Annual Salaries and Gender

According to a recent *New York Times* article, more than thirty percent of American adults hold bachelor’s degrees. In the early 1980s, women first started to outnumber men in college enrollment. Since the mid-1990s, women have earned more bachelor degrees than men. Does this mean that annual salaries have followed suit? In this task, you’ll apply what you’ve learned in this unit to answer this question.

Directions

Complete each of the following tasks, reading the directions carefully as you go. Be sure to show all work where indicated, including inserting images of graphs. Be sure that all graphs or screenshots include appropriate information such as titles, labeled axes, etc. If your word processing program has an equation editor, you can insert your equations here. Otherwise, print this activity sheet and write your answers by hand.

In addition to the answers you arrive at, you will be graded based on the work you show, or your solution process. So, be sure to show all of your work and answer each question as you complete the task. Type all of your work into this document so you can submit it to your teacher for a grade. You will be given partial credit based on the work you show and the completeness and accuracy of your explanations.

Your teacher will give you further directions as to how you are to submit your work. You may be asked to upload the document, e-mail it to your teacher, or hand in a hard copy.

Now let’s get started!

Step 1: Finding regression equations for the relationship between time and degrees earned.

Below is a table depicting the number of US citizens, in thousands, who earned a bachelor degree for each year since 2000.

<table>
<thead>
<tr>
<th>Year</th>
<th>00</th>
<th>01</th>
<th>02</th>
<th>03</th>
<th>04</th>
<th>05</th>
<th>06</th>
<th>07</th>
<th>08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>530</td>
<td>532</td>
<td>550</td>
<td>573</td>
<td>595</td>
<td>613</td>
<td>631</td>
<td>668</td>
<td>681</td>
</tr>
<tr>
<td>Female</td>
<td>708</td>
<td>712</td>
<td>742</td>
<td>775</td>
<td>804</td>
<td>826</td>
<td>855</td>
<td>895</td>
<td>918</td>
</tr>
</tbody>
</table>

a. Use the regression calculator or another tool of your choice to create a scatter plot of the data for men, where the independent variable is the year since 2000 and the dependent variable is the number of people (in thousands). Take a screenshot of your scatterplot and paste it below. If your graph does not include labels, then include a description of what the axes represent.
b. Use your calculator to find the regression line  \( y = mx + b \) for men where \( x \) is the number of years since 2000 and \( y \) is the number of men. Complete the regression equation below.

\[ M(x) = \]

c. Repeat the above steps with the data for women.

Insert a screenshot of the scatterplot for women below.

Complete the regression equation below.

\[ F(x) = \]

**Step 2: Interpreting the regression equations for the relationship between time and degrees earned.**

a. Often, social changes, such as education trends, show linear relationships. How well does a linear model fit the data in this problem? Justify your answer in terms of the scatterplots and in terms of the data that the regression calculator gives.

b. Using proper units, state the slopes for the functions \( M \) and \( F \).

Slope of \( M \):
Slope of $F$:

c. Explain what these slopes represent in terms of Americans earning bachelor degrees.

Step 3: Solving a system of equations to make comparisons between men and women earning degrees.

a. The functions $M$ and $F$ form a system of linear equations. Use your graphing calculator to find the solutions to this system graphically. Insert a screenshot of your graph below.

b. The solution of the system is:

c. Solve the system again using any algebraic method, such as substitution or elimination. Show your work step-by-step with clear notation. Make sure your answer matches the answer you found in the previous problem.

d. Interpret the solution to the system in terms of Americans earning bachelor degrees. Recall the opening paragraph: “In the early 1980s, women first started to outnumber men in college enrollment. Since the mid-1990s, women have earned more bachelor degrees than men.” State whether or not you think your results from Steps 3a-3c support the opening paragraph. Justify your reasoning. If the results do not support it, explain why this might be.

Step 4: Extrapolating to predict the number of degrees earned by men and women.

a. Use the models for $M$ and $F$ to predict the number of degrees that will be earned by men and women in the year 2015.

   The number of degrees earned by men =
   The number of degrees earned by women =

Step 5: Using data from a specific town to write equations and draw conclusions about degrees earned.

In Springfield, a specific town in the US, 6 women and 25 men earned bachelor degrees in 2000. In 2010, however, 391 women and 410 men in that town earned bachelor degrees. Assume that the rate of change was constant between 2000 and 2010.
a. Without using regression, write a system of equations that model the number of bachelor degrees earned by men and women in Springfield as a function of $x$, the number of years since 2000. Show your work.

Equation for Springfield's men:

Equation for Springfield's women:

b. When, if ever, will the number of women earning bachelor degrees equal the number of men earning bachelor degrees in Springfield? Justify your answer using appropriate mathematics vocabulary.

Step 6: Analyzing trends between degrees earned and salaries.

The table below shows the median annual salaries in the United States by gender. Use the skills from this lesson to correlate trends in the US from 2000 to 2010 in the number of people who received a bachelor degree to annual salaries by gender.

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
<th>Percentage women to men</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>$34,944</td>
<td>$26,572</td>
<td>$31,616</td>
<td>77.9%</td>
</tr>
<tr>
<td>02</td>
<td>$35,308</td>
<td>$27,508</td>
<td>$32,240</td>
<td>79.4%</td>
</tr>
<tr>
<td>03</td>
<td>$36,140</td>
<td>$28,704</td>
<td>$32,876</td>
<td>80.4%</td>
</tr>
<tr>
<td>04</td>
<td>$37,076</td>
<td>$29,796</td>
<td>$33,176</td>
<td>80.7%</td>
</tr>
<tr>
<td>05</td>
<td>$37,544</td>
<td>$30,420</td>
<td>$33,652</td>
<td>81.0%</td>
</tr>
<tr>
<td>06</td>
<td>$38,636</td>
<td>$31,200</td>
<td>$34,336</td>
<td>80.8%</td>
</tr>
<tr>
<td>07</td>
<td>$39,832</td>
<td>$31,928</td>
<td>$36,140</td>
<td>80.2%</td>
</tr>
<tr>
<td>08</td>
<td>$41,496</td>
<td>$33,176</td>
<td>$35,544</td>
<td>79.9%</td>
</tr>
<tr>
<td>09</td>
<td>$42,588</td>
<td>$34,164</td>
<td>$38,142</td>
<td>80.2%</td>
</tr>
<tr>
<td>10</td>
<td>$42,848</td>
<td>$34,788</td>
<td>$38,544</td>
<td>81.2%</td>
</tr>
</tbody>
</table>

a. Assuming a linear relationship between year and salaries by gender, determine when the median annual salary for women will exceed men. Justify your answer. Include in the discussion the regression analysis you performed.

b. Based on the answer you found in the above step, provide an argument pro or con to the statement “As the number of women exceed men in the number of bachelor degrees received, expect there to be a corresponding change in the median annual salaries for each gender.”
Sources:

http://www.good.is/post/women-now-earning-more-bachelor-s-and-graduate-degrees-than-men/