

**Sequence of activities to develop reasoning about covariation.**

<i>Milestones: Ideas and Concepts</i>	<i>Suggested Activities</i>
<b>INFORMAL IDEAS PRIOR TO FORMAL STUDY OF COVARIATION</b>	
<ul style="list-style-type: none"> <li>Understanding when to infer causation: from an experiment, rather than from correlated variables.</li> </ul>	<ul style="list-style-type: none"> <li>Taste Test Activity, Lesson 4, Data Unit</li> </ul>
<b>FORMAL IDEAS OF COVARIATION</b>	
<ul style="list-style-type: none"> <li>Understanding ideas of trend by recognizing a positive linear pattern in the medians of vertical boxplots.</li> </ul>	<ul style="list-style-type: none"> <li>Credit Questions Activity (Lesson 1: “Reasoning about Scatterplots and Correlation”)</li> </ul>
<ul style="list-style-type: none"> <li>Understand the nature of bivariate data and the idea of covariation of two quantitative variables.</li> </ul>	<ul style="list-style-type: none"> <li>Interpreting Scatterplots Activity (Lesson 1)</li> </ul>
<ul style="list-style-type: none"> <li>Points in a scatterplot represent pairs of data for individual cases, measured on each variable.</li> </ul>	<ul style="list-style-type: none"> <li>Interpreting Scatterplots Activity (Lesson 1)</li> </ul>
<ul style="list-style-type: none"> <li>The idea of a linear trend in a bivariate plot.</li> </ul>	<ul style="list-style-type: none"> <li>Interpreting Scatterplots Activity (Lesson 1)</li> </ul>
<ul style="list-style-type: none"> <li>Understanding how to distinguish between a positive trend and a negative trend, and how this differs from strength of the trend.</li> </ul>	<ul style="list-style-type: none"> <li>Interpreting Scatterplots Activity (Lesson 1)</li> </ul>
<ul style="list-style-type: none"> <li>Reasoning about factors that could cause a linear trend in bivariate data, and that there could be a lurking variable (or a causal relationship).</li> </ul>	<ul style="list-style-type: none"> <li>Interpreting Scatterplots Activity (Lesson 1)</li> </ul>
<ul style="list-style-type: none"> <li>Reasoning about what would be needed to establish a causal relationship between two correlated variables.</li> </ul>	<ul style="list-style-type: none"> <li>Interpreting Scatterplots Activity (Lesson 1)</li> </ul>
<ul style="list-style-type: none"> <li>Structure and strength in a bivariate plot: linearity, direction, closeness to the model of straight line.</li> </ul>	<ul style="list-style-type: none"> <li>Reasoning about the Correlation Coefficient Activity (Lesson 1)</li> </ul>
<ul style="list-style-type: none"> <li>A correlation coefficient as a measure of the strength and direction of the linear relationship.</li> </ul>	<ul style="list-style-type: none"> <li>Reasoning about the Correlation Coefficient Activity (Lesson 1)</li> </ul>
<ul style="list-style-type: none"> <li>Understating how different aspects of a bivariate data, as revealed in a scatterplot, affect the correlation coefficient.</li> </ul>	<ul style="list-style-type: none"> <li>Guessing Correlations Activity (Lesson 1)</li> </ul>
<ul style="list-style-type: none"> <li>Understanding how the same correlation coefficient may be obtained for very different sets of bivariate data.</li> </ul>	<ul style="list-style-type: none"> <li>❖ An activity where students examine the correlation in data sets that have the same correlation coefficient but are very different, including nonlinear patterns, such as Anscombe Data.</li> </ul>

	(The symbol ❖ indicates that this activity is not included in these lessons.)
<ul style="list-style-type: none"> <li>Fitting a model of a line to data.</li> </ul>	<ul style="list-style-type: none"> <li>Diamond Rings Activity (Lesson 2: “Fitting a Line to Data”)</li> </ul>
<ul style="list-style-type: none"> <li>Strength of the relationship is based on how well the line (model) fits the data.</li> </ul>	<ul style="list-style-type: none"> <li>Diamond Rings Activity (Lesson 2)</li> </ul>
<ul style="list-style-type: none"> <li>Linear regression as way to model a linear relationship.</li> </ul>	<ul style="list-style-type: none"> <li>Diamond Rings Activity (Lesson 2)</li> </ul>
<ul style="list-style-type: none"> <li>Regression model in explaining the relationships between two quantitative variables.</li> </ul>	<ul style="list-style-type: none"> <li>da Vinci and Body Measurements Activity (Lesson 2)</li> </ul>
<ul style="list-style-type: none"> <li>What the slope and intercept mean in a bivariate data model.</li> </ul>	<ul style="list-style-type: none"> <li>da Vinci and Body Measurements Activity (Lesson 2)</li> </ul>
<ul style="list-style-type: none"> <li>How and why better predictions have less scatter around the line (and fitted values).</li> </ul>	<ul style="list-style-type: none"> <li>da Vinci and Body Measurements Activity (Lesson 2)</li> </ul>
<ul style="list-style-type: none"> <li>Understanding the idea of residuals as deviations from the line (model) as providing evidence to assess how well the line provides a model for a bivariate data set.</li> </ul>	<ul style="list-style-type: none"> <li>da Vinci and Body Measurements Activity (Lesson 2)</li> </ul>
<ul style="list-style-type: none"> <li>Understanding how to generalize bivariate relationships to a larger population.</li> </ul>	<ul style="list-style-type: none"> <li>Testing Relationships: Admissions Variables, and Baseball Variables Activities (Lesson 3: “Inferences Involving Bivariate Data”)</li> </ul>
<ul style="list-style-type: none"> <li>Understanding how to interpret inferences about correlation coefficients and regression slopes.</li> </ul>	<ul style="list-style-type: none"> <li>Testing Relationships: Admissions Variables, and Baseball Variables Activities (Lesson 3)</li> </ul>
<ul style="list-style-type: none"> <li>Understanding that it is important to consider the size of the correlation in addition to the size of the <math>P</math>-value: practical vs. statistical significance.</li> </ul>	<ul style="list-style-type: none"> <li>Testing Relationships: Admissions Variables, and Baseball Variables Activities (Lesson 3)</li> </ul>
<b>BUILDING ON FORMAL IDEAS OF COVARIATION IN SUBSEQUENT TOPICS</b>	
Knowing how to recognize when a test of a correlation coefficient or regressions slope is appropriate to answer a research question.	Research questions involving statistical methods activity (Lesson 5, Inference Unit)