

**Sequence of activities to develop reasoning about statistical models and modeling.**

<i>Milestones: Ideas and Concepts</i>	<i>Suggested Activities</i>
<b>INFORMAL IDEAS PRIOR TO FORMAL STUDY OF STATISTICAL MODELS</b>	
<ul style="list-style-type: none"> <li>Models can be used to portray simple random outcomes. Random devices and computers can be used to simulate data to answer a question about this context.</li> </ul>	<ul style="list-style-type: none"> <li>One-Son Modeling Activity (Lesson 1: “Using Models to Simulate Data”)</li> </ul>
<ul style="list-style-type: none"> <li>A random outcome, unpredictable, but giving a predictable pattern over the long run. The more data, the more stable the pattern.</li> </ul>	<ul style="list-style-type: none"> <li>Let’s Make a Deal Simulation (Lesson 1)</li> </ul>
<ul style="list-style-type: none"> <li>Designing and using a model can help to answer a statistical question.</li> </ul>	<ul style="list-style-type: none"> <li>Let’s Make a Deal Simulation (Lesson 1)</li> </ul>
<ul style="list-style-type: none"> <li>The idea and importance of random samples (revealing the predictable pattern of random outcomes).</li> </ul>	<ul style="list-style-type: none"> <li>The Gettysburg Address Activity (Lesson 3, Data Unit)</li> </ul>
<ul style="list-style-type: none"> <li>Models can be used to generate data to informally test an experimental result to provide evidence about whether or not this result is due to chance.</li> </ul>	<ul style="list-style-type: none"> <li>Taste Test Activity (Lesson 4, Data Unit)</li> </ul>
<ul style="list-style-type: none"> <li>Distinguish between the model, the simulated data, and the sample data.</li> </ul>	<ul style="list-style-type: none"> <li>Taste Test Activity (Lesson 4, Data Unit)</li> </ul>
<ul style="list-style-type: none"> <li>The normal distribution as a model for some distributions of real world data.</li> </ul>	<ul style="list-style-type: none"> <li>Sorting Histograms Activity (Lesson 2, Distribution Unit)</li> </ul>
<ul style="list-style-type: none"> <li>The mean is a good summary of the center of a normal distribution.</li> </ul>	<ul style="list-style-type: none"> <li>Choosing an Appropriate Measure of Center Activity (Lesson 2, Center Unit)</li> </ul>
<ul style="list-style-type: none"> <li>The mean and standard deviation are good summaries for a normal distribution.</li> </ul>	<ul style="list-style-type: none"> <li>How do Students Spend their Time Activity (Lesson 4, Comparing Groups Unit)</li> </ul>
<b>FORMAL IDEAS OF STATISTICAL MODELS</b>	
<ul style="list-style-type: none"> <li>Random variables and random outcomes.</li> </ul>	<ul style="list-style-type: none"> <li>Coins, Cards, and Dice Activity (Lesson 2: “Modeling Random Variables”)</li> </ul>
<ul style="list-style-type: none"> <li>Equally likely model does not fit all random outcomes.</li> </ul>	<ul style="list-style-type: none"> <li>Coins, Cards, and Dice Activity (Lesson 2)</li> </ul>
<ul style="list-style-type: none"> <li>A probability distribution as a model.</li> </ul>	<ul style="list-style-type: none"> <li>Coins, Cards, and Dice Activity (Lesson 2)</li> </ul>
<ul style="list-style-type: none"> <li>Probability problems can be modeled using random devices and simulation tools.</li> </ul>	<ul style="list-style-type: none"> <li>❖ Activity where cards are used to model a problem, such as Random Babies activity in Chance and Rossman (2006b). (The symbol ❖ indicates that this activity</li> </ul>

	is not included in these lessons.)
<ul style="list-style-type: none"> <li>• Characteristics of normal distribution as a model.</li> </ul>	<ul style="list-style-type: none"> <li>• What is Normal? (Lesson 3: “The Normal Distribution as a Model”)</li> </ul>
<ul style="list-style-type: none"> <li>• What does normal data look like?</li> </ul>	<ul style="list-style-type: none"> <li>• What is Normal? (Lesson 3)</li> </ul>
<ul style="list-style-type: none"> <li>• Using the normal distribution as a Model.</li> </ul>	<ul style="list-style-type: none"> <li>• Normal Distribution Applications (Lesson 3)</li> </ul>
<b>BUILDING ON FORMAL IDEAS OF MODELS IN SUBSEQUENT TOPICS</b>	
<ul style="list-style-type: none"> <li>• How and why the sampling distribution of means can be modeled by the normal distribution.</li> </ul>	<ul style="list-style-type: none"> <li>• Central Limit Theorem Activity (Lesson 3, Samples and Sampling Unit)</li> </ul>
<ul style="list-style-type: none"> <li>• The null hypothesis as model to which we compare sample data.</li> </ul>	<ul style="list-style-type: none"> <li>• Balancing Coins Activity (Lesson 1, Statistical Inference Unit).</li> </ul>
<ul style="list-style-type: none"> <li>• When testing a hypothesis, it is often important to check the condition of normality of the sampling distribution.</li> </ul>	<ul style="list-style-type: none"> <li>• Research Questions Involving Statistical Methods (Lesson 5, Statistical Inference Unit)</li> </ul>
<ul style="list-style-type: none"> <li>• The regression line is a useful a model of bivariate relationship between quantitative variables.</li> </ul>	<ul style="list-style-type: none"> <li>• Diamond Rings Activity (Lesson 2, Covariation Unit)</li> </ul>
<ul style="list-style-type: none"> <li>• Checking the fit of a model to data, by examining residuals from a regression line.</li> </ul>	<ul style="list-style-type: none"> <li>• da Vinci and Body Measurements Activity (Lesson 2, Covariation Unit)</li> </ul>