Key Curriculum Press
INNOVATORS IN MATHEMATICS EDUCATION

1. Number and Operations Standard

1a. Understand numbers, ways of representing numbers, relationships among numbers, and number systems

Expectations	Statistics in Action
develop a deeper understanding of very large and very small numbers and of various representations of them;	Not typically covered in a statistics course.
compare and contrast the properties of numbers and number systems, including the rational and real numbers, and understand complex numbers as solutions to quadratic equations that do not have realsolutions;	Not typically covered in a statistics course.
understand vectors and matrices as systems that have some of the properties of the real-number system;	Not typically covered in a statistics course.
use number-theory arguments to justify relationships involving whole numbers.	Not typically covered in a statistics course.

1b. Understand meanings of operations and how they relate to one another

Expectations	Statistics in Action
judge the effects of such operations as multiplication, division, and computing powers and roots on the magnitude of quantities;	Not typically covered in a statistics course.
develop an understanding of properties of, and representations for, the addition and multiplication of vectors and matrices;	Not typically covered in a statistics course.
develop an understanding of permutations and combinations as counting techniques.	**Chapter 6:** **Probability Distributions** 6.2: The Binomial Distribution

1c. Compare fluently and make reasonable estimates

Expectations	*Statistics in Action*
develop fluency in operationswith real numbers, vectors, and matrices using mental computation or paper-and-pencil calculations for simple cases and technology for more complicated cases;	Not typically covered in a statistics course.
judge the reasonableness of numerical computation and their results.	Not typically covered in a statistics course.

2. Algebra Standard

2a. Understand patterns, relations, and functions

Expectations	*Statistics in Action*
generalize patterns using explicitly defined and recursively defined functions;	**Chapter 6:** **Probability Distributions** 6.2: The Binomial Distribution 6.3: The Geometric Distribution
understand relations and functions and select, convert flexibly among, and use various representations of them;	Not typically covered in a statistics course.
analyze functions of one variable by investigating rates of change, intercepts, zeros, asymptotes, and local and global behavior;	Not typically covered in a statistics course.
understand and perform transformations such as arithmetically combining, composing, and inverting commonly used functions, using technology to perform such operations on more-complicated symbolic expressions;	**Chapter 2:** **Exploring Distributions** 2.2: The Normal Distribution **Chapter 3:** **Relationships Between Two Quantitative Variables** 3.5: Shape-Changing Transformations **Chapter 11:** **Inference for Regression** 11.3: Transforming for a Better Fit
understand and compare the properties of classes of functions, including exponential, polynomial, rational, logarithmic, and periodic functions;	Not typically covered in a statistics course.
interpret representations of functions of two variables.	Not typically covered in a statistics course.

2b. Represent and analyze mathematical situations and structures using algebraic symbols

Expectations	*Statistics in Action*
understand the equivalent forms of expressions, equations, inequalities, and relations;	Not typically covered in a statistics course.
write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency — mentally or with paper and pencil in simple cases and using technology in all cases;	Not typically covered in a statistics course.
use symbolic algebra to represent and explain mathematical relationships;	Not typically covered in a statistics course.
use a variety of symbolic representations, including recursive and parametric equations, for functions and relations;	Not typically covered in a statistics course.
judge the meaning, utility, and reasonableness of the results of symbol manipulations, including those carried out by technology.	Not typically covered in a statistics course.

2c. Use mathematical models to represent and understand quantitative relationships

Expectations	*Statistics in Action*
identify essential quantitative relationships in a situation and determine the class or classes of functions that might model the relationships;	**Chapter 3:** **Relationships Between Two Quantitative Variables** All sections **Chapter 11:** **Inference for Regression** 11.3: Transforming for a Better Fit
use symbolic expressions,including iterative and recursive forms, to represent relationships arising from various contexts;	Not typically covered in a statistics course.
draw reasonable conclusions about a situation being modeled.	**Chapter 8:** **Inference for Proportions** All sections **Chapter 9:** **Inference for Means** All sections **Chapter 10:** **Chi-square Tests** All sections **Chapter 11:** **Inference for Regression** All sections **Chapter 12:** **Case Studies** All sections

