#### Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Mathematics	Course:	AP Statistics	Unit 1 Title:	Exploring Data	Grade Level(s):	10-12
Assessed Trimester:	Trimester A	Pacing:	25-32 Days	Date Created:	1/29/2014	Last Revision Date:	6/25/2014

#### **Course Understandings**: Students will understand that:

- A. Constructing and interpreting graphical displays of distributions of univariate data will help with the interpretation of data (dotplot, stemplot, histogram, cumulative frequency plot).
- B. Summarizing distributions of univariate data helps them draw appropriate conclusions.
- C. Comparing distributions of univariate data helps to draw conclusions/make comparisons between data sets (dotplots, back-to-back stemplots, parallel boxplots).
- D. Exploring bivariate data helps them draw conclusions and make predictions based on statistics.
- E. Exploring categorical data helps explain association between variables.
- J. Probability is the basis for inference.
- L. The normal distribution is the most common distribution and helps them to determine probabilities of many events.
- N. Estimation from samples can be used to draw conclusions about a population (point estimators and confidence intervals).

# DESIRED RESULTS (Stage 1) - WHAT WE WANT STUDENT TO KNOW AND BE ABLE TO DO?

	Established Goals
Min	nesota State/Local/Technology Standard(s) addressed (2007):
	<ul> <li>Standard (9.4.1.#): Display and analyze data; use various measures associated with data to draw conclusions, identify trends and describe relationships. Benchmark:</li> <li>9.4.1.1 Describe a data set using data displays, including box-and-whisker plots; describe and compare data sets using summary statistics, including mea center and location include mean, median, quartile and percentile. Measures of spread include standard deviation, range and inter-quartile range. Know he technology to display data and calculate summary statistics.</li> <li>9.4.1.2 Analyze the effects on summary statistics of changes in data sets.</li> <li>9.4.1.3 Use scatterplots to analyze patterns and describe relationships between two variables. Using technology, determine regression lines (line of best fi make predictions and correlation coefficients to assess the reliability of those predictions.</li> </ul>

Benchmark:

**9.4.2.2** Identify and explain misleading uses of data; recognize when arguments based on data confuse correlation and causation.

#### AP CollegeBoard

• I. Exploring Data: Describing patterns and departures from patterns (20%–30%)

Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns.

Emphasis should be placed on interpreting information from graphical and numerical displays and summaries.

- a. Student will understand that constructing and interpreting graphical displays of distributions of univariate data will help with the interpretation of data (dotplot, stemplot, histogram, cumulative frequency) plot).
- b. Students will understand that summarizing distributions of univariate data helps us draw appropriate conclusions.
- c. Students will understand that comparing distributions of univariate data helps to draw conclusions/make comparisons between data sets (dotplots, back-to-back stemplots, parallel boxplots)
- d. Students will understand that exploring bivariate data helps us draw conclusions and make predictions based on statistics.
- e. Students will understand that exploring categorical data helps explain association between variables.

sures of center, location and spread. Measures of ow to use calculators, spreadsheets or other

t) and correlation coefficients; use regression lines to

### ACT Testing

- **ACT1** Translate from one representation of data to another (e.g., a bar graph to a circle graph)
- ACT2 Manipulate data from tables and graphs
- **ACT3** Interpret and use information from figures, tables, and graphs
- ACT4 Analyze and draw conclusions based on information from figures, tables, and graphs
- ACT5 Calculate the missing data value, given the average and all data values but one
- ACT6 Distinguish between mean, median, and mode for a list of number

#### Transfer

Students will be able to independently use their learning to: (product, high order reasoning)

- Apply various statistical techniques to analyze results when working on novel research projects. •
- Students will understand that statistical information is a powerful, pervasive force in our world.
- To prepare for other courses that use statistics.

