CCRS ABE Math Webinar 2.0

www.floridaipdae.org

The goal of the CCRS ABE Mathematics Webinar is to:

- Increase teachers' understanding of the CCRS.
- Empower teachers in implementing CCRS ABE Curriculum Framework for Mathematics through modeling, collaboration and sharing of resources.
- Improve students' readiness for post ABE goals (i.e. GED or vocational training) through various instructional strategies that can be easily adapted.
- Improve students' achievement in ABE classrooms.

By the end of the webinar, participants are expected to:

- Demonstrate increased understanding of the CCR Standards and the key shifts in these standards (Focus, Coherence and Rigor).
- Understand how to effectively implement the CCR Standards for ABE through content update, effective instructional strategies and sample classroom activities.
- Solve sample problems on least known or developed areas of the CCRS ABE Curriculum Frameworks such as statistics, the number system and functions.

CCRS ABE Mathematics Domains

1. Base Ten Numbers and Operations
2. Algebraic Thinking
3. Measurement and Data
4. Geometry
5. Fractions and Operations
6. Expressions and Equations
7. The Number System
8. Ratios and Proportional Reasoning
9. Statistics and Probability
10. Functions

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Level

Domain

Anchor Standard

NRS Level 3 GE: 4.0 – 5.9	NRS Level 4 GE: 6.0 – 8.9
CCR.MA.ABE.9. **Statistics and Probability**	
3.1. Develop understanding of statistical variability. a) Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. b) Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. c) Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.	**4.1. Summarize and describe distributions.** a) Summarize numerical data sets in relation to their context, such as by: • Reporting the number of observations. • Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. • Giving quantitative measures of center such as median and/or mean. • Giving quantitative measures variability such as interquartile range (data divided into quarters) and/or mean absolute deviation (average distance between data value and the mean). • Describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. b) Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Benchmark Skill

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Let's look at the Statistics Domain of the CCRS ABE Curriculum Frameworks for Mathematics

- Look for skills students need to master.
- Look for key concepts students need to understand.
- Look at the hierarchy of skills and topics to have a better approach to teaching the Statistics domain.
- Identify resources needed in order to effectively teach ABE Statistics to students.

Why do we need to learn about Statistics?

- It is tested in multiple modules of the GED Test.
- Statistics is readily applicable in all subject areas and fields.
- Statistics is all around.
- Statistics help us make informed decisions.
- According to the Boston University College of Arts and Science:

From medical studies to research experiments, from satellites continuously orbiting the globe to ubiquitous social network sites like Facebook or Twitter, from polling organizations to United Nations observers, data are being collected everywhere and all the time. Knowledge in statistics provides you with the necessary tools and conceptual foundations in quantitative reasoning to extract information intelligently from this sea of data.

NRS Level 3 GE: 4.0 – 5.9	NRS Level 4 GE: 6.0 – 8.9
CCR.MA.ABE.9. **Statistics and Probability**	
3.1 Develop understanding of statistical variability. a) Discuss a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. b) Discuss a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. c) Discuss that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.	**4.1 Summarize and describe distributions.** a) Summarize numerical data sets in relation to their context, such as by: • Reporting the number of observations. • Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. • Giving quantitative measures of center such as median and/or mean. • Giving quantitative measures variability such as interquartile range (data divided into quarters) and/or mean absolute deviation (average distance between data value and the mean). • Describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. b) Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

3.2 Summarize and describe distributions.	4.2 Use random sampling to draw inferences about a population.
a) Display numerical data in plots on a number line, including dot plots (graph of data using dots), histograms (bar graph using ranges of data), and box plots (graph uses rectangles with lines extending from the top and bottom).	a) Understand that statistics can be used to gain information about a population by examining a sample of the population • Generalizations about a population from a sample are valid only if the sample is representative of that population. • Understand that random sampling tends to produce representative samples and support valid inferences. b) Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. c) Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
	4.3 Draw informal comparative inferences about two populations. a) Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities. • Measuring the difference between the centers by expressing it as a multiple of a measure of variability. b) Use measures of center (median and mode) and measures of variability (interquartile range and mean absolute deviation) for numerical data from random samples to draw informal comparative inferences about two populations.

