DATA ANALYSIS AND PROBABILITY FOR TEACHERS

JIM ALBERT

BRIEF TABLE OF CONTENTS

JUNE 2008

EXPLORING DATA

COLLECTING DATA

PROBABILITY

INTRODUCTION TO STATISTICAL INFERENCE

DATA ANALYSIS AND PROBABILITY FOR TEACHERS

JIM ALBERT

EXTENDED TABLE OF CONTENTS

JULY 2008

EXPLORING DATA

Relationships – summarizing by a least-squares line

Making appropriate and inappropriate predictions

ACTIVITY: Fitting a line by eye to Galton's data

The median-median line – a robust alternative method of fitting a line

TECHNOLOGY ACTIVITY (Fathom): Fitting a "best" line

Plotting residuals

TECHNOLOGY ACTIVITY (Fathom): Exploring some Olympics data

ACTIVITY: Regression to the mean

Different ways of looking at relationships

TECHNOLOGY ACTIVITY: Using *Tinkerplots* to study relationships

CLASSROOM CAPSULE: Summarizing association between two measures of family health

EXERCISES

COLLECTING DATA

Topic C1: Obtaining Data by Sampling

SPOTLIGHT [TO BE DONE]

Population and sample

Examples of popular sampling methods: Elvis Presley and Alf Landon

Simple random sampling

ACTIVITY: Random rectangles

TECHNOLOGY ACTIVITY (Fathom): Biased sampling of rectangles

Practical concerns in sampling

EXERCISES

Topic C2: Obtaining Data by Experiments

SPOTLIGHT [TO BE DONE]

An apple a day: different ways of collecting data

Music and math achievement

An experiment to detect the Mozart effect

Basic principles of experiments

ACTIVITY: Jumping frogs

EXERCISES

PROBABILITY

Topic P1: Probability – a measure of uncertainty

SPOTLIGHT: How Risky is …?

WARM-UP ACTIVITY: Some questions on probability

The classical view of a probability

EXERCISES

Topic P5: Conditional Probability

SPOTLIGHT: The three-card problem

New information, reduced sample space, and conditional probability

Conditional probability in everyday life

Conditional probability in a two-way table

Definition of conditional probability and multiplying probabilities

The multiplication rule under independence

Learning using Bayes' rule

TECHNOLOGY ACTIVITY (Fathom): Rolling two dice

TECHNOLOGY ACTIVITY (Fathom): How many defectives?

CLASSROOM CAPSULE: Spinning a random spinner

EXERCISES

Topic P6: Probability distributions

SPOTLIGHT: The hat check problem

A random variable

Summarizing a probability distribution

Standard deviation of a probability distribution

Interpreting the standard deviation for a bell-shaped distribution

TECHNOLOGY ACTIVITY (Fathom): Constructing a probability distribution by simulation

TECHNOLOGY ACTIVITY (Fathom): Playing roulette

ACTIVITY: How many keys?

ACTIVITY: Investing money: comparing safe and risky investments

CLASSROOM CAPSULE: Playing the lottery

EXERCISES

Topic P7: Coin tossing distributions

SPOTLIGHT: Galton's board

Probabilities of a coin-tossing experiment

Binomial experiments

ACTIVITY: Coin flipping: Is it Real or Fake?

TECHNOLOGY ACTIVITY (Fathom): Simulated coin flipping

ACTIVITY: Is a professional athlete streaky?

Binomial computations

Mean and standard deviation of a binomial

Negative binomial experiments

ACTIVITY: Graphing binomial and negative binomial experiments

CLASSROOM CAPSULE: Probabilities of the Galton board

EXERCISES

Topic P8: Continuous distributions

SPOTLIGHT: A spinner baseball game

INTRODUCTION TO STATISTICAL INFERENCE