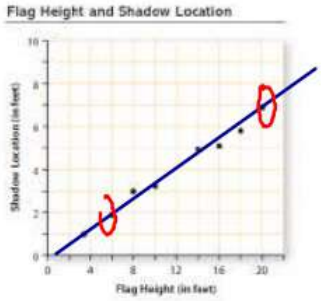
Regression and Correlation

Shadows On sunny days, every vertical object casts a shadow that is related to its height. The following graph shows data from measurements of flag height and shadow location, taken as a flag was raised up its pole. As the flag was raised higher, the location of its shadow moved farther from the base of the pole. Although the points do not all lie on a straight line, the data pattern can be closely approximated by a line.



(20,7) (6,2) $m = \frac{7-2}{20-6} = \frac{5}{14} = .36$

$y = 2 + .36(x-6)$

$y = 2 + .36x - 2.16$

$y = .36x - .16$

1. Consider the (*flag height, shadow location*) data plotted above.

a. Use a straight edge to find a line that fits the data pattern closely.

b. Write the rule for a function that has your line as its graph.

x: flag height
y: shadow

The line and the rule that match the (*flag height, shadow location*) data pattern are **mathematical models** of the relationship between the two variables. Both the graph and the rule can be used to explore the data pattern and to answer questions about the relationship between flag height and shadow location.

2. Use your mathematical models of the relationship between shadow

$y = .36x - .16$

a. What shadow location would you predict when the flag height is 12 feet?

x

$y = .36(12) - .16$

$y = 4.16$

b. What shadow location would you predict when the flag height is 25 feet?

$y = .36(25) - .16$

$y = 8.4$

c. What flag height would locate the flag shadow 6.5 feet from the base of the pole?

y

$y = .36x - .16$

$6.5 = .36x - .16$

$+.16 \quad +.16$

$\frac{6.66}{.36} = \frac{.36x}{.36}$

$18.5 = x$

d. What flag height would locate the flag shadow 10 feet from the base of the pole?

y