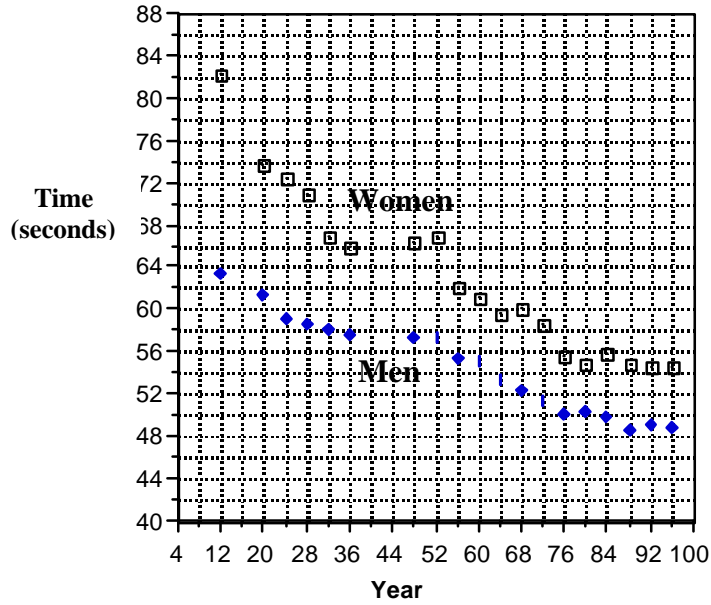


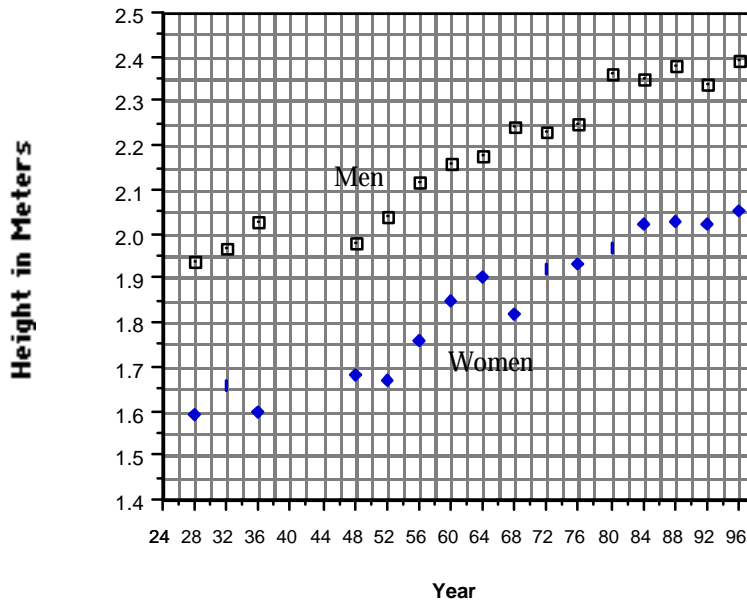
Activity 1: Will Women Athletes Ever Catch and Surpass Their Male Counterparts?

The following graphs are the simultaneous plots of the Olympic records for men and women in the same event over the same years.

Olympic 100-Meter Freestyle Men and Women



Olympic High Jump Men and Women



1. Explain why the plots for the 100-meter freestyle decrease while the plots in the high jump graph increase.

Solution: In both cases the athletes are improving. Improvement in the high jump requires jumping higher. Therefore, the graph displaying succeeding years will be increasing with a higher height each year. To improve in the swimming event, one must swim faster, which means decreasing the amount of time. Thus, the graph displaying the succeeding years will be decreasing.

2. Judging from the graph, does it appear that the women will ever jump as high as the men jump in the same year? Explain.

Solution: It does not appear that the women will ever jump as high as the men jump in the same year because the distance between the graphs seems to remain constant.

