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Lesson Title: Exploring the Stomp Rocket with Descriptive Stats
Date:
Text: STEM Correlation: Lesson Topic 7
Length: Day 1 introduction to the Topic

Big Idea (Cluster): Statistics and Probability	
Mathematics K–12 Learning Standards: S-ID.A.01 (*Statistics and Probability*) Represent data with plots on the real number line (dot plots, histograms, and box plots). S-ID.A.02 (*Statistics and Probability*) 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. S-ID.A.03 (*Statistics and Probability*) Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). S-ID.B.05 (*Statistics and Probability*) Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.	
Mathematical Practice(s): Model with mathematics. Use appropriate tools strategically. Attend to precision.	
Content Objectives: In this topic, students will: ● Select and use appropriate representations for presenting numerical data, including dotplots and bar graphs ● Select and use appropriate representations for presenting categorical data, including circle graphs, segmented bar charts, and two-way frequency tables ● Use measures of central tendency and variability to describe a set of data including mean, median, range, interquartile range, mean absolute deviation, and standard deviation ● Compare data distributions using appropriate measures of center and spread ● Create two-way frequency tables to display bivariate categorical data	Language Objectives (ELL): This topic contains strong content as well as academic vocabulary, such as ***categorical*** and **numeric data** . Make sure students are asking questions about unfamiliar words and adding them to their notebooks. **Language strategy.** Many of these words are new. Throughout this topic, use our **We Speak Algebra!** Wall activities to give students the opportunity to interact with them.

• Distinguish between and interpret marginal, joint, and conditional relative frequencies • Determine if associations exist between variables in categorical data	
Vocabulary: ***categorical data***, ***numerical data***	Connections to Prior Learning • Creating dotplots and bar graphs
Questions to Develop Mathematical Thinking: • Do you think a rocket made from cardstock will go further than one a similarly made one from cardboard? • Is there a relationship between distance and the diameter of the rocket's cone? •	Common Misconceptions: • All numbers are numeric data (groups of 3, ie, small, medium, large) • Inconsistent intervals on axes • How to read your measuring device

Assessment (Formative and Summative):

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Materials:

• Construction paper • Masking tape • Duct tape • Card stock • cardboard • Tape measure • Stop watch (cell phone) • Graph paper if no access to Desmos: https://www.youtube.com/watch?v=MSzVqjYau4s

Instruction Plan:

Introduction: Supplies, expected behaviors, group expectations
Explore:
When I observe students:
Questions to Develop Mathematical Thinking as you observe: • Do you think a rocket made from cardstock will go further than one a similarly made one from cardboard? • Is there a relationship between distance and the diameter of the rocket's cone?
Answers:

Summarize:

Career Application(s):

- Identify the best ways to categorize and display data for your business
- Finding the most and least popular items

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)

☐ Global Awareness ☐ Financial/Economic/Business/Entrepreneurial Literacy ☐ Civic Literacy
☐ Health/Safety Literacy ☐ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION
Creativity and Innovation
☐ Think Creatively
☐ Work Creatively with Others
☐ Implement Innovations
Critical Thinking and Problem Solving
x Reason Effectively
☐ Use Systems Thinking
x Make Judgments and Decisions
x Solve Problems
Communication and Collaboration
x Communicate Clearly
x Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
☐ Access and Evaluate Information
☐ Use and manage Information
Media Literacy
☐ Analyze Media
x Create Media Products
Information, Communications and Technology (ICT Literacy)
☐ Apply Technology Effectively

LIFE & CAREER SKILLS
Flexibility and Adaptability
☐ Adapt to Change
☐ Be Flexible
Initiative and Self-Direction
☐ Manage Goals and Time
☐ Work Independently
☐ Be Self-Directed Learners
Social and Cross-Cultural
☐ Interact Effectively with Others
☐ Work Effectively in Diverse Teams

Productivity and Accountability
x Manage Projects
x Produce Results
Leadership and Responsibility
☐ Guide and Lead Others
☐ Be Responsible to Others

Guided Student Notes amended from Agile Mind- Algebra 1 Topic 7 Descriptive Stats

1.Define categorical data and numerical data. In your own words, how are these two types of data different?

Categorical data:

Numerical data:

How they are different:

2.REINFORCE Can you tell the difference between categorical and numerical data? For each question below, identify whether the data collected from the question would be categorical or numerical.

How old are you?
What is your favorite flavor of ice cream?
What type of music do you like to listen to the most?

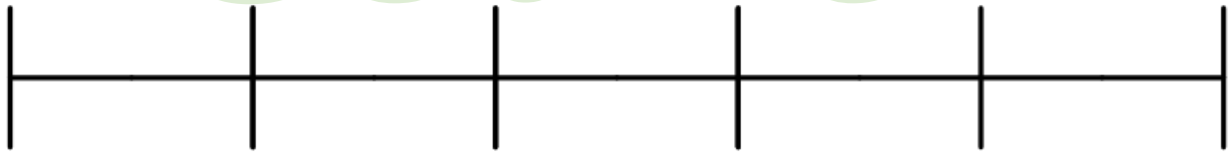
How many grams of fat are in your favorite candy bar?
How many hours of TV did you watch last night?
What is your annual income?
What is your favorite class in school?

