NCTM Hartford 2012

Integrating Statistics Throughout the High School Curriculum

A Look at the Common Core State Standards for Statistics & Probability and How They Might Fit Within the High School Mathematics Curriculum

Pamela Rawson, Poland Regional High School
pamela.rawson@gmail.com

This document is only an overview of the session and does not contain the complete analysis that participants will experience in the workshop.

Outcomes

- Briefly look at Common Core Standards for Statistics & Probability
- Engage in a few data collection activities
- Analyze the data using TI-Nspire
- Discuss implications

Common Core Standards for Statistics & Probability → *(Conceptual Category)*

Interpreting Categorical and Quantitative Data → *(Domain)*

- Summarize, represent, and interpret data on a single count or measurement variable
- Summarize, represent, and interpret data on two categorical and quantitative variables
- Interpret linear models → *(Cluster)*

Making Inferences and Justifying Conclusions

- Understand and evaluate random processes underlying statistical experiments
- Make inferences and justify conclusions from sample surveys, experiments and observational studies

Conditional Probability and the Rules of Probability

- Understand 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

Using Probability to Make Decisions (+)→ *(intended for STEM students)*

- Calculate expected values and use them to solve problems
- Use probability to evaluate outcomes of decisions

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

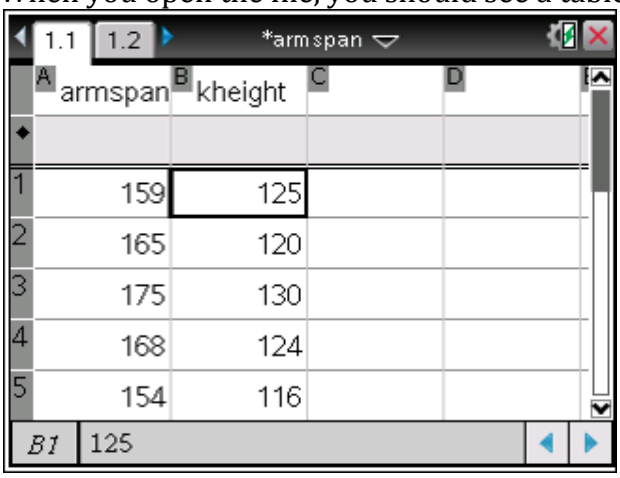
Activity 1: Arm Span and Kneeling Height

adapted from *Core-Plus Mathematics Course 2*, Glencoe, 2008

Find a partner to help you measure your arm span and kneeling height in centimeters

Name	Arm Span (cm)	Kneeling Height (cm)

When you open the file, you should see a table like this (but with different numbers):



THE COMMON CORE MATHEMATICS STANDARDS STATE THAT STUDENTS SHOULD BE ABLE TO ANALYZE BOTH ONE-VARIABLE AND TWO-VARIABLE DATA.

Thinking about each data set as a single variable

What do you notice about the data?

What do you wonder about the data?

THE COMMON CORE MATHEMATICS STANDARDS STATE THAT STUDENTS SHOULD BE ABLE TO ANALYZE BOTH ONE-VARIABLE AND TWO-VARIABLE DATA.

Now, think about each row in your spreadsheet as an ordered pair of (*armspan*, *kheight*) representing a single person. Use ctrl◀ or ctrl▶ to navigate back to the spreadsheet page.

What do you notice about the data?

What do you wonder about the data?

ACTIVITY DEBRIEF

Common Core Mathematics Standards:

Interpreting Categorical and Quantitative Data

- Summarize, represent, and interpret data on a single count or measurement variable
- Summarize, represent, and interpret data on two categorical and quantitative variables
- Interpret linear models

Which Standards for Mathematical Practice will students engage in with this activity?

In which course would the activity fit? Is this an easy fit, or would it take some effort?

Activity 2: Meaningful Words

borrowed from *Focus in High School Mathematics*, NCTM, 2009

Is it easier to memorize meaningful words?

A ninth-grade class of thirty students was randomly divided into two groups of fifteen students. One group was asked to memorize a list of 20 meaningful three-letter words; the other group was asked to memorize a list of 20 nonsense words. This number of words correctly recalled by each student was recorded.

Open the envelope on your table

Blue = number of meaningful words remembered

9, 13, 14, 11, 9, 15, 3, 5, 10, 12, 12, 9, 10, 12, 7

Yellow = number of nonsense words remembered

2, 7, 6, 8, 6, 9, 3, 4, 10, 7, 4, 7, 4, 5, 5

What do you notice about the data?
What do you wonder about the data?

THE COMMON CORE MATHEMATICS STANDARDS STATE THAT STUDENTS SHOULD UNDERSTAND THE RANDOM PROCESSES UNDERLYING STATISTICAL EXPERIMENTS AND BE ABLE TO MAKE INFERENCES FROM EXPERIMENTAL RESULTS.

What can you do to analyze the data? How different are the two groups, really? Can this difference just be "dumb luck"?

Steps of a randomization test:

1. Write the results on separate cards.
2. Shuffle the cards and deal out 15 to be the Meaningful group. The rest will be the Nonsense group.
3. Calculate the difference of the means of the two groups.
4. Repeat steps 2 & 3 a large number of times.
5. Make a histogram of the results.
6. Compare your observed value to the histogram results

The question is, "***Is the difference in the mean number of words remembered unusual enough to be attributed to the difference in word type: meaningful vs nonsense?***" What is your conclusion and on what evidence is it based?

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Activity 3: Footwear vs. Gender

adapted from *Core-Plus Mathematics Course 2*, Glencoe, 2008

Let's start by collecting some data.

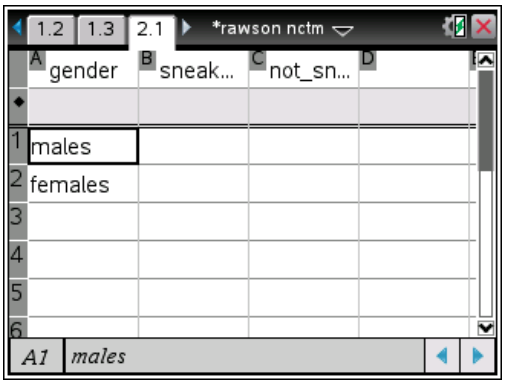
Gender	Sneakers	Not Sneakers
Males		
Females		

A Couple of Definitions

The probability that event A occurs, given that event B has occurred is called a ***conditional probability*** and is written symbolically as P(A | B).
Two events A and B are said to be ***independent*** if P(A | B) = P(A).

What do you notice about the data?
What do you wonder about the data?

Page 2.1 of the "rawson nctm" document contains a framework for exploring the data. You can use regular spreadsheet commands to calculate totals to help answer questions about the situation.



Some questions to consider:

- What is the probability of being a sneaker-wearing female in this session?
- What is the probability that a person in this session is wearing sneakers, given that the person is female?
- Why do these two questions result in different answers? Aren't they the same question?
- Are gender and sneaker-wearing independent events?

ACTIVITY DEBRIEF

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