Winslow Township School District
Mathematics Curriculum – Algebra 2
Unit 4

Overview	Standards for Mathematical Content		Unit Focus	Standards for Mathematical Practice
Unit 4 **Making Inference, Justifying Conclusion and Conditional Probability**	• S.ID.A.4 • S.IC.A.1 • S.IC.A.2 • S.IC.B.3 • S.IC.B.4 • S.IC.B.5 • S.IC.B.6	• S.CP.A.1 • S.CP.A.2 • S.CP.A.3 • S.CP.A.4 • S.CP.A.5 • S.CP.B.6 • S.CP.B.7	• Summarize, represent, and interpret data on a single count or measurement variable • Understand and evaluate random processes underlying statistical experiments • Make inferences and justify conclusions from sample surveys, experiments and observational studies • Understand the independence and conditional probability and use them to interpret data • Use the rules of probability to compute probabilities of compound events in a uniform probability model	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.3 Construct viable arguments & critique the reasoning of others. MP.4 Model with mathematics.
Unit 4: *Suggested Open Educational Resources*	S.ID.A.4 Do You Fit in This Car? S.IC.A.1 School Advisory Panel S.IC.A.2 Sarah, the chimpanzee S.IC.B.3 Strict Parents S.IC.B.4 Margin of Error for Estimating a Population Mean		S.CP.A.1 Describing Events S.CP.A.2 Cards and Independence S.CP.A.3 Lucky Envelopes S.CP.A.4 Two-Way Tables and Probability S.CP.A.5 Breakfast Before School S.CP.B.6 The Titanic 1 S.CP.B.7 The Addition Rule S.CP.B.7 Rain and Lightning	MP.5 Use appropriate tools strategically. MP.6 Attend to precision. MP.7 Look for and make use of structure. MP.8 Look for and express regularity in repeated reasoning.

Major Supporting Additional (Identified by PARCC Model Content Frameworks).

Curriculum Unit 4	Standards		Pacing	
			Days	**Unit Days**
Unit 4 **Making Inference, Justifying Conclusion and Conditional Probability**	• S.CP.A.1 • S.CP.A.2 • S.CP.A.3 • S.CP.A.4 • S.CP.A.5 • S.CP.B.6 • S.CP.B.7 • S.ID.A.4	Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). Use two-way frequency tables to determine if events are independent and to calculate conditional probability. Use everyday language to explain independence and conditional probability in real-world situations. Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A and apply the Addition Rule [$P(A$ or $B) = P(A) + P(B) - P(A$ and $B)$]. Use the mean and standard deviation of a data set to fit it to a normal distribution, estimate population percentages, and recognize that there are data sets for which such a procedure is not appropriate (use calculators, spreadsheets, and tables to estimate areas under the normal curve).	13	45
	• S.IC.A.1 • S.IC.A.2	Identify and evaluate random sampling methods. Determine if the outcomes and properties of a specified model are consistent with results from a given data-generating process (e.g. using simulation).	10	
	• S.IC.B.3 • S.IC.B.4 • S.IC.B.5 • S.IC.B.6	Identify the differences among and purposes of sample surveys, experiments, and observational studies, explaining how randomization relates to each. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. Use data from a randomized experiment to compare two treatments and use simulations to decide if differences between parameters are significant; evaluate reports based on data.	17	
	Assessment, Re-teach and Extension		5	

Unit 4 Algebra 2		
Content Standards	**Suggested Standards for Mathematical Practice**	**Critical Knowledge & Skills**
● S.ID.A.4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics.	Concepts: ● Mean and standard deviation are used to fit in a normal distribution ● Population percentages may be estimated when the data are approximately normally distributed. Students are able to: ● identify data sets as approximately normally distributed or not. ● explain the 68-95-99.7 rule for normal distributions (approximately 68% of the area under a normal distribution curve is within one standard deviation, approximately 95% of the area under a normal distribution curve is within two standard deviations, etc). ● use the mean and standard deviation of a normal distribution to estimate population percentages. ● use calculators, spreadsheets, and tables to estimate areas under the normal curve and interpret in context. Learning Goal 1: Use the mean and standard deviation of a data set to fit it to a normal distribution, estimate population percentages, and recognize that there are data sets for which such a procedure is not appropriate (use calculators, spreadsheets, and tables to estimate areas under the normal curve).
● S.IC.A.1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics.	Concepts: ● Statistics is a process for making inferences about a population based on analysis of a random sample from the population. Students are able to: ● identify and evaluate random sampling methods. ● explain the importance of randomness to sampling and inference making. ● explain the difference between values that describe a population and a sample, in context. Learning Goal 2: Identify and evaluate random sampling methods.
● S.IC.A.2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails*	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics.	Concepts: ● Random processes can be described mathematically by using a model: a list or description of possible outcomes. Students are able to: ● determine whether a given model is consistent with results from and experiment.

