The Des Moines Public Schools Curriculum guide contains the prioritized standards, required pacing, materials and resources, and assessment correlates for the school year. This document is intended to be used in conjunction with our balanced assessment plan to scaffold our students in mastery of the Iowa Core State Standards.

**AP Statistics: Des Moines Public Schools**

**2018-2019 CURRICULUM GUIDE MTH 551/552 MTH 555/556**

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| **AP Statistics** |
| The AP Statistics course is equivalent to a one-semester, introductory, non-calculus-based college course in statistics. The course introduces students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. There are four themes in the AP Statistics course: exploring data, sampling and experimentation, anticipating patterns, and statistical inference. Students use technology, investigations, problem solving, and writing as they build conceptual understanding.  **Topic Outline for AP Statistics**  *I. Exploring Data*  • Constructing and interpreting graphical displays of distributions of univariate data  • Summarizing and comparing distributions of univariate data  • Exploring bivariate and categorical data  *II. Sampling and Experimentation*  • Planning and conducting surveys and experiments using appropriate methods of data collection  • Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys  *III. Anticipating Patterns*  • Exploring random phenomena using probability and simulation  • Combining independent random variables  • The normal distribution  • Sampling distributions  *IV. Statistical Inference*  • Estimating population parameters and testing hypotheses  • Tests of significance  **AP Statistics Exam**  Exam questions are based on the topics and skills addressed in the AP Statistics course. Formulas and tables needed to complete exam questions are provided to students taking the exam. Students are expected to use a graphing calculator with statistical capabilities on the entire exam.  **Format of Assessment**  **Section I: Multiple Choice | 40 Questions | 90 Minutes |50% of Exam Score**  • Individual Questions  **Section II: Constructed Response | 6 Questions | 90 Minutes | 50% of Exam Score**  • 5 Short-Answer Questions • 1 Investigative Tasks  **Link to Course Information @ AP Central:** <http://apcentral.collegeboard.com/apc/public/courses/teachers_corner/2151.html> |

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| **College Board Curriculum Framework Alignment – Semester 1 Topics** | |
| **Exploring Data** | **I. Exploring Data: Describing patterns and departures from patterns**  A. Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot)  1. Center and spread  2. Clusters and gaps  3. Outliers and other unusual features  4. Shape  B. Summarizing distributions of univariate data  1. Measuring center: median, mean  2. Measuring spread: range, interquartile range, standard deviation  4. Using boxplots  C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)  1. Comparing center and spread: within group, between group variation  2. Comparing clusters and gaps  3. Comparing outliers and other unusual features  4. Comparing shapes |
| **Modeling Distributions** | **I. Exploring Data: Describing patterns and departures from patterns**  B. Summarizing distributions of univariate data  3. Measuring position: quartiles, percentiles, standardized scores (z-scores)  5. The effect of changing units on summary measures  **III. Anticipating Patterns: Exploring random phenomena using probability and simulation**  A. Probability  6. Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable  B. Combining independent random variables  1. Notion of independence versus dependence  2. Mean and standard deviation for sums and differences of independent random variables  C. The normal distribution  1. Properties of the normal distribution  2. Using tables of the normal distribution  3. The normal distribution as a model for measurements |
| **Bivariate Data** | **I. Exploring Data: Describing patterns and departures from patterns**  D. Exploring bivariate data  1. Analyzing patterns in scatterplots  2. Correlation and linearity  3. Least-squares regression line  4. Residual plots, outliers and influential points |
| **Sampling and Experimentation** | **II. Sampling and Experimentation: Planning and conducting a study**  A. Overview of methods of data collection  1. Census  2. Sample survey  3. Experiment  4. Observational study  B. Planning and conducting surveys  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  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 |