4.4 Investigate chance processes and develop, use, and evaluate probability models.
a) Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.
   • Larger numbers indicate greater likelihood.
   • A probability near 0 indicates an unlikely event.
   • A probability around 1/2 indicates an event that is neither unlikely nor likely.
   • A probability near 1 indicates a likely event.
b) Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency.
   • Predict the approximate relative frequency given the probability.
c) Develop a probability model and use it to find probabilities of events.
   • Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
   • Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.
   • Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.
d) Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
e) Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams.
   • For an event described in everyday language, such as "rolling double sixes", identify the outcomes in the sample space which compose the event.

4.5. Investigate patterns of association in data with two variables (bivariate).
a. Construct and interpret scatter plots (a graph of plotted points that show the relationship between two sets of data) for bivariate measurement data to investigate patterns of association between two quantities.
- Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
b. Know that straight lines are widely used to model relationships between two quantitative variables.
- For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
a. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
b. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table.
- Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects.
- Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

Standards for Mathematical Practice
- MP1: Make sense of problems and persevere in solving them.
- MP2: Reason abstractly and quantitatively.
- MP3: Construct viable arguments and critique the reasoning of others.
- MP4: Model with mathematics.
- MP5: Use appropriate tools strategically.
- MP6: Attend to precision.
- MP7: Look for and make use of structure.
- MP8: Look for and express regularity in repeated reasoning.

- Look for entry points to solutions.
- Analyze givens, constraints, relationships, and goals.
- Plan a solution pathway.
- Look for regularity or patterns.

Below is a sampling of student responses comparing the hours they spent studying per week and their Grade Point Averages (GPA). Using this sampling data, predict the grade point average of a student who only studies 1 hour per week.

Hours Spent Studying Per Week	6	2	5	7	3	8	9	4
Grade Point Average (GPA)	3.00	2.75	3.10	3.25	2.50	3.10	3.50	3.00
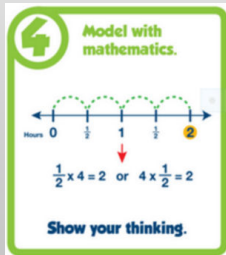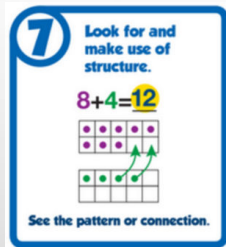
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- Identify the quantities or variables.
- Which ones are independent or dependent?
- How can we organize this data so we can analyze it further?
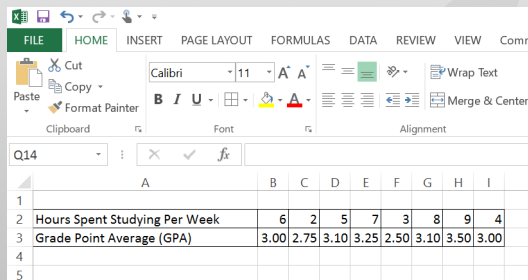- Would a visual picture help?

Below is a sampling of student responses comparing the hours they spent studying per week and their Grade Point Averages (GPA). Using this sampling data, predict the grade point average of a student who only studies 1 hour per week.

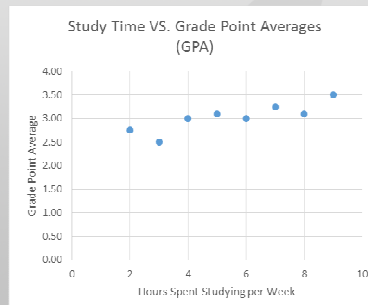| Hours Spent Studying Per Week	6	2	5	7	3	8	9	4
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Graphically represent the data using:
- plain paper
- graph paper
- graphing calculator
- computer

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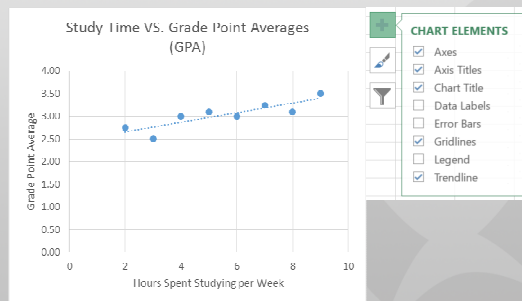| Hours Spent Studying Per Week	6	2	5	7	3	8	9	4
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Study Time VS. Grade Point Averages (GPA)

5 Use appropriate tools strategically.

3x2=6

Use the right tools.

