Bias versus Random Error — Math 111

1. In each of the following situations, decide whether the result was caused by bias or random error.

   (a) A novice marksman with shaking hands misses a target.

   (b) A butcher charges too much because he weighs meat with his thumb on the scale.

   (c) A committee of six employees is randomly selected by drawing names out of a hat. All six end up being men.

2. The are two kinds of bias: **sample bias** is when the sample selected is not representative of the whole population, and **non-sample bias** is when the sample might be representative, but there are other factors such as leading questions or measurement errors that systematically skew the results. For each of the following situations, explain why there might be bias, and identify the bias as sample or non-sample bias.

   (a) A Fox News poll asks viewers to express their opinions on the candidates.

   (b) Randomly selected volunteers are asked about their sexual history during an in-person interview.

   (c) Likely voters are contacted by phone, but many refuse to participate in the poll.

   (d) Suicide statistics are often based on the decisions of police officers and forensic specialists who have to decide, for example, if a death was an accidental overdose or deliberate suicide. Because of the stigma associated with suicide, these decisions might be biased one way or another.

3. The July 2006 issue of *Consumer Reports* included ratings of 103 chain restaurants. The ratings were based on surveys that *Consumer Reports* readers sent in after eating at one of the restaurants. The article said, "The survey is based on 148,599 visits to full-service restaurant chains between April 2004 and April 2005, and reflects the experiences of our readers, not necessarily those of the general population."

   (a) Do you think that the sample here was chosen randomly from the population of *Consumer Reports* readers? Explain.

   (b) Why do the authors of the article make this disclaimer about not necessarily representing the general population?

4. Suppose you want to estimate the proportion of vehicles on the road in your hometown that are sport utility vehicles (SUVs). You decide to stand at the intersection closest to your house one morning between 7 and 8 AM, observing how many vehicles go by and how many are SUVs.

   (a) Identify the individuals, variable, population, sample, parameter, and statistic (all in words) in this study.

   (b) Explain why this sampling method is likely to be biased.