Assignment 3: Graphing

Background:
*Note: This background material will need to be taken into account as you analyze the data for this assignment. Read it carefully!*

The Boston Marathon is the world's oldest annual marathon, having been run since 1897, soon after the first Olympic marathon in 1896. In the early years, the length of the Boston Marathon was 24.5 miles.

In the first few Olympic games, the marathon distance of 24.8 miles was based on the distance run, according to famous Greek legend, in which the Greek foot-soldier Pheidippides was sent from the plains of Marathon to Athens with the news of the astounding victory over a superior Persian army. Exhausted as he approached the leaders of the City of Athens, he staggered and gasped, "Rejoice! We Conquer!" and then collapsed.

The marathon distance was later changed as a result of the 1908 Olympic Games in London. That year, King Edward VII and Queen Alexandria wanted the marathon race to begin at Windsor Castle outside the city so that the Royal family could view the start. The distance between the castle and the Olympic Stadium in London proved to be 26 miles. Organizers added extra yards to the finish around a track, 385 to be exact, so the runners would finish in front of the king and queen's royal box. Every Olympic marathon run since the 1908 Games has been a distance of 26 miles, 385 yards.

It was not until 1927 that the Boston Marathon course was lengthened from 24.5 miles to 26.2 miles.

Assignment:
Analyze the finishing times of the Boston Marathon to figure out if athletes of today are getting faster. If they are, what is the rate of change? Are the runners getting faster more or less quickly now than they did in the past? Are women improving more or less quickly than men?
What to Do:
1. Make a new spreadsheet, and format the cells in the first 4 columns as text. This will allow the data to paste correctly.

2. Open a web browser and go to http://www.bostonmarathon.org
   Under the Boston Marathon menu, go to History, and choose "Past Champions" from the menu on the right.

   Copy the data for the Men's Open champions to your spreadsheet, pasting it into the columns that you formatted as text. You can then remove the columns showing the name and home of each athlete.

3. Convert each winning time to a number that Excel can perform arithmetic on. A time like 2:55:10 would be 175 minutes and 10 seconds, or 175.17 minutes.

   Hint: use LEFT and MID to extract the numbers from the time, along with some arithmetic to do the calculation. If you make your calculation in a column that is formatted as number, then Excel will convert from text to number automatically, otherwise you might have to use the N function.

4. Now, for each year, calculate the speed at which the winner ran. This should be in minutes per mile. Read the background information to find out how many miles the marathon was in different years.

5. Using the same spreadsheet, repeat steps 1-4, copying and pasting the data for the Women's Open champions. Remember to format the columns for text before pasting, or the time will not be viewed as text! Also, note that women began running the Boston Marathon in 1966 – be sure to past the data so that the years line up.

   Convert the women's times to minutes and calculate the rate of speed in minutes per mile, just as you did for the men's times.

   You can remove the columns showing the name and home of the women runners, and the second column showing the year once you are sure they are aligned properly.
6. Make a line graph showing the men’s running speed and women's running speed (minutes per mile) over the 110-year history of the Boston Marathon. Both lines should be on the same graph.

Label the chart and both axes. A legend should indicate which line is for the Men's Open Champions and which is for the Women's Open Champions.

7. Examine the graph. Although they might show a trend, the lines are not smooth. What factors might cause the winner in one year to slower than the winner from the previous year? Faster?

Compare the two lines. Overall, who runs faster, men or women? Who improved more quickly in the '60s and '70s? Who has improved more quickly in the last 20 years?

Bonus question 1: if the 2008 Men's Open champion ran from the start of the Boston Marathon to Lab School in Chicago, how long would it take him? Assume he runs along roads and streets and doesn't stop at all. Give your answer in days and hours.

How far behind him would the 2008 Women's Open champion be when he finished? Give your answer in miles.

What application(s) did you use in figuring this out?

Bonus question 2: on your line graph, plot a trendline for the men's race. (Click on the line to select it, and choose "Add Trendline..." from the Chart menu.) Experiment with different types of trendlines: linear, logarithmic, polynomial, power, etc. What type seems to fit the data best.

Does the trendline approach an asymptote? Does it appear that there might be a limit to how fast a man can run a marathon? If so, what is the pace (minutes per mile) of that limit? How fast would the marathon time be?