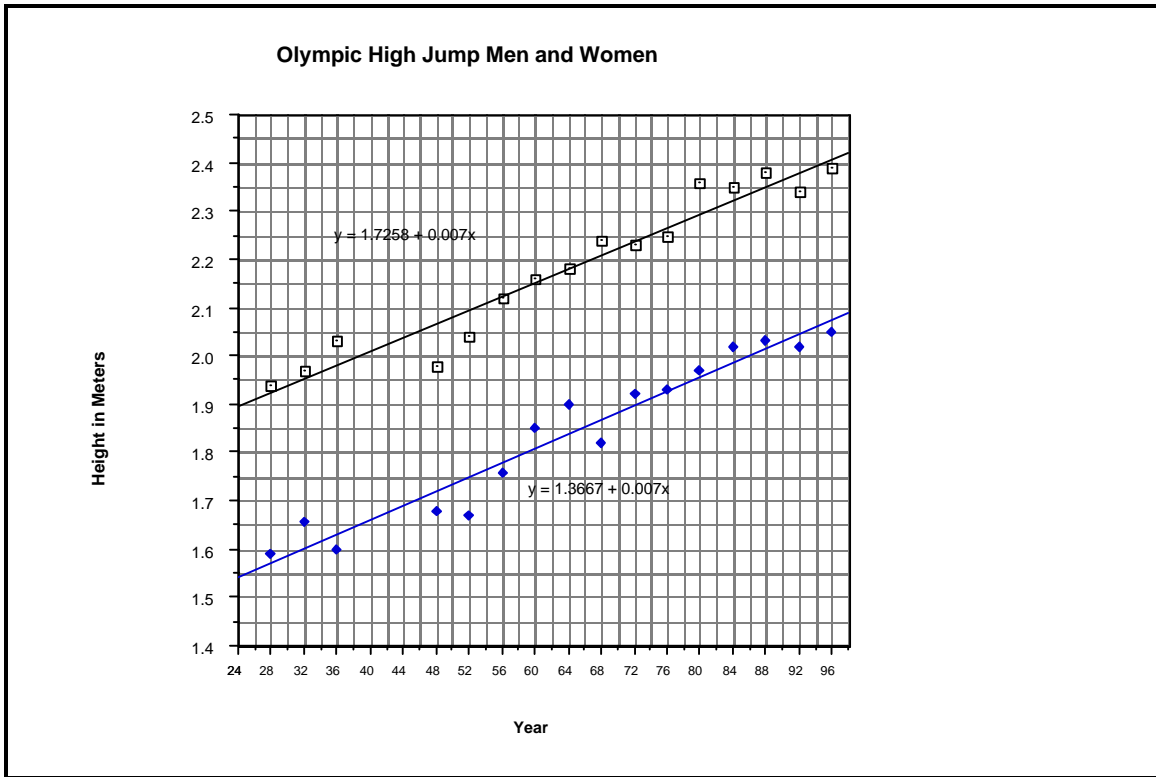
3. Judging from the graph, does it appear the women and men will ever swim the 100-meter freestyle in the same record time in the same year?

Solution: The distance between the two graphs appears to be getting smaller as the years increase. If conditions remain the same, it appears that the women will eventually swim the 100-meter freestyle in the same record time in the same year as the men in some future year.

4. Draw straight lines on the high jump scatter plots, find their equations, and use that information to support your arguments from problem 2.

Solution: Answers will vary according to student lines.

Sample: From the graph and equation of the regression lines, you can see that the lines are nearly parallel. So both rates of change are about 0.007. Assuming the straight line to be the model and that things remain constant, i.e. both continue to progress at the same rates, the lines will never intersect and the women will never jump the same height as the men in the same year. There is a strong possibility that the model for this data would be another function.