in a row cause you to question the model?		● know the difference between experimental and theoretical modeling. ● know how far predictions can be projected based on sample size. ● design simulations of random sampling. Learning Goal 3: Determine if the outcomes and properties of a specified model are consistent with results from a given data-generating process (e.g. using simulation).
● S.IC.B.3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	MP.4 Model with mathematics.	Concepts: ● Collecting data from a random sample of a population makes it possible to draw conclusions about the whole population. ● Randomly assigning individuals to different treatments allows a fair comparison of the effectiveness of those treatments. ● Sample surveys, experiments, and observational studies serve different statistical purposes allowing for different statistical analyses. Students are able to: ● distinguish between sample surveys, experiments, and observational studies. ● explain the importance of randomization in each of these processes. ● identify voluntary response samples and convenience samples. ● describe simple random samples, stratified random samples, and cluster samples. ● explain how under coverage, nonresponse, and question wording can lead to bias in a sample survey. Learning Goal 4: Identify the differences among and purposes of sample surveys, experiments, and observational studies, explaining how randomization relates to each.
● S.IC.B.4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision.	Concepts: ● Appropriately drawn samples of a population may be used to estimate a population mean or population proportion. ● Relationship between margin of error, variation with a data set, and variability in the population Students are able to: ● conduct simulations of random sampling to gather samples. ● estimate population means with sample means. ● estimate population proportions with sample proportions. ● calculate martins of error for the estimates. ● explain how the results relate to variability in the population.

		Learning Goal 5: Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
● S.IC.B.5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant ● S.IC.B.6. Evaluate reports based on data.	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision.	Concepts: ● A statistically significant outcome is one that is unlikely to be due to chance alone. Students are able to: ● conduct a t-test to evaluate the effectiveness and differences in two treatments. ● use simulations to generate data simulating applying two treatments. ● use the results of simulations to determine if the differences are significant. ● read and explain, in the context of the situation, data from outside reports – discussing experimental study design, drawing conclusions from graphical and numerical summaries, and identifying characteristics of the experimental design. Learning Goal 6: Use data from a randomized experiment to compare two treatments and use simulations to decide if differences between parameters are significant; evaluate reports based on data.
● S.CP.A.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").	MP.1 Make sense of problems and persevere in solving them. MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision.	Concepts: ● Events are described as subsets of a sample space. Students are able to: ● identify a sample space, recognizing it as the set of all possible outcomes. ● identify and describe subsets of a sample space as events. ● describe unions, intersections and complements of events. ● visualize unions, intersections and complements of events with Venn diagrams. Learning Goal 7: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
● S.CP.A.2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.	MP.1 Make sense of problems and persevere in solving them.	Concepts: ● Two events A and B are independent if the probability of A and B occurring together is the product of their probabilities. ● Independence of event A and event B means that the conditional probability of A given B is the same as the probability of, and the conditional probability of B given A is the same as the probability of B.

● S.CP.A.3. Understand the conditional probability of *A* given *B* as P(*A* and *B*)/P(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*. ● S.CP.A.4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.* ● S.CP.A.5. Recognize and explain the NEW Concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision.	Students are able to: ● identify events as independent or dependent. ● interpret the conditional probability of A given B as answering the question 'now that B *has* occurred, what is the probability that event A will occur?'. ● determine the conditional probability of *A* given *B* using P(*A* and *B*)/P(*B*). ● represent conditional probability of *A* given *B* as P(A|B). ● calculate conditional probabilities. ● construct two-way frequency tables for two categorical variables. ● calculate probabilities from the two-way frequency table. ● use the probabilities to assess independence of two variables. Learning Goal 8: Use two-way frequency tables to determine if events are independent and to calculate conditional probability. Use everyday language to explain independence and conditional probability in real-world situations.
● S.CP.B.6. Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model.	MP.1 Make sense of problems and persevere in solving them.	Concepts: ● Mutually exclusive events exist. Students are able to: ● analyze event B's outcomes to determine the proportion of B's outcomes that also belong to event A.

● S.CP.B.7. Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.	MP.2 Reason abstractly and quantitatively. MP.4 Model with mathematics. MP.5 Use appropriate tools strategically. MP.6 Attend to precision.	● interpret this proportion as conditional probability of A given B. ● identify two events as mutually exclusive (disjoint). ● calculate probabilities using the Addition rule P(A or B) = P(A) + P(B) – P(A and B). Learning Goal 9: Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A* and apply the Addition Rule [*P(A or B) = P(A) + P(B) – P(A and B)*].

