For their project in an introductory statistics class a group of students looked at the relationship between the height of a ramp (inches) and the distance a golf balled rolled (inches) when released from the given height.

a) Answer the questions: Who are we collecting data on?

**Data is collected on a golf ball.**

b) What is the explanatory variable? What type of variable; categorical or numerical, is it?

**The explanatory variable is the height of a ramp. This is numerical measured in inches.**

c) What is the response variable? What type of variable, categorical or numerical, is it?

**The response variable is how far the golf ball rolls. This is numerical measured in inches.**

d) Below is a plot of distance rolled versus ramp height.

![Plot of distance rolled versus ramp height](image)

Describe the relationship between ramp height and distance rolled.

**As the ramp height increases the distance the golf ball rolls tends to increase. This is a positive linear relationship.**

Below is partial JMP output for the least squares regression line.

**Linear Fit**

Distance Rolled (in.) = 22.43 + 22.492*Ramp Height (in.)

**Summary of Fit**

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSquare</td>
<td>0.96329</td>
</tr>
<tr>
<td>RSquare Adj</td>
<td>0.96198</td>
</tr>
<tr>
<td>Root Mean Square Error</td>
<td>6.42733</td>
</tr>
<tr>
<td>Mean of Response</td>
<td>89.9</td>
</tr>
<tr>
<td>Observations (or Sum Wgts)</td>
<td>30</td>
</tr>
</tbody>
</table>
e) Give an interpretation of the estimated slope within the context of the problem.

For each additional inch the ramp height is increased, the golf ball rolls 22.492 inches further, on average.

f) Use the least squares regression line to predict the distance rolled for a golf ball rolled from a height of 2.5 inches.

Predicted Distance Rolled = 22.43 + 22.492*(2.5) = 78.66 inches

g) Graph the least squares regression line on the plot in d). It must be clear to me that the prediction equation was used to draw the line.

Height = 0.5 inches, Predicted Distance Rolled = 33.68 inches  
Height = 2.5 inches, Predicted Distance Rolled = 78.66 inches  
Height = 5.0 inches, Predicted Distance Rolled = 134.89 inches

h) What is the value of the correlation coefficient?

\[ r = +\sqrt{0.96329} = 0.98 \]

i) Below is a plot of residuals versus the ramp height. Describe what you see in the plot and what this tells you about the straight line fit?

When the ramp height is 1 inch or 5 inches the residuals fall below the zero line (the least squares line over predicts the distance rolled). As ramp height increases from 2 to 3 and 4 inches the residuals tend to increase (under predicting for a 4 inch ramp height). Because there is a pattern in the residuals, the straight line fit is probably not the best fit.