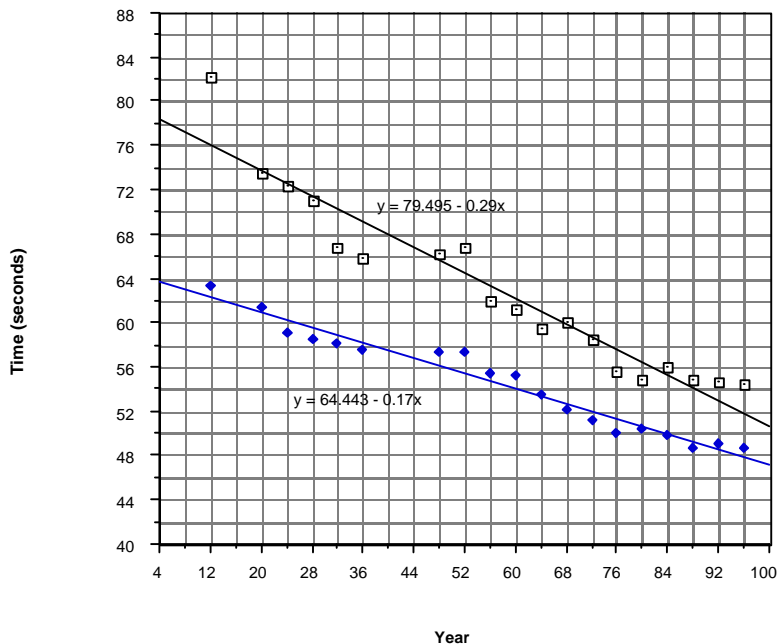


5. Draw straight lines on the freestyle scatter plots, find their equations, and use that information to support your arguments from problem 3.

Solution: Answers will vary according to the student lines.

Sample: From the graph and equation of the linear regression lines, the rate of change for the men is approximately (-0.17) and for the women is approximately (-0.29) . So the women's record times are decreasing faster than the men's are. Assuming the straight line to be the model and all things remain constant, i.e. the rate of change or *slope* remains the same, it is reasonable to conclude that the women will overtake the and even surpass the men's record time in the 100-meter freestyle.

Olympic 100-Meter Freestyle Men and Women



6. Use the equations of the lines created in problem 5 to determine the year when the women will swim the 100-meter freestyle in the same time as the men. What is that predicted time?

Solution: Answers will vary according to student lines.

Sample: The regression line for the men is $y = 64.4 - 0.17x$.

The regression line for the women is $y = 79.5 - 0.29x$.

Equating the two yields: $64.4 - 0.17x = 79.5 - 0.29x$

$$15.1 = 0.12x$$

$$125.8 = x$$

Substituting $y = 64.4 - 0.17(125.8) = 43.02$ seconds

Answer: In the month of October in the year 2025, the women will swim the 100-meter freestyle as fast as the men and the record will be about 43.02 seconds.

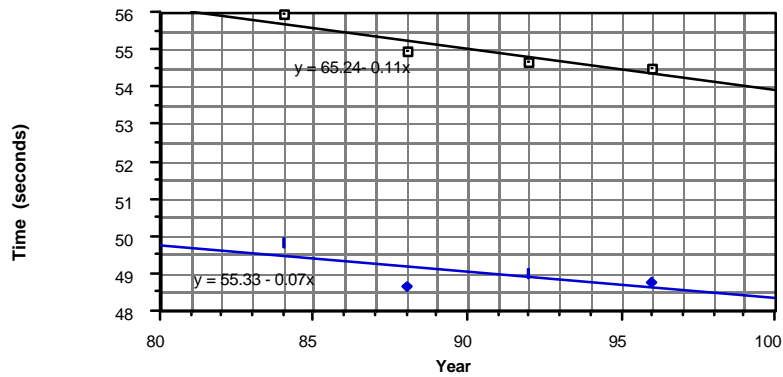
7. Do you think that the solution to problem 5 is a possible achievement? Explain your reasoning.

Solution: Answers will vary.

Sample solution. There is a likely limit to the amount of strength and endurance of the human. This can be noticed as you look at the differences in last four record times for each sex. Whether or not that limit is different for the sexes is not known. The mathematics does not take these factors into account, and it is hard to determine them.

Consider the last four years only. If you accept that the model is the straight line, the plot shows that the rates of change (-0.07) and (-0.11) are much closer than the original rates. This could imply that each sex is approaching its physical limitations and each graph is approaching an asymptote. This information would lead to a strong suspicion that the straight line model is incorrect

Olympic Record times in 100-freestyle for Years 1984 -1996



Upper level suggested solution:

Data from "100 free data"