2d. Analyze change in various contexts

Expectations	Statistics in Action
approximate and interpret rates of change from graphical and numerical data.	**Chapter 3: Relationships Between Two Quantitative Variables** 3.2: Getting a Line on the Pattern

3. Geometry Standard

3a. Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships

Expectations	*Statistics in Action*
analyze properties and determine attributes of two- and three-dimensional objects;	Not typically covered in a statistics course.
explore relationships (including congruence and similarity) among classes of two- and three-dimensional geometric objects, make and test conjectures about them, and solve problems involving them;	Not typically covered in a statistics course.
establish the validity of geometric conjectures using deduction, prove theorems, and critique arguments made by others;	Not typically covered in a statistics course.
use trigonometric relationships to determine lengths and angle measures.	Not typically covered in a statistics course.

3b. Specify locations and describe spatial relationships using coordinate geometry and other representational systems

Expectations	*Statistics in Action*
use Cartesian coordinates and other coordinate systems, suchas navigational, polar, orspherical systems, to analyze geometric situations;	Not typically covered in a statistics course.
investigate conjectures and solve problems involving two-and three-dimensional objects represented with Cartesiancoordinates.	**Chapter 3:** **Relationships Between Two Quantitative Variables** 3.5: Shape-Changing Transformations

3c. Apply transformations and use symmetry to analyze mathematical situations

Expectations	*Statistics in Action*
understand and represent translations, reflections, rotations, and dilations of objects in the plane by using sketches, coordinates, vectors, function notation, and matrices;	Not typically covered in a statistics course.
use various representations to help understand the effects of simple transformations and their compositions.	**Chapter 3:** **Relationships Between Two Quantitative Variables** 3.5: Shape-Changing Transformations **Chapter 11:** **Inference for Regression** 11.3: Transforming for a Better Fit

3d. Use visualization, spatial reasoning, and geometric modeling to solve problems

Expectations	*Statistics in Action*
draw and construct representations of two- and three-dimensional geometric objects using a variety of tools;	Not typically covered in a statistics course.
visualize three-dimensional objects from different perspectives and analyze their cross sections;	Not typically covered in a statistics course.
use vertex-edge graphs to model and solve problems;	Not typically covered in a statistics course.
use geometric models to gain insight into, and answer questions in, other area of mathematics;	Not typically covered in a statistics course.
use geometric ideas to solve problems in, and gain insights into, other disciplines and other areas of interest such as art and architecture.	Not typically covered in a statistics course.

4. Measurement Standard

4a. Understand measurable attributes of objects and the units, systems, and processes of measurement

Expectations	Statistics in Action
make decisions about units and scales that are appropriate for problem situations involving measurement.	Not typically covered in a statistics course.

4b. Apply appropriate techniques, tools, and formulas to determine measurements

Expectations	Statistics in Action

analyze precision, accuracy, and approximate error in measurement situations;	**Chapter 8:** **Inference for Proportions**
	    8.1: Estimating a Proportion with Confidence
	
	Chapter 9: **Inference for Means**
	    9.1: A Confidence Interval for a Mean
	
	Chapter 11: **Inference for Regression**
	    11.1: Variation in the Estimated Slope

understand and use formulas for the area, surface area, and volume of geometric figures, including cones, spheres, and cylinders;	Not typically covered in a statistics course.
apply informal concepts of successive approximation, upper and lower bounds, and limit in measurement situations;	Not typically covered in a statistics course.
use unit analysis to check measurement computations.	Not typically covered in a statistics course.