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| **Probability** | **I. Exploring Data: Describing patterns and departures from patterns**  E. Exploring categorical data  1. Frequency tables and bar charts  2. Marginal and joint frequencies for two-way tables  3. Conditional relative frequencies and association  **III. Anticipating Patterns: Exploring random phenomena using probability and simulation**  A. Probability  1. Interpreting probability, including long-run relative frequency interpretation  2. “Law of Large Numbers” concept  3. Addition rule, multiplication rule, conditional probability and independence  **I. Exploring Data: Describing patterns and departures from patterns**  E. Exploring categorical data  1. Frequency tables and bar charts  2. Marginal and joint frequencies for two-way tables  3. Conditional relative frequencies and association |
| **AP Style (MC)** | AP-style multiple choice questions are based on the topics and skills addressed in the AP Statistics course. Formulas and tables needed to complete exam questions are provided to students. Students are expected to use a graphing calculator with statistical capabilities on the entire exam. |

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| **College Board Curriculum Framework Alignment – Semester 2 Topics** | |
| **Distributions** | **III. Anticipating Patterns: Exploring random phenomena using probability and simulation**  A. Probability  4. Discrete random variables and their probability distributions, including binomial and geometric  5. Simulation of random behavior and probability distributions  D. Sampling distributions  1. Sampling distribution of a sample proportion  2. Sampling distribution of a sample mean  3. Central Limit Theorem  6. Simulation of sampling distributions |
| **Confidence Intervals** | **IV. Statistical Inference: Estimating population parameters and testing hypotheses**  A. Estimation (point estimators and confidence intervals)  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  6. Confidence interval for a mean |
| **Tests of Significance** | **III. Anticipating Patterns: Exploring random phenomena using probability and simulation**  D. Sampling distributions  7. t-distribution  **IV. Statistical Inference: Estimating population parameters and testing hypotheses**  B. Tests of significance  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  4. Test for a mean |
| **Comparing Two Populations** | **III. Anticipating Patterns: Exploring random phenomena using probability and simulation**  D. Sampling distributions  4. Sampling distribution of a difference between two independent sample proportions  5. Sampling distribution of a difference between two independent sample means  7. t-distribution  **IV. Statistical Inference: Estimating population parameters and testing hypotheses**  A. Estimation (point estimators and confidence intervals)  5. Large sample confidence interval for a difference between two proportions  7. Confidence interval for a difference between two means (unpaired and paired)  B. Tests of significance  3. Large sample test for a difference between two proportions  5. Test for a difference between two means (unpaired and paired) |
| **Inference for Categorical Data** | **III. Anticipating Patterns: Exploring random phenomena using probability and simulation**  D. Sampling distributions  8. Chi-square distribution  **I. Exploring Data: Describing patterns and departures from patterns**  E. Exploring categorical data  4. Comparing distributions using bar charts  **IV. Statistical Inference: Estimating population parameters and testing hypotheses**  6. Chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables) |
| **AP Style (MC)** | AP-style multiple choice questions are based on the topics and skills addressed in the AP Statistics course. Formulas and tables needed to complete exam questions are provided to students. Students are expected to use a graphing calculator with statistical capabilities on the entire exam. |

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| Exploring Data – Semester 1 |
| **Text and Resources** |
| *Chapter 1* |

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|  | **Topic: Exploring Data** |
| **4** | In addition to meeting the level 3, the student makes in-depth inferences and applications that go beyond the learning goal. |
| **3** | *The student demonstrates the ability to:*  3A: Interpreting graphical displays of distributions; using appropriate measures of center and spread.  3B: Comparing graphical representations of distributions. |
| **2** | *The student demonstrates the ability to:*  2A: Summarizing distributions.   * 1. Measuring center   2. Measuring spread   3. Calculating outliers   2B: Constructing a graphical representation of a distribution. |

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| Modeling Distributions – Semester 1 |
| **Text and Resources** |
| *Chapter 2* |

