

Dublin City Schools Mathematics Graded Course of Study

A.P. Statistics

Course Description: The collection, processing, interpretation, and presentation of numerical data all belong to the domain of statistics. This course will stress the development of statistical thinking, the assessment of credibility and the value of the inferences made from data, both by those who consume them and those who produce them. Students need little or no background in statistics and will be given the opportunity to take the AP Statistics exam in May. The computer will be used to produce graphic displays of data. A graphing calculator is required.

I. AP Statistics Major Topic: **Exploring Data: Describing patterns and departures from patterns**

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.

Topics

AP Stats Indicators

Topics	AP Stats Indicators
A. Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot)	<ol style="list-style-type: none">1. Center and spread2. Clusters and gaps3. Outliers and other unusual features4. Shape
B. Summarizing distributions of univariate data	<ol style="list-style-type: none">1. Measuring center: median, mean2. Measuring spread: range, interquartile range, standard deviation3. Measuring position: quartiles, percentiles, standardized scores (z-scores)4. Using boxplots5. The effect of changing units on summary measures
C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)	<ol style="list-style-type: none">1. Comparing center and spread: within group, between group variation2. Comparing clusters and gaps3. Comparing outliers and other unusual features4. Comparing shapes
D. Exploring bivariate data	<ol style="list-style-type: none">1. Analyzing patterns in scatterplots2. Correlation and linearity3. Least-squares regression line4. Residual plots, outliers, and influential points

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	5. Transformations to achieve linearity: logarithmic and power transformations
E. Exploring categorical data	<ol style="list-style-type: none">1. Frequency tables and bar charts2. Marginal and joint frequencies for two-way tables3. Conditional relative frequencies and association4. Comparing distributions using bar charts



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II. AP Statistics Major Topic: **Sampling and Experimentation: Planning and conducting a study**

Data must be collected according to a well-developed plan if valid information on a conjecture is to be obtained. This plan includes clarifying the question and deciding upon a method of data collection and analysis.

Topics

AP Stats Indicators

Topics	AP Stats Indicators
A. Overview of methods of data collection	<ol style="list-style-type: none"> 1. Census 2. Sample survey 3. Experiment 4. Observational study
B. Planning and conducting surveys	<ol style="list-style-type: none"> 1. Characteristics of a well-designed and well-conducted survey 2. Populations, samples, and random selection 3. Sources of bias in sampling and surveys 4. Sampling methods, including simple random sampling, stratified random sampling, and cluster sampling
C. Planning and conducting experiments	<ol style="list-style-type: none"> 1. Characteristics of a well-designed and well-conducted experiment 2. Treatments, control groups, experimental units, random assignments, and replication 3. Sources of bias and confounding, including placebo effect and blinding 4. Completely randomized design 5. Randomized block design, including matched pairs design
D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys	<ol style="list-style-type: none"> 1. Experiment vs. observational study 2. Basic principles of experimental design: control, randomization and replication 3. Use of control groups and placebos 4. Block design; matched pairs; blinding

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III. AP Statistics Major Topic: Anticipating Patterns - Exploring random phenomena using probability and simulation

Probability is the tool used for anticipating what the distribution of data should look like under a given model.

Topics

AP Stats Indicators

<p>A. Probability</p>	<ol style="list-style-type: none"> Interpreting probability, including long-run relative frequency interpretation “Law of Large Numbers” concept Addition rule, multiplication rule, conditional probability, and independence Discrete random variables and their probability distributions, including binomial and geometric Simulation of random behavior and probability distributions Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable
<p>B. Combining independent random variables</p>	<ol style="list-style-type: none"> Notion of independence versus dependence Mean and standard deviation for sums and differences of independent random variables
<p>C. The normal distribution</p>	<ol style="list-style-type: none"> Properties of the normal distribution Using tables of the normal distribution The normal distribution as a model for measurements
<p>D. Sampling distributions</p>	<ol style="list-style-type: none"> Sampling distribution of a sample proportion Sampling distribution of a sample mean Central Limit Theorem Sampling distribution of a difference between two independent sample proportions

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	<ol style="list-style-type: none">5. Sampling distribution of a difference between two independent sample means6. Simulation of sampling distributions7. t-distribution8. Chi-square distribution
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IV. AP Statistics Major Topic: **Statistical Inference: Estimating population parameters and testing hypotheses**

Statistical inference guides the selection of appropriate models.

Topics

AP Stats Indicators

<p>A. Estimation (point estimators and confidence intervals)</p>	<ol style="list-style-type: none"> 1. Estimating population parameters and margins of error 2. Properties of point estimators, including unbiasedness and variability 3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals 4. Large sample confidence interval for a proportion 5. Large sample confidence interval for a difference between two proportions 6. Confidence interval for a mean 7. Confidence interval for a difference between two means (unpaired and paired) 8. Confidence interval for the slope of a least-squares regression line
<p>B. Tests of significance</p>	<ol style="list-style-type: none"> 1. Logic of significance testing, null and alternative hypotheses; p-values; one- and two-sided tests; concepts of Type I and Type II errors; concept of power 2. Large sample test for a proportion 3. Large sample test for a difference between two proportions 4. Test for a mean 5. Test for a difference between two means (unpaired and paired) 6. Chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables) 7. Test for the slope of a least-squares regression line

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V. Content Standard: Mathematical Processes

The benchmarks for mathematical processes articulate what students should demonstrate in problem solving, representation, communication, reasoning and connections at key points in their mathematics program. Specific grade-level indicators have not been included for the mathematical processes standard because content and processes should be interconnected at the indicator level. Therefore, mathematical processes have been embedded within the grade-level indicators for the five content standards

- A. Formulate a problem or mathematical model in response to a specific need or situation, determine information required to solve the problem, choose method for obtaining this information, and set limits for acceptable solution.
- B. Apply mathematical knowledge and skills routinely in other content areas and practical situations.
- C. Recognize and use connections between equivalent representations and related procedures for a mathematical concept; e.g., zero of a function and the x -intercept of the graph of the function, apply proportional thinking when measuring, describing functions, and comparing probabilities.
- D. Apply reasoning processes and skills to construct logical verifications or counter-examples to test conjectures and to justify and defend algorithms and solutions.
- E. Use a variety of mathematical representations flexibly and appropriately to organize, record and communicate mathematical ideas.
- F. Use precise mathematical language and notations to represent problem situations and mathematical ideas.
- G. Write clearly and coherently about mathematical thinking and ideas.
- H. Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.