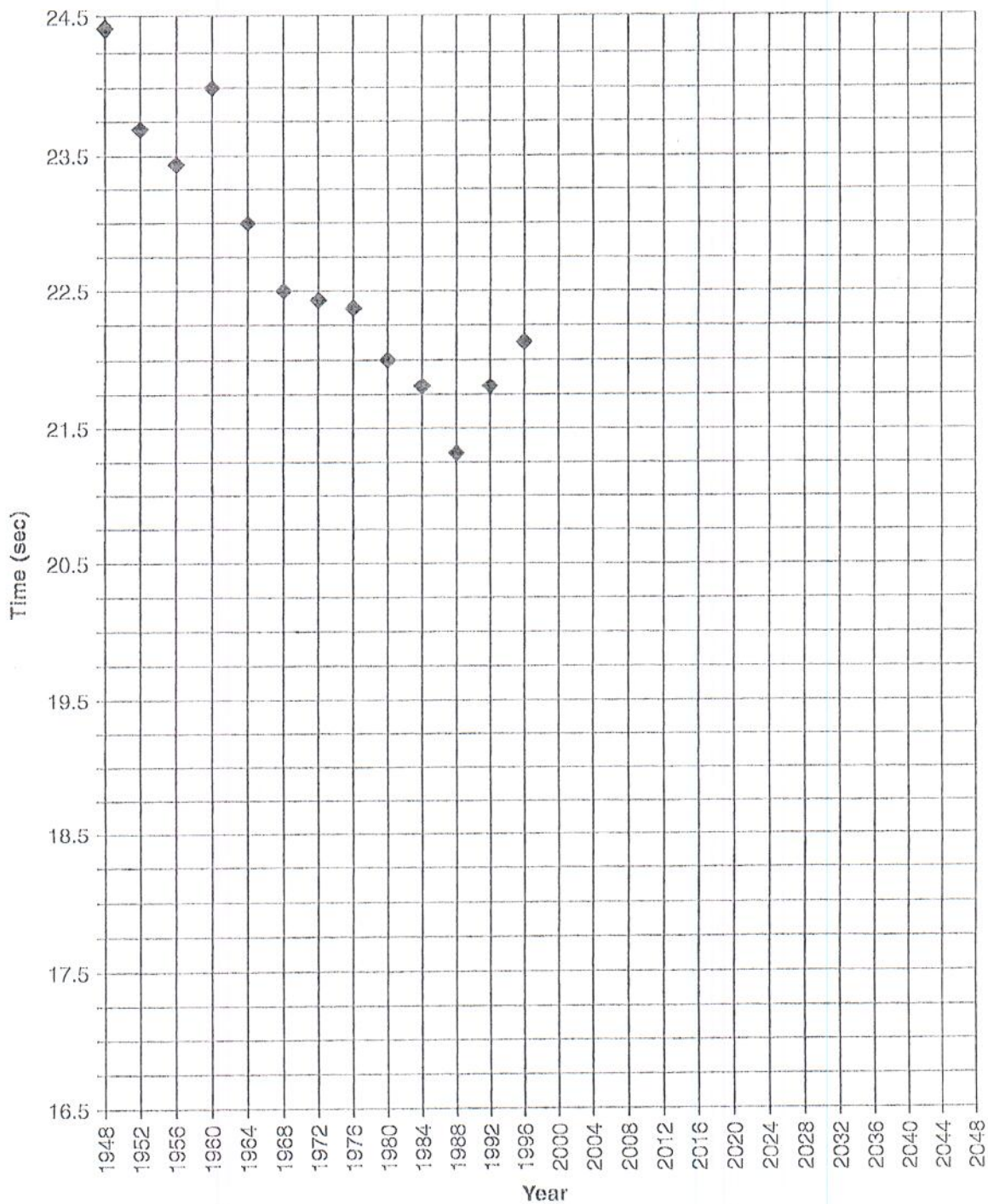
12. a. Use the median fit lines to predict the year when women will have the same time in the 200-m run as men.

   b. How does your prediction in Part a compare with that made by the University of California researchers?

   c. Approximately what will be the record for the 200-m run when men's and women's times are equal?

13. Why are women's times for the 200-m run decreasing at a faster rate than men's times? Explain.

14. Prepare an argument that supports the prediction that in the future, women's times for the 200-m run will equal men's times.

15. Prepare an argument to support the position that women's times for the 200-m run will never equal men's times?

EXTENSIONS   Find the men's and women's winning times for the Boston Marathon over the last 20 years.

1. Use line graphs to construct two displays of the data, one that could be used to argue that in the future women's times for the marathon will be equal to the men's, and one that could be used to argue that they will not.

2. Construct scatter plots of the data. Find the median fit lines for both sets of data. Use the lines to predict the year that the women's time for the Boston Marathon will equal the men's.

3. Compare the data using box-and-whisker plots. Explain how the two different visual presentations of the data can lead to different conclusions.