Name _____

Lesson 13: Relationships Between Two Variables

LEARNING OUTCOMES (L.O.)

- I can describe the relationship between two variables on a scatter plot.

Warm Up: Regents Prep

1. What is the value of x in the equation $\frac{x-2}{3} + \frac{1}{6} = \frac{5}{6}$?

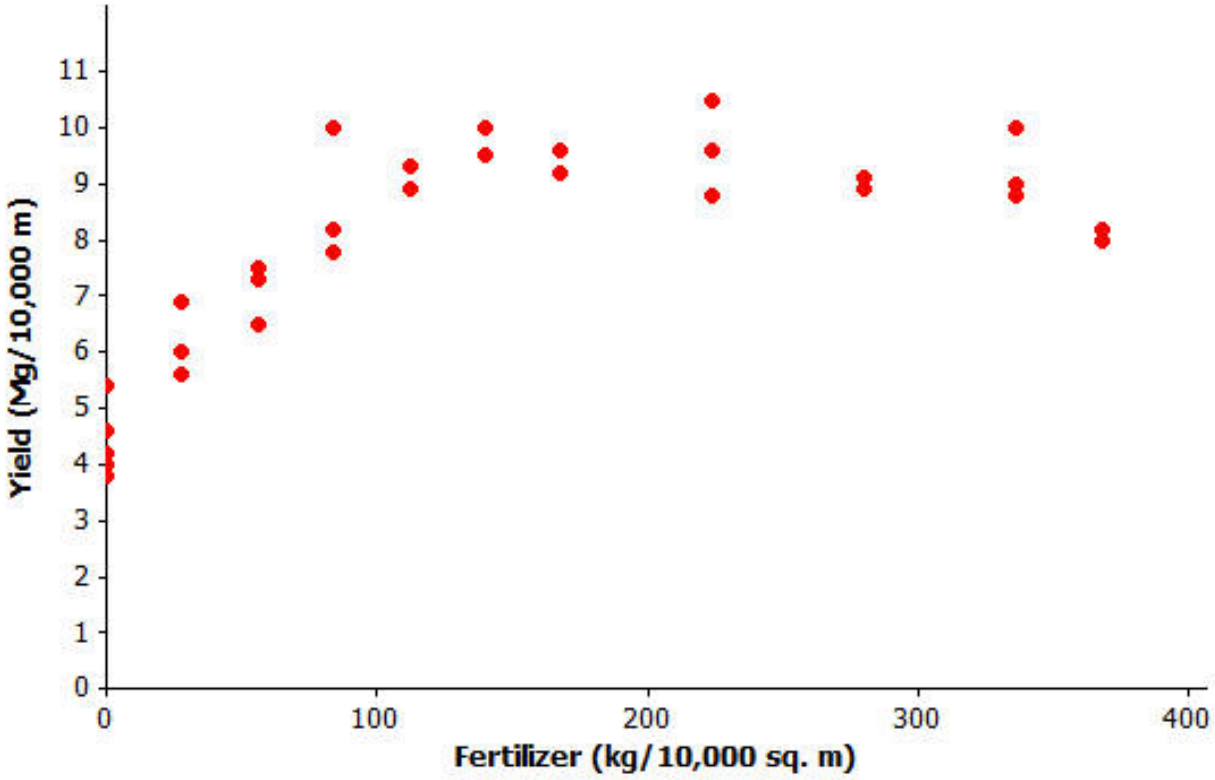
   (1) 4
   (2) 6
   (3) 8
   (4) 11

2. If $4x^2 - 100 = 0$, the roots of the equation are

   (1) -25 and 25
   (2) -25, only
   (3) -5 and 5
   (4) -5, only

A Quadratic Model

Farmers sometimes use fertilizers to increase crop yield, but often wonder just how much fertilizer they should use. The data shown in the scatter plot below are from a study of the effect of fertilizer on the yield of corn.



Data Source: *Agronomy Journal,* 1990

1. The researchers who conducted this study decided to use a quadratic curve to describe the relationship between yield and amount of fertilizer. Explain why they made this choice.

