DATA ANALYSIS AND PROBABILITY FOR TEACHERS

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Introduction

This book is a data analysis and probability textbook for prospective and in-service Middle School and High School teachers. The National Council of Teachers in Mathematics (NCTM) has recently established standards in data analysis and probability to be taught to all students from grades K-12. This text is designed to teach the prospective teachers basic concepts in probability and statistics so they have the background to teach the content listed in the NCTM standards.

Structure of the Text

In this text, the basic concepts in data analysis and probability will be taught by means of *exposition*, *practice*, group work on *directed activities*, and *homework exercises*. The following structure is following for each concept.

- The students are introduced to the concept by some textual material
- The students are given practice on the concept through an exercise immediately following the textual material. This practice can be done during the class and is useful for engaging the student immediately with the concept.
- The students work in groups on a directed activity where they have the opportunity to think about the underlying concept, give predictions, and summarize their reaction to the activity.
- The homework exercises provide the students with different types of practice with the concepts.

Some of the activities are the hands-on type where the students make measurements or perform simple simulations in groups. In other technology activities, software packages

like *Fathom*, *Tinkerplots*, and the TI graphing calculators will be used to explore the concept from a different perspective. The students will be assessed both on in-class exams and on the quality of work on their activities. The use of activities is especially appropriate in the teaching of these courses. First, many statistical educators advocate the use of activities, labs, or projects to get the students engaged in the subject matter. Second, the activities in the classes serve as a model for the prospective teacher who will be leading similar activities in the Middle or High schools.

Background of the Students

At the author's home institution, this text can be used for two distinct classes in statistics. One class (MATH 247) is designed to provide an introduction to data analysis and probability for prospective Middle School Teachers who choose to concentrate in mathematics. The prerequisite is one five-hour course in calculus. A second class (MATH 341) is designed for students who plan on teaching at the High School level. These students are essentially math majors with regards to their coursework and the prerequisite for this class is two five-hour courses in calculus.

This text can also be used to train current Middle School and High School teachers in topics of data analysis and probability. These training sessions typically occur in two-week or month-long classes in a university setting.

Relationship with other statistics texts

This text is distinctly different in content from the standard introductory statistics textbook such as David Moore's *Basic Practice of Statistics*. The goal of Moore's book (and many other introductory statistics texts) is to provide an introduction to statistical inference. This emphasis of this text is not on statistical inference, but on concepts of data analysis and probability that are taught in the schools. Also this book is fundamentally different in content from the AP Statistics course that is currently taught at the high school level.

This book is similar in spirit to the *Workshop Statistics* texts (authored by Rossman, Chance and others) and *Activity-Based Statistics* (ABS) by Scheaffer, Gnanadesikan, Watkins, and Witmer in its focus on the use of activities to teach concepts. However, the *Workshop Statistics* texts are intended to provide an introduction to statistical inference and *Activity-Based Statistics* is suitable only as a supplemental text and doesn't contain the basic content of the course.

Use of Technology

This text will focus on the use of *Fathom*, *Tinkerplots* and the TI 83-Plus and TI 84-Plus calculators in the technology activities. *Fathom* is distinctive in that it was developed specifically to aid in teaching statistics. It is graphically oriented and is very ease for students (and teachers) to learn. One attractive feature of *Fathom* is that it easy to perform probability simulations without writing a program. *Tinkerplots* is a "construction kit" for graphically representing data that is designed specifically for Middle School students. It is especially suitable for activities where the students can learn about relationships and comparisons by playing with the graphical tools.

Due to the popularity of the calculator, activities will be also written using the TI 83-Plus and TI 84-Plus calculators.