Olympics

The first Olympic Games of modern times were held in Athens, Greece, in 1896. They have been held every four years since, with three exceptions—they were not held in 1916, 1940, or 1944 because of World Wars I and II.

In this activity, you'll explore the track-and-field gold-medal results from the Summer Olympic Games, 1896 to 2004. The data you'll use have the winning times or distances for several of the events that both men and women compete in.

MAKE A CONJECTURE

You probably already have some ideas about what the data look like. Think about what you expect to see.

Q1 In how many seconds do you think a male athlete can run the 100-meter dash?

Q2 From 1896 to 2004, do you think men's gold-medal times for the 100-meter dash have gotten longer, gotten shorter, or stayed the same? Explain your thinking.

Q3 How do you think the Olympic results for the 100-meter dash compare to the results for the 200-meter dash? Explain your thinking.

Q4 How do you think the men's results compare to the women's results for the 100-meter dash? If you think one gender's results are better, how much better do you think they are?

Q5 If there is a difference between men's and women's times for the 100-meter dash, do you think the difference has changed over time? Have the times gotten closer together, gotten farther apart, or stayed the same?

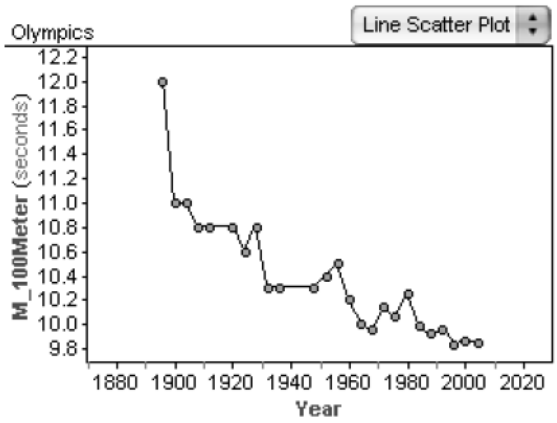
INVESTIGATE

Now you'll use Fathom to look at the Olympic data. You'll make several graphs and look for patterns and relationships. Keep questions Q1–Q5 in mind because you're going to see whether your predictions were correct.

1. Open the document **Olympics.ftm.** You'll see only a collection.
2. Use the collection inspector or a case table to look at the data. Be sure that you understand what each case and each attribute represent. You'll notice that some events (especially women's events) do not have values for every year. That's because more and more events have been added over time—not every event was held in 1896.

Question Q2 asked about changes in the men's gold-medal times for the 100-meter dash. You'll look at that event first.

3. Make a scatter plot of *M_100Meter* versus *Year*. Change the graph to a line scatter plot, which connects the points in order by year.



Q6 Based on your graph, have the times for the men's 100-meter dash gotten longer, gotten shorter, or stayed the same? Explain how you know.

Q7 Between which two years was there the greatest improvement? From the graph, how can you distinguish improvement from setback?

Q8 Are there any years for which the gold-medal result was unusual? If so, tell which years and explain why you picked those points.

4. Add a line of fit to your graph. You can use a movable line, median-median line, or least-squares line, whichever you think fits the best.

Q9 What is the meaning (if any) of your line's slope? What is the meaning (if any) of its *y*-intercept?

Q10 Use your line to predict the men's gold-medal time for the 100-meter dash in the next Olympics.

Question Q3 compared the results for the 100-meter dash and the 200-meter dash. Next you'll look at those two events.

5. Make a single scatter plot that compares the results for the 100-meter dash and the 200-meter dash over time. You can use either men or women, but use the same gender for both events.

Q11 Does your scatter plot support your prediction from Q3? If so, explain how. If not, describe the comparison that the graph does show. (*Hint:* You might want to adjust the graph's axes.)

Questions Q4 and Q5 compared the results for the men's 100-meter dash and the women's 100-meter dash. Now you'll look at those two events together.

6. Make a single scatter plot that compares the results for the men's 100-meter dash and the women's 100-meter dash over time. Look for patterns that help you understand how the data compare and change.

7. Add lines of fit to approximate the trends of each data set. Use median-median lines or least-squares lines because they'll give you a line for men and a line for women. Notice and interpret the slope and *y*-intercept of each line.

Q12 In general, how do the men's results compare to the women's results for the 100-meter dash? Are one gender's results better than the other's? If so, how much better?

Q13 The graphs definitely show a difference between the genders. Is this difference changing over time? Explain.

Q14 Based on your lines, will one gender ever "catch up" to the other gender? If so, when? How confident are you about this prediction?

EXPLORE MORE

1. In question Q8, you identified unusual results in the men's 100-meter dash. You probably did this by finding points that were very far from the general pattern of the data. When you add a line of fit, the line represents the general pattern of the data. You can then use *residuals* to measure how far each point is from the line.

   Go back to your graph of *M_100Meter* versus *Year* and make sure you have a line of fit. Select the graph and choose **Make Residual Plot** from the **Graph** menu. Spend some time understanding what the residual plot shows you. How can you recognize points that are unusual for the pattern? How do you recognize points that fit the pattern almost perfectly? Really unusual points are sometimes called *outliers*. Try deleting one or two outlier cases from your collection and see whether the line of fit changes. After you've seen the effect of deleting the outliers, choose **Undo** from the **Edit** menu to bring back the cases.

2. Are there events for which there is no noticeable difference between the genders? Are there events for which the difference between the genders doesn't seem to be changing? Compare the data for other events and describe your findings.