3.The table shows the cell phone providers for a group of 25 students.

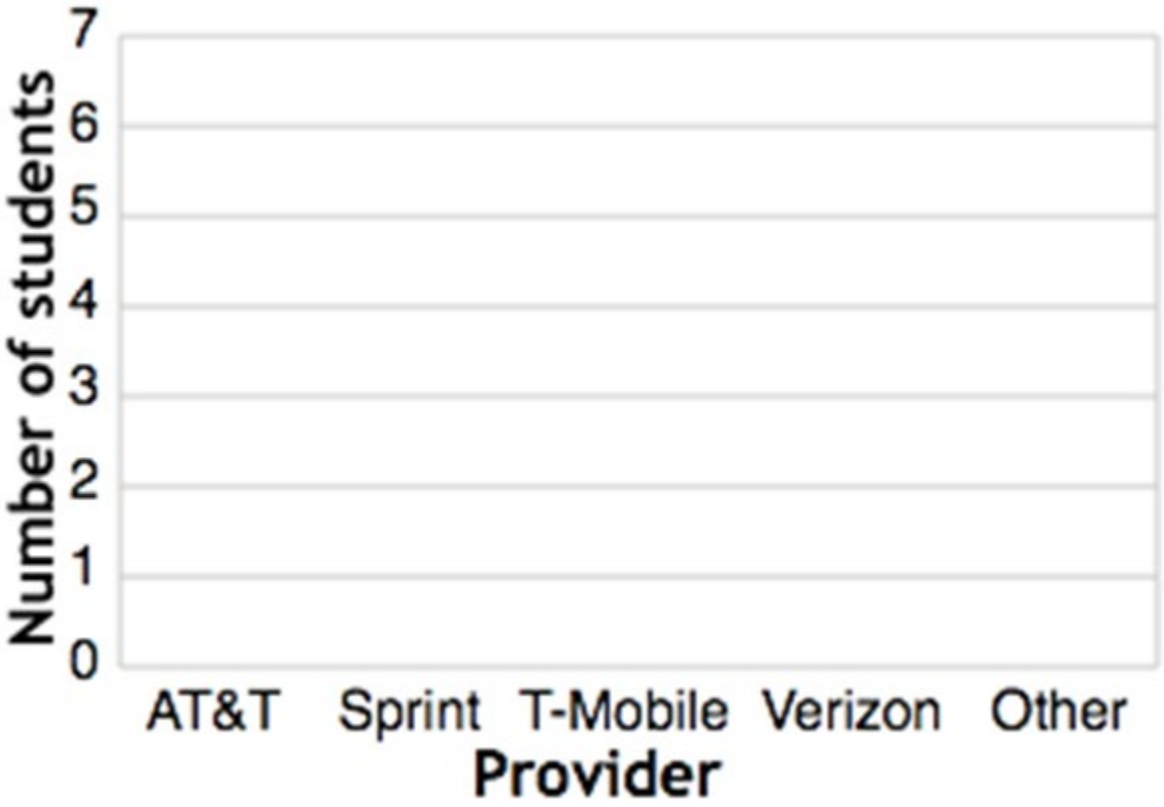
Cell Phone Provider				
Verizon	Sprint	AT&T	T-Mobile	Verizon
T-Mobile	Verizon	AT&T	Verizon	Sprint
T-Mobile	T-Mobile	Other	Sprint	AT&T
Other	Sprint	Sprint	T-Mobile	AT&T
Other	AT&T	Sprint	AT&T	Other

a.How many categories of cell phone providers are there?

b.Create a dotplot showing how many students use each cell phone provider. Don't forget to label the axis with the names of the cell phone providers.



c. Use the counts in the dotplot to create a bar graph of the data. Remember, the counts in your dotplot correlate to the height of each bar in the bar graph.



4.Now let's play with some of our own data. Remember our stomp rockets? Here is some of our data.

d.How many categories of data are there?

e.Create a dotplot showing how many groups stomped English, History and PE. Don't forget to label the axis with the names of the stomped classes.

f.Use the counts in the dotplot to create a bar graph of the data in Desmos. Remember, the counts in your dotplot correlate to the height of each bar in the bar graph. Also remember to title your graph, clearly label your axes, and your scale.

https://www.desmos.com/calculator

Lab Instructions: Stomp Rocket

1) You will need to acquire the following items from the supplies. Construction paper (choose one of 3 colors), masking tape, card stock and a tape measure. You also will need a stopwatch function on your phone.

2) Your mission, should you decide to accept it, will be to construct a rocket of your own design, that can be launched with the provided launch pad, using construction paper, card stock and masking tape.

3) Name your rocket, English, History or PE (your least favorite class)

4) Determine if your rocket is considered small, medium or large (less than 6 inches long, 6 to 8 inches long, more than 8 inches long.

5) After the completion of the construction of your rocket you will launch your rocket and calculate its time of flight and its distance traveled.

6) You then must enter your data on the provided graph paper and develop an equation using your data points.