2. The model that the researchers used to describe the relationship was:

$$y = 4.7 + 0.05x - 0.0001x^2$$

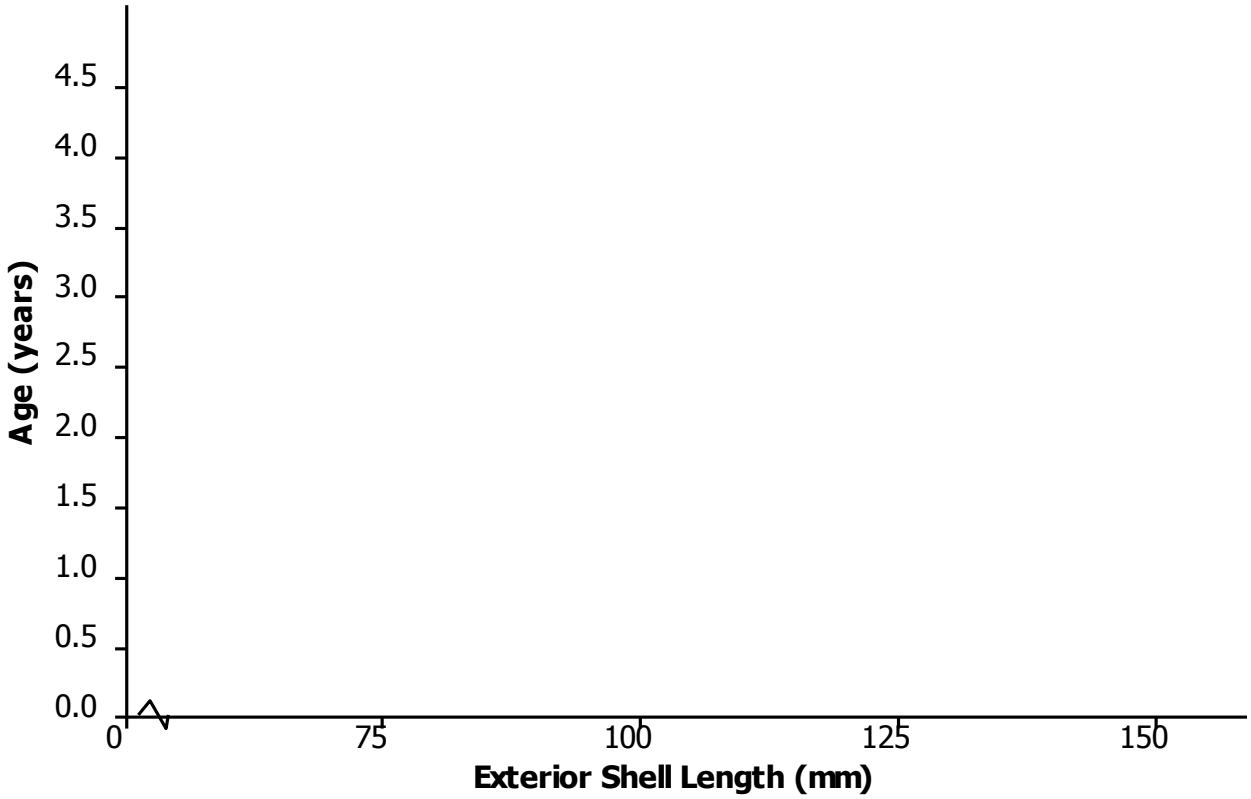
where x represents the amount of fertilizer (kg per 10,000 sq m) and y represents corn yield (Mg per 10,000 sq m). Use this quadratic model to complete the following table. Then sketch the graph of this quadratic equation on the scatter plot.

x	y
0	
100	
200	
300	
400	

3. Based on this quadratic model, how much fertilizer per 10,000 square meters would you recommend that a farmer use on his cornfields in order to maximize crop yield? Justify your choice.

