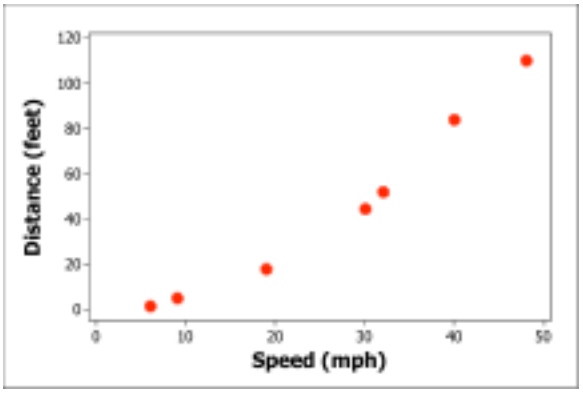
AP Statistics Name: _____ Date: _____

Chapter 12 Practice: Transformations to Achieve Linearity

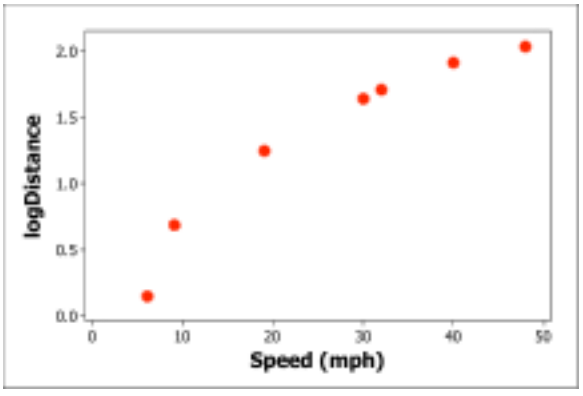
*Braking distance*

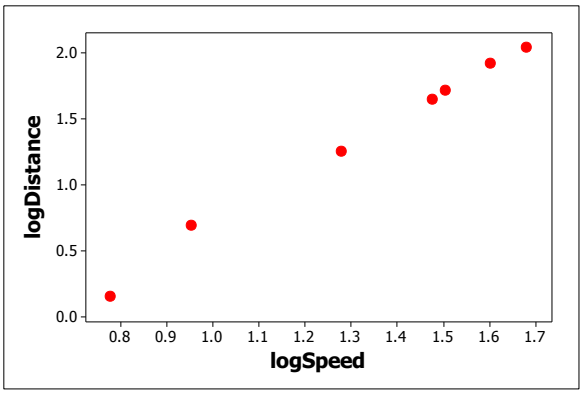
How is the braking distance for a motorcycle related to the speed the motorcycle was going when the brake was applied? Statistics teacher Aaron Waggoner gathered data to answer this question. The table and scatterplot below shows the speed (in miles per hour, or mph) and the distance (in feet) needed to come to a complete stop when the brake was applied.

| Speed (mph) | Distance (feet) |
|---|---|
| 6 | 1.42 |
| 9 | 4.92 |
| 19 | 18.00 |
| 30 | 44.75 |
| 32 | 52.08 |
| 40 | 84.00 |
| 48 | 110.33 |




**Problem:** The graphs below show the results of two different transformations of the data. The first graph plots the logarithm of the distance against speed and the second graph plots the logarithm of distance against the logarithm of speed.






(a) Explain why a power model would provide a more appropriate description of the relationship between braking distance and speed than an exponential model.
(b) Minitab output from a linear regression analysis on the second set of transformed data is shown below. Give the equation of the least-squares regression line. Be sure to define any variables you use.

```
Predictor       Coef  SE Coef       T      P
Constant   -1.35063  0.09697  -13.93  0.000
logSpeed    2.03610  0.07118   28.61  0.000

S = 0.0594632   R-Sq = 99.4%   R-Sq(adj) = 99.3%
```

(c) Use your model from part (b) to predict the braking distance if the motorcycle was going 55 miles per hour. Show your work.
(d) A residual plot for the linear regression in part (b) is shown below. Do you expect your prediction in part (c) to be too high, too low, or just right? Justify your answer.