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|  | **Topic: Modeling Distributions** |
| **4** | In addition to meeting the level 3, the student makes in-depth inferences and applications that go beyond the learning goal. |
| **3** | *The student demonstrates the ability to:*  3A: Interpret the meaning of the area under the normal curve.  3B: Solve for values using the area under the normal curve.  3C: Comparing two sets of data by normalizing data. |
| **2** | *The student demonstrates the ability to:*  2A: Find the area under the normal distributions using z-scores and 68%-95%-99.7%.  2B: Make an appropriate graph to determine whether a distribution is bell-shaped.  2C: Compute a z score. |

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| Bivariate Data – Semester 1 |
| **Text and Resources** |
| *Chapter 3*  Mixer problem set: weight vs. price |

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|  | **Topic: Bivariate Data** |
| **4** | In addition to meeting the level 3, the student makes in-depth inferences and applications that go beyond the learning goal. |
| **3** | *The student demonstrates the ability to:*  3A: Interpret the slope, y-intercept, residual, and correlation of a least squares regression line.  3B: Interpret r2 in context of the problem.  3C: Use standard deviations and means to calculate the regression line.  3D: Interpret a scatterplot (DFSO). |
| **2** | *The student demonstrates the ability to:*  2A: Find the equations for a least squares regression line and the residuals.  2B: Find r and r2.  2C: Calculate slope and y-intercept.  2D: Construct a scatterplot. |

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| Sampling and Experimentation – Semester 1 |
| **Text and Resources** |
| *Chapter 4*  Experimental Design Project: C. Olsen Scenarios |

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|  | **Topic: Sampling and Experimentation** |
| **4** | In addition to meeting the level 3, the student makes in-depth inferences and applications that go beyond the learning goal. |
| **3** | *The student demonstrates the ability to:*  3A: Create an experimental design that is appropriate for the given scenario.  3B: Design a sampling method for a random sample for a given scenario. |
| **2** | *The student demonstrates the ability to:*  2A: Identify and support types of experimental design in a given scenario.  2A2: Distinguish between an observational study and an experiment.  2A3: Identify the experimental units (subjects), explanatory variables (factors), treatments, and response variables in an experiment.  2A4: Explain why random assignment is an important experimental design principle.  2B1: Identify type of sampling in a given scenario.  2B2: Use table D to create a random sample.  2B3: Identify type of bias in a given scenario. |
| Probability – Semester 1 | |
| **Text and Resources** | |
| *Chapter 5, Chapter 6.1*  Success Criteria: Use basic probability rules, including the complement rule and the addition rule for mutually exclusive events. | |

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|  | **Topic: Probability** |
| **4** | In addition to meeting the level 3, the student makes in-depth inferences and applications that go beyond the learning goal. |
| **3** | Students demonstrate the ability to:  3A: Design simulations to model chance behavior.  3B: Interpret probabilities using random variables.  3C: Generate conditional probabilities.  3D: Determine whether two events are independent.  3E: Interpret the mean and standard deviation of a random variable.  3F: Calculate linear transformations for combining random variables. |
| **2** | Students demonstrate the ability to:  2A: Use Table D or technology to create a random sample.  2B1: Find probabilities of random variables.  2B2: Create appropriate displays of distributions.  2C/D1: Use general addition rule and multiplication rule to generate probabilities.  2C/D2: Find the probability that an event occurs using a two-way table.  2E: Calculate the mean and standard deviation of a random variable.  2F: Recognize the different rules for combining random variables. |

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| Distributions – Semester 2 |
| **Text and Resources** |
| *Chapter 6, 7* |

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|  | **Topic: Distributions** |
| **4** | In addition to meeting the level 3, the student makes in-depth inferences and applications that go beyond the learning goal. |
| **3** | *The student demonstrates the ability to:*  3A: Calculate probabilities using binomial and geometric probabilities.  3B: Find and interpret a probability using a sampling distribution for a proportion.  3C: Find and interpret a probability using a sampling distribution for a mean. |
| **2** | *The student demonstrates the ability to:*  2A: Identify when a scenario is binomial or geometric.  2B/C: Check conditions using appropriate formulas and language.  2B/C: Find the mean and standard deviation of the sampling distribution. |