5. Data Analysis and Probability Standard

5a. Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them

Expectations	Statistics in Action

understand the differences among various kinds of studies and which types of inferences can legitimately be drawn from each;	**Chapter 4: Sample Surveys and Experiments**
	    4.3: Experiments and Inference About Cause
	    4.4: Designing Experiments to Reduce Variability
	
	Chapter 12: Case Studies
	All sections

know the characteristics of well-designed studies, including the role of randomization in surveys and experiments;	**Chapter 4: Sample Surveys and Experiments** All sections **Chapter 5: Sampling Distributions** All sections
understand the meaning of measurement data and categorical data, of univariate and bivariate data, and of the term variable;	**Chapter 1: Statistical Reasoning: Investigating a Claim of Discrimination** All sections **Chapter 2: Exploring Distributions** All sections **Chapter 3: Relationships Between Two Quantitative Variables** All sections
understand histograms, parallel box plots, and scatter plots and use them to display data;	**Chapter 2: Exploring Distributions** All sections **Chapter 3: Relationships Between Two Quantitative Variables** All sections
compute basic statistics and understand the distinction between a statistic and a parameter.	**Chapter 7: Sampling Distributions** 7.2: Sampling Distribution of the Sample Mean

5b. Select and use appropriate statistical methods to analyze data

Expectations	Statistics in Action
for univariate measurement data, be able to display the distribution, describe its shape, and select and calculate summary statistics;	**Chapter 1:** **Statistical Reasoning: Investigating a Claim of Discrimination** All sections **Chapter 2:** **Exploring Distributions** All sections **Chapter 7:** **Sampling Distributions** All sections **Chapter 10:** **Chi-Square Tests** All sections
for bivariate measurement data, be able to display scatter plot, describe the shape, and determine regression coefficients, regression equations, and correlation coefficients using technological tools;	**Chapter 3:** **Relationships Between Two Quantitative Variables** All sections **Chapter 9:** **Inference for Means** 9.5: Paired Comparisons **Chapter 11:** **Inference for Regression** All sections **Chapter 12:** **Case Studies** 12.3: Baseball: Does Money Buy Success?
display and discuss bivariate data where at least one variable is categorical;	**Chapter 10:** **Chi-Square Tests** 10.2: The Chi-Square Test of Homogeneity 10.3: The Chi-Square Test of Independence **Chapter 12:** **Case Studies** 12.4: Martin v. Westvaco Revisited: Testing for Discrimination Against Employees
recognize how linear transformations of univariate data affect shape, center, and spread;	**Chapter 2:** **Exploring Distributions** 2.3: Measures of Center and Spread 2.5: The Normal Distribution **Chapter 6:** **Probability Distributions** 6.1: Random Variables and Expected Value
identify trends in bivariate data and find functions that model the data or transform the data so that they can be modeled.	**Chapter 3:** **Relationships Between Two Quantitative Variables** All sections **Chapter 11:** **Inference for Regression** 11.3: Transforming for a Better Fit

5c. Develop and evaluate inferences and predictions that are based on data

Expectations	*Statistics in Action*
use simulations to explore the variability of sample statistics from a known population and to construct sampling distributions;	**Chapter 7:** **Sampling Distributions** All sections
understand how sample statistics reflect the values of population parameters and use sampling distributions as the basis for informal inferences;	**Chapter 1:** **Statistical Reasoning: Investigating a Claim of Discrimination** 1.2: Discrimination in the Workplace: Inference **Chapter 7:** **Sampling Distributions** All sections **Chapter 8:** **Inference for Proportions All Sections**

evaluate published reports thatare based on data by examining the design of the study, the appropriateness of the data analysis, and the validity of conclusions;	**Chapter 4:** **Sample Surveys and Experiments**
	  4.3: Experiments and Inference About Cause
	  4.4: Designing Experiments to Reduce Variability
	
	Chapter 8: **Inference for Proportion**
	  8.2: Testing a Proportion
	  8.3: A Confidence Interval for the Difference of Two Proportions
	  8.4: A Significance Test for the Difference of Two Proportions
	  8.5: Inference for Experiments
	
	Chapter 9: **Inference for Means**
	  9.2: A Significance Test for a Mean
	  9.3: When Things Aren't Normal
	  9.4: Inference for the Difference Between Two Means
	  9.5: Paired Comparisons
	
