Binomial Activity

This activity is broken into two parts. Part I occurs on the first day of the class and gathers a number of samples from binomial distributions through an in-class activity aimed at allowing students to get to know each other. Part II occurs when the binomial distribution is introduced. It recalls Part I to show students examples of binomial data and then proceeds to choose a new question that the class will collect data on and analyze.

Part I

Part I has the dual purpose of allowing students to get to know their classmates and gathering examples of binomial data. In large class sizes, as introductory statistics courses typically are, it is eye-opening for students to understand who their classmates. In this part, I will ask a series of yes/no questions which students will respond to by standing and recording their answer in a [Personal Response System] (PRS). If no PRS is available, then I will just estimate the number of students who respond affirmatively. Students stand so that their classmates can see who they are whereas the PRS is used as an easy data collection tool.

The questions that I will ask will certainly vary, be here is a list of example questions:

- Who is from [state that we are in]?
- Who is from [region of the country we are in]?
- Who is not from the U.S.?
- Who has a birthday in this semester?
- Who has (or has had) a birthday this month?
- Who had trigonometry in high school?
- Who had calculus in high school?
- Who is taking this class because it is requirement?
- Who is taking this class because they think statistics is interesting?

These questions can also work as the starting point for getting to know more about the students. For example, after the question ‘Who is not from the U.S.?’ I would probably ask about what countries people are from. These questions can also be used in other activities throughout the course. For example, the question ‘Who is taking this class because they think statistics is interesting?’ can be used to initiate a discussion about bias.
Part II

The purpose of Part II is to generate a scientific question interesting to students. In particular, for this activity we need students to be able to collect realizations from a binomial distribution. The activity can be broken down into several steps: introduction, reminder, brainstorming, discussion, and selection.

Introduction

This step is meant to introduce the students to the object of this activity. That is, to create a scientific question they are interested in that can be answered using binomial data and is easily collectable by them. This process can be accomplished one of (at least) two ways. The first way is to consider scientific questions and determine the appropriate data to answer them and the second way is to consider a particular binomial data and what scientific question they are answering. Although the former is preferred as a means of scientific inquiry, the second is more practical in this setting.

Reminder

This step is meant to remind students of what a binomial distribution is. Namely

- A sequence of independent Bernoulli trials with common success probability.

Some questions for students to consider when determining whether the particular data is binomial are

- Are there only two possible outcomes for each unit?
  - Of course many situations can be simplified into this, e.g. recording the color of cars on the road can be made into a binomial by consider whether the car is red or not.

- Is there a maximum number of successes?
  - i.e. can you tell me what that maximum number is?

- Do the responses from one unit affect the responses from another?

Brainstorming

This step encourages students to shout out their binomial data ideas. I would initiate the discussion by mentioning two examples: 1) Part I activity and 2) coin tossing. As the binomial data ideas come in, I will ask the students or elaborate myself on what I feel the underlying scientific question is. Also, I will let students know that there will be a discussion period after the brainstorming session where they can critique the suggestions, but for now all suggestions are 'correct.' I expect the suggestions to look something like this:
1. Count the number of sunny hours in a day.

2. Count the number of cars coming through an intersection over ten minutes.

3. Count the number of empty seats in this classroom.

4. Count the number of students listening to iPods in a room of the library.

**Discussion**

This step encourages students to think about whether the suggestions in the brainstorming step are truly binomial and, if not, how we turn them into a binomial. The first suggestion certainly questions the assumption of independence, but perhaps we can make them more independent by considering the number of sunny days in a week or sunny Wednesdays in a month. The second suggestion certainly does not have a maximum number, but perhaps we can make it binomial by consider the number of red cars that come through an intersection of the first ten cars. The third and fourth suggestions, to an approximation, are binomial.

**Selection**

Now that we have a set of suggestions that are binomial, the final step is to have students vote on what type of data they want to collect. Perhaps they vote on the fourth suggestion, the number of students listening to iPods. I would then explain how to collect the data, i.e. record both the number of successes and the total number, and how to submit it on blackboard.