An Exponential Model

How do you tell how old a lobster is? This question is important to biologists and to those who regulate lobster trapping. To answer this question, researchers recorded data on the shell length of 27 lobsters that were raised in a laboratory and whose ages were known.

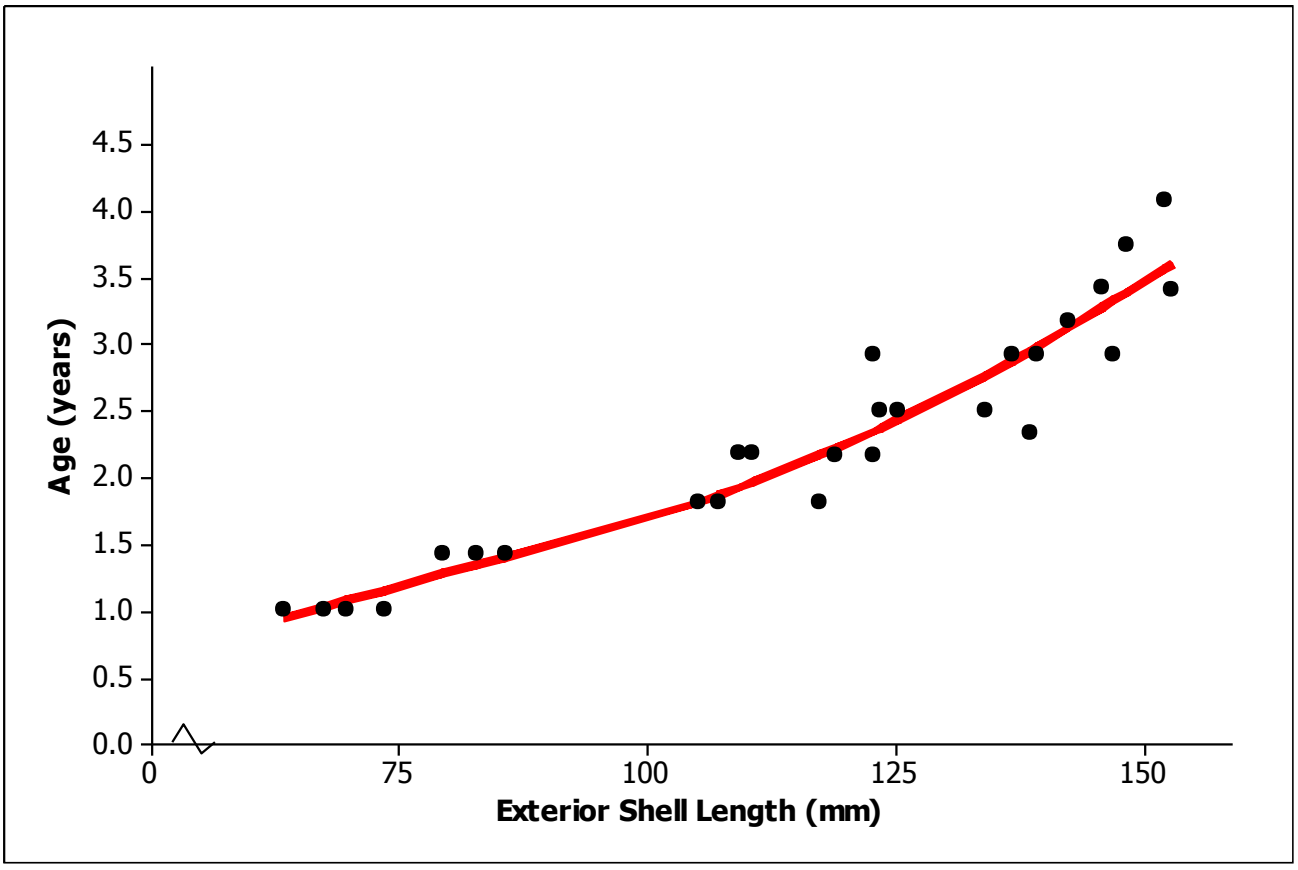


4. The researchers who conducted this study decided to use an exponential curve to describe the relationship between age and exterior shell length. Explain why they made this choice.

