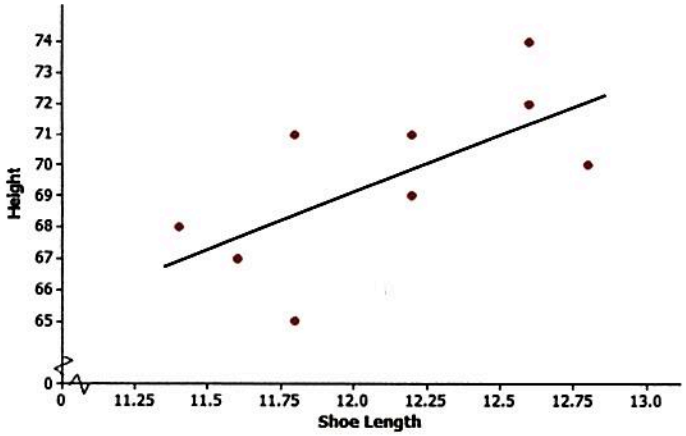
Name: _____ Date: _____

UNIT 4 **LESSON 9**

Do now: Answer Part a and part b

Kendra watched a show where investigators used a shoe print to help identify a suspect in a case. To investigate, she collected data on shoe length (in inches) and height (in inches) from 10 adult men. Her data appear in the table and scatter plot below.

x = Shoe Length	y = Height
12.6	74
11.8	65
12.2	71
11.6	67
11.4	68
12.8	70
12.2	69
12.6	72
11.8	71



a. Is there a relationship between shoe length and height? How would you describe the relationship?

Yes! Positive & weak. As shoe length increases, the height tend to be taller.

b. Using the table, find the height of a man whose shoe length is 11.6 inches. Circle this point on the scatterplot.

67

c. The line $y = 3.66x + 25.3$ might be used to describe the relationship between shoe length and height, where x represents shoe length and y represents height. Using the linear regression equation, find the predicted height of a man with a shoe length of 11.6.

$y = 3.66(11.6) + 25.3$

$y = 67.76$

AIM: CALCULATING & INTERPRETING RESIDUALS

d. Because his actual height was 67 inches, you can calculate the prediction error by subtracting the predicted value from the actual value. This prediction error is called a residual.

Residual = actual y-value − predicted y-value

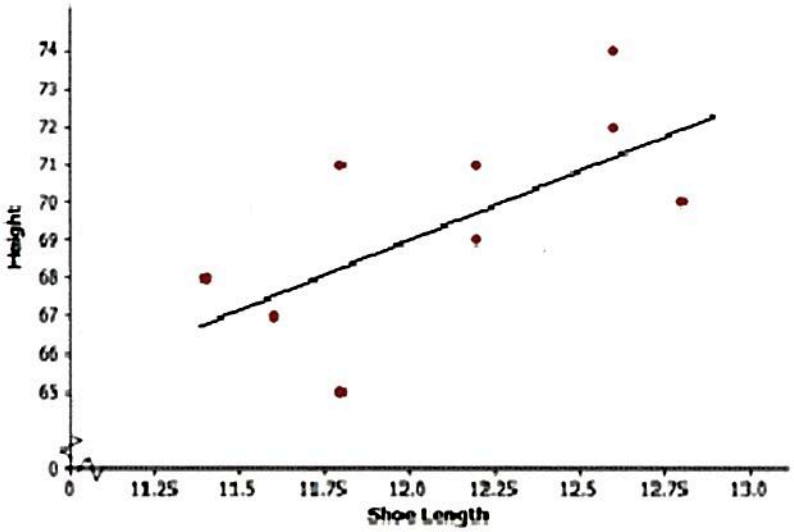
e. Calculate the residual whose shoe size is 11.6 inches.

Actual − predicted

$67 - 67.76 = -.76$

1) For the line, $y = 3.66x + 25.3$, answer the following questions and then complete the table.

$x =$ Shoe Length	$y =$ Height	Predicted y-value	Residual
12.6	74	71.42	2.58
11.8	65	68.49	-3.49
12.2	71	69.95	1.05
11.6	67	67.76	−0.76
12.2	69	69.95	−0.95
11.4	68	67.02	0.98
12.8	70	72.15	−2.15
12.6	72	71.42	0.58
11.8	71	68.49	2.51



a) Will the residual for the shoe size of 12.6 inches positive or negative? Explain your answer.

Positive, b/c the point is above the line of best fit.

b) Calculate the residual whose shoe size is 12.6 inches.

$y = 3.66x + 25.3$

$y = 3.66(12.6) + 25.3$

$y = 71.42$

$74 - 71.42$

$\boxed{2.58}$

c) Will the residual for the shoe size of 11.8 inches positive or negative? Explain your answer.

Negative, b/c the point is below the line of best fit.

d) Calculate the residual whose shoe size is 11.8 inches.

$y = 3.66x + 25.3$

$y = 3.66(11.8) + 25.3$

$y = 68.49$

$65 - 68.49$

$\boxed{-3.49}$

x = Shoe Length	y = Height	Predicted y-value	Residual
12.6	74	71.42	2.58
11.8	65	**68.49**	−3.49
12.2	71	**69.95**	**1.05**
11.6	67	67.76	−0.76
12.2	69	69.95	−0.95
11.4	68	67.02	**0.98**
12.8	70	72.15	−2.15
12.6	72	71.42	0.58
11.8	71	68.49	2.51

a. What is the sum of the residuals? .6

b. Why did you get a number close to zero for this sum? Does this mean that all of the residuals were close to 0?

Because we basing our difference to a predicted line of best fit, the sum of the residuals should be close to zero.

c. If the residuals tend to be small, what does that say about the fit of the line to the data?

It means the actual data values are close to the line, the correlation will be high

d. Why are some residuals positive and some residuals negative?

If the points are above the line of best fit, then the residuals are positive.
If the points are below the line of best fit, then the residuals are negative.