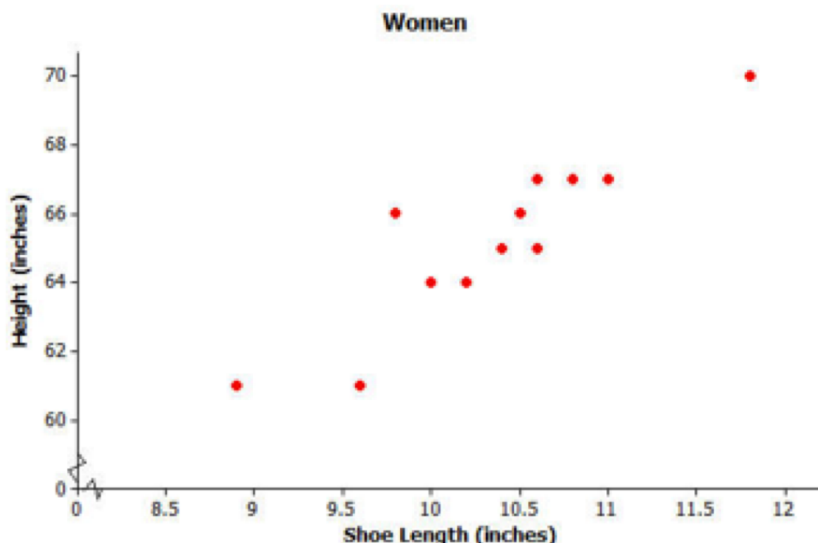


NAME: _____ PERIOD: _____ DATE: _____

Homework Problem Set

Kendra wondered if the relationship between shoe length and height might be different for men and women. To investigate, she also collected data on shoe length (in inches) and height (in inches) for 12 women.

x (Shoe Length of Women)	y (Height of Women)
8.9	61
9.6	61
9.8	66
10.0	64
10.2	64
10.4	65
10.6	65
10.6	67
10.5	66
10.8	67
11.0	67
11.8	70



1. Construct a scatter plot of these data.

2. Is there a relationship between shoe length and height for these 12 women? Explain.

Yes, as shoe length increases, height tends to increase.

The least squares equation of the line for this data is $y = 32.68 + 3.15x$, where x represents the shoe length in inches and y represents the height of women in inches.

3. Suppose that these 12 women are representative of adult women in general. Based on the least squares line, what would you predict for the height of a woman whose shoe length is 10.5 in.?

What would you predict for the height of a woman whose shoe length is 11.5 in.?

$x =$ shoe length
 $y =$ height

Shoe size: 10.5
 $y = 32.68 + 3.15x$
 $y = 32.68 + 3.15(10.5)$
 $y = 65.75 \text{ inches}$

Shoe size: 11.5
 $y = 32.68 + 3.15x$
 $y = 32.68 + 3.15(11.5)$
 $y = 68.905 \text{ inches}$

4. One of the women in the sample had a shoe length of 9.8 in. Based on the regression line, what would you predict for her height?

$$y = 32.68 + 3.15x$$

$$y = 32.68 + 3.15(9.8)$$

$$y = 32.68 + 30.87$$

$$y = 63.55 \text{ inches}$$

5. What is the value of the residual associated with the observation for the woman with the shoe length of 9.8 in.?

* use chart on pg 207

Actual Value: 66 in
 Predicted Value: 63.55 in

$$\text{Residual: } 66 - 63.55 = 2.45 \text{ inches}$$

6. Add the predicted value and the residual you just calculated to the table below. Then, calculate the sum of the squared residuals.

x (Shoe Length of Women)	y (Height of Women)	Predicted Height (in.)	Residual (in.)	Squared Residual
8.9	61	60.72	0.28	0.784
9.6	61	62.92	-1.98	3.6864
9.8	66	63.55	2.45	6.0025
10.0	64	64.18	-0.18	0.0324
10.2	64	64.81	-0.81	0.6561
10.4	65	65.44	-0.44	0.1936
10.6	65	66.07	-1.07	1.1449
10.6	67	66.07	0.93	0.8649
10.5	66	65.76	0.24	0.0576
10.8	67	66.7	0.3	0.09
11.0	67	67.33	-0.33	0.1089
11.8	70	69.85	0.15	0.0225
Sum of Squared Residuals				12.94

$$y = 32.68 + 3.15x$$

7. Provide an interpretation of the slope of the least squares line.

$$m = \frac{3.15 \text{ (height)}}{1 \text{ shoe length}} \frac{\Delta x}{\Delta y}$$

For every one inch of increase in women's shoe length, the height increases by 3.15 inches.

8. Does it make sense to interpret the y-intercept of the least squares line in this context? Explain why or why not.

No, \rightarrow zero shoe length is not possible.

9. Would the sum of the squared residuals for the line $y = 25 + 2.8x$ be greater than, about the same as, or less than the sum you computed in Problem 6? Explain how you know this. You should be able to answer this question without calculating the sum of squared residuals for this new line.

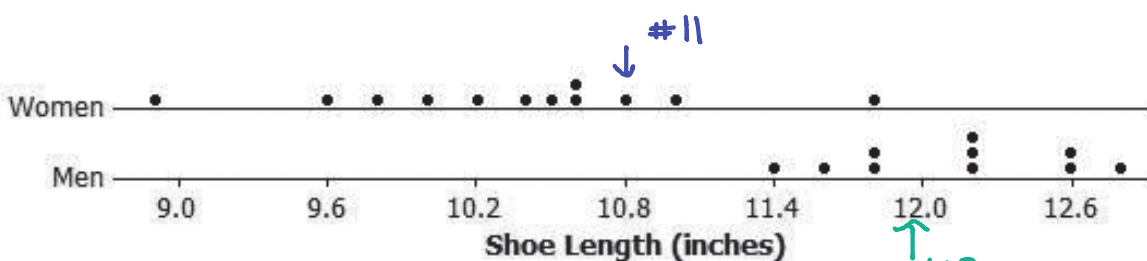
Greater because $y = 3.15x + 32.68$ is the line of best fit. (least residuals)

10. For the men, the least squares line that describes the relationship between x , which represents shoe length (in inches), and y , which represents height (in inches), was $y = 25.3 + 3.66x$. How does this compare to the equation of the least squares line for women? Would you use $y = 25.3 + 3.66x$ to predict the height of a woman based on her shoe length? Explain why or why not.

Men: $y = 3.66x + 25.3$ \leftarrow No, this is the equation for men.

Women: $y = 3.15x + 32.68$
 \leftarrow This least square line is better option.

11. Below are dot plots of the shoe lengths for women and the shoe lengths for men. Suppose that you found a shoe print and that when you measured the shoe length, you got 10.8 in. Do you think that a man or a woman left this shoe print? Explain your choice.



Most likely women
 (more data is clustered here)

12. Suppose that you find a shoe print and the shoe length for this print is 12 in. What would you predict for the height of the person who left this print? Explain how you arrived at this answer.

$$y = 3.66(12) + 25.3$$

$$= 69.22 \text{ in}$$

print most likely belongs to a man.

Spiral REVIEW—Interpreting Scatterplots

Match the graphs to the correct description.

13. Linear, Negative, strong B

14. Nonlinear, weak C

15. Linear, negative, weak D

16. Linear, positive, strong A

A.



B.



C.



D.