	Chapter 10: **Chi-Square Tests**
	All sections
	
	Chapter 12: **Case Studies**
	All sections

understand how basic statistical techniques are used to monitor process characteristics in the workplace.	**Chapter 4:** **Sample Surveys and Experiments** All sections **Chapter 6:** **Probability Distributions** All sections **Chapter 8:** **Inference for Proportions** All sections **Chapter 9:** **Inference for Means** All sections **Chapter 10:** **Chi-Square Tests** All sections

5d. Understand and apply basic concepts of probability

Expectations	Statistics in Action
understand the concepts of sample spaces and distributions in simple cases;	**Chapter 7: Sampling Distributions** 7.1: Generating Sampling Distributions
use simulations to construct empirical probability distributions;	**Chapter 5: Probability Models** All sections **Chapter 6: Probability Distributions** All sections **Chapter 7: Sampling Distributions** All sections
compute and interpret the expected value of random variables in simple cases;	**Chapter 6: Probability Distributions** 6.1: Random Variables and Expected Value
understand the concepts of conditional probability and independent events;	**Chapter 5: Probability Models** 5.4: Conditional Probability 5.5: Independent Events
understand how to compute the probability of a compound event.	**Chapter 5: Probability Models** 5.3: The Addition Rule and Disjoint Events

1. Problem Solving Standard

Expectations	*Statistics in Action*
Build new mathematical knowledge through problem solving	Addressed in all chapters of *Statistics in Action.*
Solve problems that arise in mathematical and in other contexts	Addressed in all chapters of *Statistics in Action.*
Apply and adapt a variety of appropriate strategies to solve problems	Addressed in all chapters of *Statistics in Action.*
Monitor and reflect on the process of mathematical problem solving	Not typically covered in a statistics course.

2. Reasoning and Proof Standard

Expectations	*Statistics in Action*
Recognize reasoning and proof as fundamental aspects of mathematics	Reasoning is addressed in all chapters of *Statistics in Action,* and proof is addressed in specific exercises of: Section 6.3: The Geometric Distribution.
Develop and evaluate mathematical arguments and proofs	The development of mathematical arguments is addressed in all chapters of *Statistics in Action,* and proof is addressed in specific exercises of: Section 6.3: The Geometric Distribution.
Select and use various types of reasoning and methods of proof	Reasoning is addressed in all chapters of *Statistics in Action.*

3. Communication Standard

Expectations	*Statistics in Action*
Organize and consolidate their mathematical thinking through communication	Written communication is addressed in all chapters of *Statistics in Action,* but with particular emphasis in **Chapter 4: Sample Surveys and Experiments**
Communicate their mathematical thinking coherently and clearly to peers, teachers, and others	Not typically covered in a statistics course.
Analyze and evaluate the mathematical thinking and strategies of others	Not typically covered in a statistics course.
Use the language of mathematics to express mathematical ideas precisely	Addressed in all chapters of *Statistics in Action,* but with particular emphasis in: **Chapter 4: Sample Surveys and Experiments**

4. Connections Standard

Expectations	*Statistics in Action*
Recognize and use connections among mathematical ideas	Addressed in all chapters of *Statistics in Action*.
Understand how mathematical ideas interconnect and build on one another to produce a coherent whole	Addressed in all chapters of *Statistics in Action*.
Recognize and applymathematics in contexts outside of mathematics	Addressed in all chapters of *Statistics in Action,* with particular emphasis in: **Chapter 1: Statistical Reasoning: Investigating a Claim of Discrimination** and in: **Chapter 12: Case Studies.**

5. Representations Standard

Expectations	*Statistics in Action*
Create and use representations to organize, record, and communicate mathematical ideas	Addressed in all chapters of *Statistics in Action.*
Select, apply, and translate among mathematical representations to solve problems	Addressed in all chapters of *Statistics in Action,* but with initial emphasis in: **Chapter 2: Exploring Distributions** and **Chapter 3: Relationships Between Two Quantitative Variables.**
Use representations to model and interpret physical, social, and mathematical phenomena	Addressed in all chapters of *Statistics in Action.*