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| Confidence Intervals – Semester 2 |
| **Text and Resources** |
| *Chapter 8* |

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|  | **Topic: Confidence Intervals** |
| **4** | In addition to meeting the level 3, the student makes in-depth inferences and applications that go beyond the learning goal. |
| **3** | *The student demonstrates the ability to:*  3A: Interpret a confidence interval or level for proportions, in context.  3B: Interpret a confidence interval or level for means, in context. |
| **2** | *The student demonstrates the ability to:*  2A: Construct a confidence interval for proportions.  2B: Construct a confidence interval for means.  2A/B: Find the appropriate critical value.  2A/B: Check conditions.  2C: Identify the which formula to use (population proportion or mean) |

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| Significance Tests – Semester 2 |
| **Text and Resources** |
| *Chapter 9*  Applying confidence Intervals to hypothesis testing. |

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|  | **Topic: Significance Tests** |
| **4** | In addition to meeting the level 3, the student makes in-depth inferences and applications that go beyond the learning goal. |
| **3** | *The student demonstrates the ability to:*  3A: Perform and interpret a significance test for proportions.  3B: Perform and interpret a significance test for means.  3C: Interpret Type I and Type II error in context and the consequence of each. |
| **2** | *The student demonstrates the ability to:*  2A/B: State the appropriate significance level.  2A/B: State the appropriate hypotheses.  2A/B: Check conditions.  2C: Identify Type I and Type II error. |

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| Comparing Populations – Semester 2 |
| **Text and Resources** |
| *Chapter 10* |

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|  | **Topic: Comparing Populations** |
| **4** | In addition to meeting the level 3, the student makes in-depth inferences and applications that go beyond the learning goal. |
| **3** | *The student demonstrates the ability to:*  3A: Interpret a confidence interval for proportions for two populations **or** for means for two populations, in context.  3B: Perform a significance test for proportions for two populations **or** for means for two populations. |
| **2** | *The student demonstrates the ability to:*  2A: Construct a confidence interval for proportions for two populations **or** for means for two populations.  2A/B: Find the appropriate critical value.  2C/D: State the appropriate hypotheses.  2A/B/C/D: Check conditions. |

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| Inference for Categorical Data – Semester 2 |
| **Text and Resources** |
| *Chapter 11*  Examine the individual components of the Chi-Squared test as part of a follow-up analysis. |

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|  | **Topic: Inference for Categorical Data** |
| **4** | In addition to meeting the level 3, the student makes in-depth inferences and applications that go beyond the learning goal. |
| **3** | *The student demonstrates the ability to:*  3A: Use and interpret a Chi-Squared test for the goodness of fit.  3B: Use and interpret a Chi-Squared test for homogeneity/association/independence. |
| **2** | *The student demonstrates the ability to:*  2A/B/C: Check conditions.  2A: Show how to compute expected counts, conditional distributions, and contributions to the Chi-Squared statistic. |

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| SRG Scale Score | Topic: AP-Style Assessments | AP Exam  Score Conversion |
| 4 | In addition to meeting the learning goal, the student demonstrates in-depth inferences and applications that go beyond the goal. | **90-100%** |
| 3.5 | Student’s performance reflects exceptional facility with **some**, but not all Level 4 learning targets. | **80-89%** |
| 3  Learning Goal | Student’s performance reflects success on **all Level 3** learning targets. | **70-79%** |
| 2.5 | Student’s performance reflects success on **some**, but not all, Level 3 learning targets. | **60-69%** |
| 2 | Student’s performance reflects success on **all Level 2** learning targets. | **50-59%** |
| 1.5 | Student’s performance reflects success on **some,** but not all, Level 2 learning targets. | **40-49%** |
| 1 | Student’s performance reflects insufficient progress towards foundational skills and knowledge. | **20-39%** |