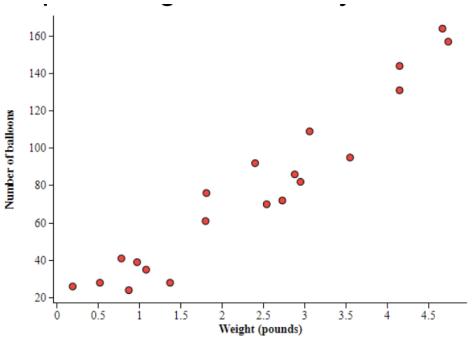
Confidence Interval for the slope of a regression line

March 23, 2022

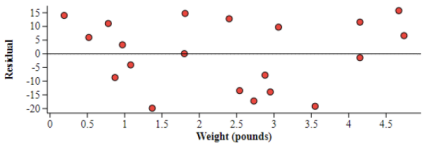
1. A thrill-seeker wanted to try to travel across a large field while being suspended in the air by holding onto balloons. In order to determine the number of balloons needed per pound of weight, he did a preliminary study. He selects a random sample of 20 rocks of various sizes. He weighed each one and also determined how many balloons are needed to lift the rock. Here is output from a least- squares regression analysis of the data.

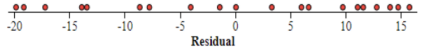


Regression Analysis: Number of Balloons versus Weight

Predictor	Coef	SE Coef	T	P
Constant	6.211	5.5831	1.1127	0.2805
Weight	30.4126	2.0416	14.8968	0.000

s = 12.2625 R-Sq = 0.9250 R-Sq(adj) = 0.9208





Construct and interpret a 90% confidence interval for the slope of the regression line.

Solution: 1. State: β: The true slope of the population LSRL for weight (x) and number of balloons (y).

We are using a 90% confidence level.

2. Plan: We are constructing a one sample t interval for slope. Let's check conditions:

- Linear: Scatter plot shows fairly linear pattern and residual plot has no left over pattern.
- Independent: 20 rocks is clearly less than the population of all rocks.
- Normal: Dotplot of residuals shows no strong skew or outliers.
- Equal Standard Deviations: Residual plot shows similar variability for each x value.
- Random: This is clearly stated as a random sample.

3. Do:

$$\begin{array}{rcl} \text{Point Estimate} & \pm & \text{Margin of Error} \\ b & \pm & t^\star SE_b \\ 30.4126 & \pm & 1.734(2.0416) \end{array}$$

Our interval is given (26.87, 33.95).

4. Conclude: We are 90% confident that the interval from 26.87 to 33.95 captures the true slope of the L:SRL for number of balloons (y) and weight (x).