Unit 4 Algebra 2	
District/School Formative Assessment Plan	**District/School Summative Assessment Plan**
Pre-Assessment, Quizzes Exit Tickets Daily Monitoring Linkit!	Unit Benchmark Linkit! PARCC Diagnostic
Focus Mathematical Concepts	

Prerequisite skills:

In grades 7 and 8, students encountered the development of basic probability, including chance processes, probability models and sample spaces. In high school, the relative frequency approach to probability is extended to conditional probability and independence, rules of probability and their use in finding probabilities of compound events, and the use of probability distributions to solve problems involving expected value.

Common Misconceptions:

Using the wrong total from the frequency table.

Misunderstanding between the connection of joint frequency, marginal frequency, and conditional relative frequency

Finding the wrong probability.

Fluency Recommendations:

A-SSE.A.2 The ability to see structure in expressions and to use this structure to rewrite expressions is a key skill in everything from advanced factoring (e.g., grouping) to summing series to the rewriting of rational expressions to examine the end behavior of the corresponding rational function.

F-IF.A.3 Fluency in translating between recursive definitions and closed forms is helpful when dealing with many problems involving sequences and series, with applications ranging from fitting functions to tables to problems in finance.

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District/School Tasks	District/School Primary and Supplementary Resources and Technology Integration
PARCC Released Items **http://www.parcc-assessment.org/released-items** **NJDOE Digital Item Library** **https://nj.digitalitemlibrary.com/home** **NJSLA Mathematics Evidence Statements** **https://docs.google.com/spreadsheets/d/18M5r1jk4P729fTpAlWAzrw1gE6tken233I-Yk0U712M/edit#gid=554025491** **LinkIt! Form A, B, & C**	**Textbook** **IXL** https://www.ixl.com/ **Khan Academy** https://www.khanacademy.org/ **HS Flip Book:** http://community.ksde.org/Default.aspx?tabid=5646 **North Carolina Dept of Ed. Wikispaces:** http://maccss.ncdpi.wikispaces.net/High+School **101 Math Discourse Questions:** http://www.casamples.com/downloads/100MathDiscourseQuestions_Printable.pdf **Asking Effective Questions** http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/CBS_AskingEffectiveQuestions.pdf **Diversity, Equity & Inclusion Educational Resources** https://www.nj.gov/education/standards/dei/

Instructional Best Practices and Exemplars	
1. Identifying similarities and differences 2. Summarizing and note taking 3. Reinforcing effort and providing recognition 4. Homework and practice 5. Nonlinguistic representations	6. Cooperative learning 7. Setting objectives and providing feedback 8. Generating and testing hypotheses 9. Cues, questions, and advance organizers 10. Manage response rate

Vocabulary			
bell curve population proportion random variable sampling	simple random sampling statistic systematic random sample categorical data complementary events	correlation coefficient Numerical data probability distribution random sample standard deviation	survey theoretical probability census conditional probability counting methods

9.1 Personal Financial Literacy, 9.2 Career Awareness, Exploration, Preparation and Training & 9.4 Life Literacies and Key Skills

9.1.12.CFR.4: Demonstrate an understanding of the interrelationships among attitudes, assumptions, and patterns of behavior regarding money, saving, investing, and work across cultures.

9.1.12.CDM.1: Identify the purposes, advantages, and disadvantages of debt.

9.1.12.CDM.2: Compare and contrast the advantages and disadvantages of various types of mortgages.

9.1.12.CDM.4: Identify issues associated with student loan debt, requirements for repayment, and consequences of failure to repay student loan debt.

9.1.12.CDM.6: Compute and assess the accumulating effect of interest paid over time when using a variety of sources of credit. (e.g., student loans, credit cards, auto loans, mortgages, etc.).

9.1.12.CDM.7: Calculate a mortgage payment based on type of loan, down payment, credit score, and loan interest rate.

9.1.12.CDM.8: Compare and compute interest and compound interest and develop an amortization table using business tools.

9.1.12.CP.3: Summarize factors that affect a positive credit rating, including on-time payments, debt versus available credit, length of open credit, and how often you apply for credit.

9.1.12.CP.5: Create a plan to improve and maintain an excellent credit rating.

9.1.12.CP.6: Explain the effect of debt on a person's net worth.

9.1.12.RM.3: Compare the cost of various types of insurance (e.g., life, homeowners, motor vehicle) for the same product or service, strategies to lower costs, and the process for filing an insurance claim.

9.1.12.RM.4: Determine when and why it may be appropriate for the government to provide insurance coverage rather than private industry.

9.2.12.CAP.15: Demonstrate how exemptions, deductions, and deferred income (e.g., retirement or medical) can reduce taxable income.

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8)

9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience (e.g., S-ID.B.6b, HS-LS2-4).

9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.

9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.

The implementation of the 21st Century skills and standards for students of the Winslow Township District is infused in an interdisciplinary format in a variety of curriculum areas that include, English language Arts, Mathematics, School Guidance, Social Studies, Technology, Visual and Performing Arts, Science, Physical Education and Health, and World Language.