5. The model that the researchers used to describe the relationship is:

$$y = 10^{-0.403 + 0.0063x}$$

where x represents the exterior shell length (mm) and y represents the age of the lobster (years). The exponential curve is shown on the scatter plot below. Does this model provide a good description of the relationship between age and exterior shell length? Explain why or why not.

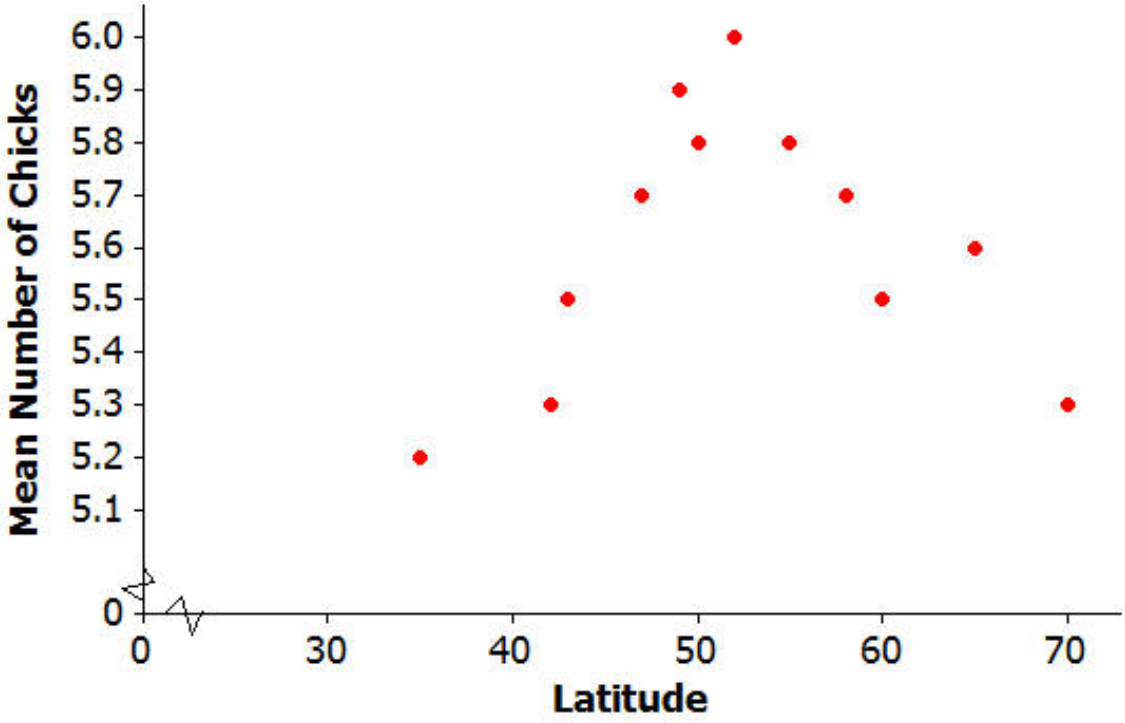


6. Based on this exponential model, what age is a lobster with an exterior shell length of 100 mm?

Name _____ Date _____

Lesson 13: Relationships Between Two Variables CW/HW

Biologists conducted a study of the nesting behavior of a type of bird called a flycatcher. They examined a large number of nests and recorded the latitude for the location of the nest and the number of chicks in the nest.



Data Source: *Ibis*, 1997

1. What type of model (linear, quadratic or exponential) would best describe the relationship between latitude and mean number of chicks?

2. One model that could be used to describe the relationship between mean number of chicks and latitude is:

$$y = 0.175 + 0.21x - 0.002x^2$$

where x represents the latitude of the location of the nest and y represents the number of chicks in the nest. Use the quadratic model to complete the following table. Then sketch a graph of the quadratic curve on the scatter plot above.

x	y
30	
40	
50	
60	
70	

3. Based on this quadratic model, what is the best latitude for hatching the most flycatcher chicks? Justify your choice.