Meaning		
Unit Understanding(s): Students will understand that: • Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns and departures from patterns. In examining distributions of data, students should be able to detect important characteristics, such as shape, location, variability and unusual values. From careful observations of patterns in data, students can generate conjectures about relationships among variables. The notion of how one variable may be associated with another permeates almost all of statistics, from simple comparisons of proportions through linear regression. The difference between association and causation must accompany this conceptual development throughout.	Essential Q Students will keep considering: • How do we obtain data? • How do we understand data? • How do we communicate data? • How and to what extent can you lie with statistics? • Who might want to use statistics in a misleading we • How and to what extent can we predict the future of • How and to what extent can we predict the future of • How are correlation and causation related? • How can modeling data help us to understand part	

## Acquisition

Knowledge - Students will:	Reasoning - Students will:	
<ul> <li>Mean</li> <li>Median</li> <li>Quartile</li> <li>Percentile</li> <li>Standard deviation</li> <li>Range</li> <li>Interquartile range</li> <li>How linear transformations affect measures of center and spread and its effect on correlation</li> <li>How to create/remove outliers affect measures of center and spread</li> <li>Identify whether a point is influential and its effect on slope and correlation</li> <li>Describe strength, direction, form, context of scatterplot</li> <li>Know how to generate least squares regression line, r, r<sup>2</sup> with technology</li> <li>Population percentage</li> <li>Normal curve (bell-shaped)</li> <li>Correlation and causation</li> <li>Center, location, and spread</li> </ul>	<ul> <li>Distinguish the use of the 5-number summary vs</li> <li>Differentiate between adding a constant and mu</li> <li>Justify why a linear transformation does not affect</li> <li>Distinguish whether a point is influential or an out</li> <li>Analyze the impact of outliers/ influential points of</li> <li>Make predictions using least squares regression</li> <li>Justify when it is not reasonable to make predict</li> <li>Recognize when it is appropriate to use mean a</li> <li>Explain why correlation does not imply causation</li> <li>Justify why lurking variables affect correlation</li> <li>Describing and comparing data sets using summ</li> <li>Evaluate and analyze data and graphs, including</li> <li>Predict effect of changing unit measure on summ</li> <li>Analyze patterns in bivariate data</li> </ul>	

## uestion(s):

way? And why might they do so? through data collection?

tterns?

mean standard deviation Itiplying by a constant and its effect on data sets ct correlation ıtlier on slope and correlation n line tions based on domain or correlation value nd standard deviation to describe a data set mary statistics misleading data/graphs nary statistics

tatistics

<ul> <li>Clusters and gaps</li> <li>Outliers and unusual features</li> <li>Shape</li> <li>5 number summary</li> <li>Standardized scores (z-scores)</li> <li>Correlation, linearity, regression equations</li> </ul>	<ul> <li>Skills - Students will:</li> <li>Construct box-and-whisker plots, histograms, ste</li> <li>Calculate or find measure of center, location and</li> <li>Use technology to construct box-and-whisker plote</li> <li>Using technology to calculate measure of center</li> <li>Use scatterplots and least squares regression line</li> <li>Calculate population percentages given m and state</li> </ul>
<ul> <li>Common Misunderstandings</li> <li>Students think bar graphs and histograms are the same</li> <li>Students think the 1.5*IQR Criterion finds what the outlier value is (instead of the outer limit which any data exceeding is considered an outlier)</li> <li>Students confuse skewed left and skewed right</li> <li>Students misinterpret standard deviation</li> <li>Students think standard deviation always changes when the data is transformed</li> <li>Students confuse the terms variation and variance</li> <li>Students confuse r and r<sup>2</sup></li> <li>Students think r and/or r<sup>2</sup> is sufficient evidence for determining if a line is a good fit (instead of also including a residual plot or description of the original scatterplot)</li> <li>Students confuse conditional distributions when to use row totals vs. column totals</li> </ul>	Essential new vocabulary <ul> <li>Bimodal</li> <li>Boxplots</li> <li>Center</li> <li>Dotplots</li> <li>Location</li> <li>Mean</li> <li>Median</li> <li>Mode</li> <li>Normal</li> <li>Ogive</li> <li>Outliers</li> <li>Scatterplot</li> <li>Shape</li> <li>Skewed</li> <li>Spread</li> </ul>
	<ul> <li>Spread</li> <li>Stemplots</li> <li>Symmetric</li> <li>Uniform</li> </ul>

templots and normal distributions d spread ots, histograms, stemplots & normal distributions r, location, spread, display data, and summary statistics ines to make predictions