Additional opportunities to address 9.1, 9.2 & 9.4:

Philadelphia Mint

https://www.usmint.gov/learn/kids/resources/educational-standards

Different ways to teach Financial Literacy.

https://www.makeuseof.com/tag/10-interactive-financial-websites-teach-kids-money-management-skills/

Suggested Modifications for Special Education/504

Students with special needs: The students' needs will be addressed on an individual and grade level using a variety of modalities. Accommodations will be made for those students who need extra time to complete assignments. Support staff will be available to aid students related to IEP specifications. 504 accommodations will also be attended to by all instructional leaders. Physical expectations and modifications, alternative assessments, and scaffolding strategies will be used to support this learning. The use of Universal Design for Learning (UDL) will be considered for all students as teaching strategies are considered.

☐ Provide the opportunity to re-take tests

☐ Modify activities/assignments/projects/assessments

☐ Breakdown activities/assignments/projects/assessments into manageable units

☐ Additional time to complete activities/assignments/projects/assessments

☐ Provide an option for alternative activities/assignments/projects/assessments

☐ Modify Content

☐ Modify Amount

☐ Small Group Intervention/Remediation

☐ Individual Intervention/Remediation

☐ Additional Support Materials

☐ Guided Notes

☐ Graphic Organizers

☐ Adjust Pacing of Content

☐ Increase one on one time

☐ Peer Support

☐ Other Modifications for Special Education:

Modifications for At-Risk Students

Formative and summative data will be used to monitor student success. At first signs of failure, student work will be reviewed to determine support. This may include parent consultation, basic skills review and differentiation strategies. With considerations to UDL,   time may be a factor in overcoming developmental considerations

☐ Provide the opportunity to re-take tests

☐ Increase one on one time

☐ Oral prompts can be given

☐ Using visual demonstrations, illustrations, and models

☐ Give directions/instructions verbally and in simple written format

☐ Peer Support

☐ Modify activities/assignments/projects/assessments

☐ Additional time to complete activities/assignments/projects/assessments

☐ Provide an option for alternative activities/assignments/projects/assessments

☐ Modify Content

☐ Modify Amount

☐ Adjust Pacing of Content

☐ Small Group Intervention/Remediation

☐ Individual Intervention/Remediation

☐ Additional Support Materials

☐ Guided Notes

☐ Graphic Organizers

☐ Other Modifications for Students At-Risk:

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Suggested for English Language Learners	Suggested Modifications for Gifted Students

All WIDA Can Do Descriptors can be found at this link: https://wida.wisc.edu/teach/can-do/descriptors
 ☐ Grades 9-12 WIDA Can Do Descriptors:
   ☐ Listening ☐ Speaking
   ☐ Reading ☐ Writing
   ☐ Oral Language
 Students will be provided with accommodations and modifications that may include:
 • Relate to and identify commonalities in mathematics studies in student's home country
 • Assist with organization
 • Use of computer
 • Emphasize/highlight key concepts
 • Teacher Modeling
 • Peer Modeling
 • Label Classroom Materials - Word Walls
	Students excelling in mastery of standards will be challenged with complex, high level challenges related to the topic.
	 • Raise levels of intellectual demands
	 • Require higher order thinking, communication, and leadership skills
	 • Differentiate content, process, or product according to student's readiness, interests, and/or learning styles
	 • Provide higher level texts
	 • Expand use of open-ended, abstract questions
	 • Critical and creative thinking activities that provide an emphasis on research and in-depth study
	 • Enrichment Activities/Project-Based Learning/ Independent Study
	 Additional Strategies may be located at the links:
	 ❖ Gifted Programming Standards
	 ❖ Webb's Depth of Knowledge Levels and/or Revised Bloom's Taxonomy
	 ❖ REVISED Bloom's Taxonomy Action Verbs

Suggested Activities	
☐ Do Now/Warm-Up ☐ Whole Group ☐ Small Groups ☐ Guided Practice ☐ Independent Practice	☐ Centers ☐ Intervention/Remediation ☐ Projects ☐Academic Games ☐ Other Suggested Activities:

Interdisciplinary Connections

Big Ideas Real-Life STEM Videos and Performance Tasks

Interdisciplinary Connections: ELA

NJSLSA.R1. Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content

NJSLSA.L1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking

SL.9-10.4: Present information, findings and supporting evidence clearly, concisely and logically. The content, organization, development and style are appropriate to task, purpose and audience.

NJSLSA.L6: Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

Integration of Computer Science and Design Thinking NJSLS 8

8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.

8.1.12.IC.2: Test and refine computational artifacts to reduce bias and equity deficits.

8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.

8.1.12.AP.8: Evaluate and refine computational artifacts to make them more usable and accessible.

8.2.12.EC.3: Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience.

8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment. • 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.

8.2.12.EC.3: Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience.