03 Problem Solving & Data Analysis

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **4-5 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

Senior Math Analysis CP is designed for seniors who will pursue liberal arts or humanities in college. The main course objective is to strengthen and extend the concepts of algebra, geometry, and problem solving, including modeling and reasoning. The course integrates ideas of functions and trigonometry with explorations in world-life applications. Additionally, students are provided SAT review and exposure to college placement exam experiences.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

This unit reviews and develops fluency in skills and knowledge related to: ratios, proportions, and percentages; interpreting data presented in multiple formats; understanding and using basic statistics; as well as analyzing and implementing problem solving strategies.

Essential Questions:

- How can mathematics be used to analyze and manipulate data?
- How can you determine if data is valid?
- What conclusions can be drawn from a given data set?
- What the advantages and disadvantages of various methods for displaying data?

Enduring Understandings:

- Valid data and valid analysis are can be independent of each other
- Data analysis and statistics allow us to make predictions
- Different presentations of the same data can skew one's perception of that data
- Different methods and tools can be applied to solve specific types of problems

CONTENT AREA STANDARDS

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.6	Attend to precision.

MA.S-CP.A.5	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.
MA.S-IC.A.1	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
MA.S-IC.B.3	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
MA.S-ID.A.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).
MA.S-ID.A.2	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
MA.S-ID.A.3	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).
MA.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.
MA.S-ID.C.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
MA.S-ID.C.9	Distinguish between correlation and causation.
MA.S-MD.B.7	Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

CS.K-12.1.a	Include the unique perspectives of others and reflect on one's own perspectives when designing and developing computational products.
CS.K-12.2.b	Create team norms, expectations, and equitable workloads to increase efficiency and effectiveness.
CS.K-12.2.c	Solicit and incorporate feedback from, and provide constructive feedback to, team members and other stakeholders.
CS.K-12.2.d	Evaluate and select technological tools that can be used to collaborate on a project.
CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.b	Decompose complex real-world problems into manageable sub-problems that could integrate existing solutions or procedures.
CS.K-12.3.c	Evaluate whether it is appropriate and feasible to solve a problem computationally.
LA.RH.9-10.4	Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history and the social sciences; analyze the cumulative impact of specific word choices on meaning and tone.
LA.RH.9-10.5	Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.
LA.RH.9-10.7	Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text, to analyze information presented via different mediums.
LA.RST.9-10.2	Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

LA.RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LA.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
LA.RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
LA.RST.9-10.6	Determine the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Statistics is a process for making inferences about population parameters based on a random sample from that population.
- Data can be analyzed through various measures to determine certain characteristics
- Valid data and valid analysis are can be independent of each other
- Data analysis and statistics allow us to make predictions
- Different presentations of the same data can skew one's perception of that data
- Different methods and tools can be applied to solve specific types of problems

Procedural Knowledge

Students will be able to:

- Analyze decisions and strategies using probability concepts. *Analysis*
- Compare the center and spread of two or more different data sets using statistics appropriate to the shape of the data distribution. *Analysis*
- Distinguish between correlation and causation. *Analysis*
- Explain how randomization relates to sample surveys, experiments, and observational studies. (*Comprehension*
- Interpret differences in shape, center, and spread in the context of the data sets. *Comprehension*
- Interpret the slope and the intercept of a linear model. *Comprehension*
- Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *Comprehensio*

- Represent data with plots on the real number line. *Comprehension*
- Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. *Comprehension*

EVIDENCE OF LEARNING

Formative Assessments

- Student feedback/questioning/observation
- Exit Ticket
- Error analysis
- Specific skill assessment/questions
- Survey/polling
- Reflection questions
- Scored/evaluated class work or homework
- Task completion

Summative Assessments

Lesson Quizzes
Unit Test
Performance Tasks

RESOURCES (Instructional, Supplemental, Intervention Materials)

Core Instructional Resource

Official SAT Study Guide chapter 20 Problem solving and data analysis

Supplemental Resource

Khan Academy Statistics and Probability , SAT section

NJDOE model curriculum for Algebra

Khan Acadmey Algebra

Kuta Software worksheets

INTERDISCIPLINARY CONNECTIONS

Interdisciplinary connections are frequently addressed through modeling and application problems whereby students solve and analyze situations taken from business, physics, engineering, biology, statistics, geography, and numerous other fields. Examples can be found in topic specific textbook problems and digital resources.

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.