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Study Time VS. Grade Point Averages (GPA)

CHART ELEMENTS
- ☑ Axes
- ☑ Axis Titles
- ☑ Chart Title
- ☐ Data Labels
- ☐ Error Bars
- ☑ Gridlines
- ☐ Legend
- ☑ Trendline

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5 Use appropriate tools strategically.

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Use the right tools.
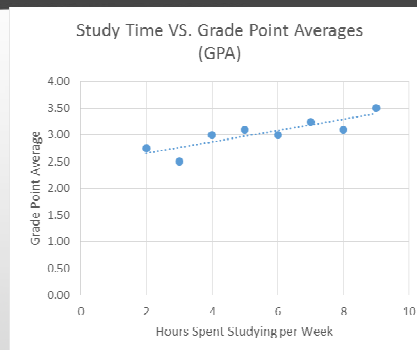
2 Reason abstractly and quantitatively.

Write a story for the mathematical equation

$\frac{1}{2}$ x 4

DeJuan exercises 1/2 hour a day for 4 days. How many total hours does he exercise?

Think what makes sense.

Study Time VS. Grade Point Averages (GPA)

$$\text{Average Number of Hours Studying} = \frac{6 + 2 + 5 + 7 + 3 + 8 + 9 + 4}{8} = 5.5$$

$$\text{Average GPA} = \frac{3.00 + 2.75 + 3.10 + 3.25 + 2.5 + 3.10 + 3.50 + 3.00}{8} = 3.03$$

Study Time VS. Grade Point Averages (GPA)

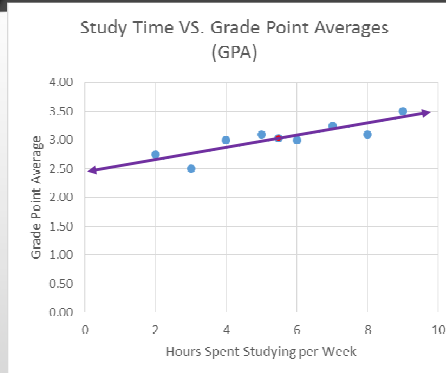**5** Use appropriate tools strategically.

$3 \times 2 = 6$

Use the right tools.

2 Reason abstractly and quantitatively.

Write a story for the mathematical equation

$\frac{1}{2} \times 4$

DeJuan exercises 1/2 hour a day for 4 days. How many total hours does he exercise?

Think what makes sense.

Construct the line of best fit or trend line that passes through the mean values and closest to most points on the scatter plot.

Study Time VS. Grade Point Averages (GPA)

2 Reason abstractly and quantitatively.

Write a story for the mathematical equation

$\frac{1}{2} \times 4$
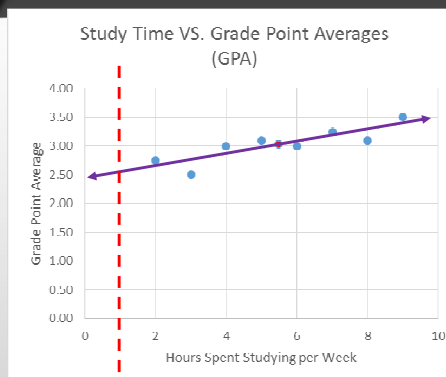
DeJuan exercises 1/2 hour a day for 4 days. How many total hours does he exercise?

Think what makes sense.

3 Construct viable arguments and critique the reasoning of others.

$\frac{2}{4} = \frac{1}{2}$ I agree.

Talk and explain.

A reasonable estimate for the GPA of a person that studies 1 hour per week is about **2.6**.

Keys to Understanding Statistics:

- Understand how data is organized and represented.
- Understand the purpose of sharing statistics.
- Know how statistics can be used to mislead its audience.
- Understand how to draw conclusions based on a set of statistics.
- Understand the different factors that may affect statistics such as population size, sample size, bias, correlation, causality and assumptions.

Summary:

In this workshop we:
- Demonstrated increased understanding of the CCR Standards and the key shifts in these standards (Focus, Coherence and Rigor).
- Understood how to effectively implement the CCR Standards for ABE through content update, effective instructional strategies and sample classroom activities.
- Solved a sample problem on a least developed group of areas of the CCRS ABE Curriculum Frameworks which is statistics, the number system and functions.

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