Statewide IT Bridge Curriculum
Contextualized Math Module

Outcome #1 - Use spreadsheets to generate graphs from data

Module Content -
Navigation, input, interpretation, and entry of data

Targeted ABE/ASE Content Standards -
5.S.CC.1 Initiate and participate effectively in a range of collaborative discussions with diverse partners on texts, topics and issues appropriate to skill level, building on others' ideas and expressing their own clearly and persuasively.
5.S.CC.2 Demonstrate active listening skills.
2.MD.9 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories.
3.G.4 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).

Targeted ESL Content Standards -
ELP Standard 1 / AE.1.1 - determine a central idea or theme in oral presentations and spoken and written texts.
ELP Standard 2 / AE.2.1 - participate in conversations, discussions, and written exchanges about a range of topics, texts, and issues.

Activities & Resources -
Navigate and use the functions of a spreadsheet application (e.g., Google Sheets or MS Excel)

Introduction: Benefits of using a spreadsheet application
Provide a small numeric data set (i.e., ages of students in class) and have students work in groups to create a bar graph or pie chart to represent the data. Discuss as a class the process of creating the graphs and how to interpret the results.

Activity 1: Warmup explanation to graphical representation of data
- Discuss the uses of graphs to show and explain data.
- Show graphs created using Google Sheets – bar charts, pie charts, and line graphs.
- Input numeric data via a spreadsheet, database, or directly.

Activity 2: Open Google Drive and navigate to the application
Demonstrate: How to Access Google Sheets
- Recall how to access your Google Drive from G-mail.
- Open the SPREADSHEETS folder.
- Go to My Drive pull down menu.

- Select Google SHEETS and open a new, blank spreadsheet.
- Recall the following spreadsheet features: rows, columns, column width, row height.
- Demonstrate how to create a pie chart, bar chart, and line graph

Practice: Students follow the instructions to access their SPREADSHEETS folder and Google Sheets.

- Open a blank spreadsheet, practice navigating across rows and down columns using arrow keys; be ready to enter data.
- Create a pie chart, line graph, and bar chart using the data
- Enter title text, axis names, and legends in graphs

Activity 3: Build-up Exercises
Task 1: Enter data and display graphs
Any data set could be used for this task. If you have access to appropriate data that are relevant to the students in some way, use that. Otherwise, consider using the Random Data Generator at http://www.randat.com/ to generate a data set for the class.

- Students work individually to enter the text and data, create graphs, then move the sheet to the SPREADSHEETS folder.

NOTE: Consider pacing this by demonstrating how to do one type of graph at a time, and having students create each graph after the demonstration.

- Edit data as necessary
- Adjust the size of the graph
- Change the scale of a graph
- Successfully print graphs

Activity 4: Build-up Exercises
Task 2: Change graphical display

- Demonstrate how to locate the key editing functions of Google Sheets.
  - Edit the y-axis by setting upper and lower scale limits.
  - Change scale ratios on horizontal and vertical axes.
  - Save the new graph or chart.
- Demonstrate the following functions to edit the spreadsheet charts from Activity Task 1.
  - Edit the y-axis by setting upper and lower scale limits.
  - Change scale ratios on horizontal and vertical axes.
  - Print the new chart.
- Students work individually to:
  - Enter data into a new spreadsheet and create a bar chart.
  - Reduce the scales of the graph on x- and y-axis and set upper and lower scale limits, following the instructions for Task 2.

Assessment -
Series of completed graphs and charts

ELL Supports / Instructor Notes -
ELL students may need some vocabulary review (graph, chart, x- and y-axis, scale limits, etc.) before beginning the activities.

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Outcome #2 - Explore patterns in different situations

Module Content -
Description and prediction; data determination of patterns

Targeted ABE/ASE Content Standards -
5.S.CC.1 Initiate and participate effectively in a range of collaborative discussions with diverse partners on texts, topics and issues appropriate to skill level, building on others' ideas and expressing their own clearly and persuasively.
5.S.CC.2 Demonstrate active listening skills.
3.OA.6 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

Targeted ESL Content Standards -
ELP Standard 2 / AE.2.1 - participate in conversations, discussions, and written exchanges about a range of topics, texts, and issues.
ELP Standard 9 / AE.9.2 - introduce and develop an informational topic with facts, details, and evidence.

Activities & Resources -
- Find, describe, explain, and predict, using patterns.
- Determine whether or not patterns in tables are uniquely described.
- Distinguish between closed and recursive descriptions of patterns.
- Understand that a table of data associated with a specific situation determines a unique pattern.

Activity 1: Warm up: Logic patterns guessing game
NOTE: Consider demonstrating this game with a pre-selected student who has been prepped to participate.
- Use sorting and classifying to guess the number that your partner is thinking about.
  - 1st person: Give a limit (e.g., between 0–100). Select some attributes of your number.
  - 2nd person: Ask questions and use logical sorting to identify the number.
- Ask questions about the attributes (e.g., types of number, less than, greater than, between two numbers).
- Use the response to:
  - Eliminate the numbers that don't match.
  - Classify the type of number as odd, even, prime, square number, tens, hundreds, thousands.
  - Narrow down the choice and identify your process for guessing the number.
- Draw a diagram to show your logical process (decision tree or process flow chart).

Activity 2: Number Patterns: Describing a pattern
- Ask students to describe several different patterns that you see in this table. Discuss what happens to the input number to make the output number.

Input	Output
1	6
2	10
3	14
4	18
5	22
6	26

- Ask students to describe the pattern. How are the numbers in the Output increasing with the Input numbers? *Possible answers: each output number is 4 more than the last; output numbers that appear are all the even numbers that aren't multiples of 4 (starting with 6); the output number is 2 more than 4 times the input number. Also, adding one input to the following input yields half the first output.*
  RULE: the output number is 2 more than 4 times the input number
- **Question 1:** What is the 100th entry in the table? How do you know? *Possible answers: you can't be sure, because the pattern is not completely specified, but it is likely that the 100th number is 402. This follows the rule listed above - that the output number is 2 more than 4 times the input number.*

Activity 3: "Recipe" to perform on a number
  1. Pick a number
  2. Triple your number
  3. Subtract 2 from the answer
  4. Double the answer
  5. Add 6
  6. Subtract twice your original number.

- **Question 2:** What does this recipe do to the numbers from 1 to 10? Record your answers in a table.
- **Question 3:** Can you explain how this recipe is related to the patterns you saw in the table from Question 1?

Think-pair-share activity:
- Comment on each of the following descriptions of the table given below.
- Do all these descriptions produce the same list of outputs?
- Are all of these descriptions valid for the table? *(HINT: test each one using a list of numbers)*

Pair up: Each pair takes one description and decides if it produces the same list of outputs.

Share: Discuss each group's findings. Decide which, if any, of the descriptions are valid for the Table in Q2.

DESCRIPTIONS:
1. As the input increases by 1, the output increases by 4.
2. If you add 2 to 1 and double it, you get 6. If you add 3 to 2 and double it, you get 10. If you add 4 to 3 and double it, you get 14. Or, if you add the input to the next input, double that and you get the output.
3. The units' digits are in the sequence 6, 0, 4, 8, 2, so the next number would be 26, then 30, 34, 38, and 42, and then 46, 50, 54, 58, 62, etc.
4. To get the output, multiply the input by 4 and add 2.
5. To get the output, triple the input, then add 2 more than the input.
6. After 6 as an input, the output numbers repeat over again: 6, 10, 14, 18, 22, 26, etc.
7. After 6, the output numbers remain constant: 26, 26, 26, etc.

- **Question 4:** Which number comes next in this sequence: 1, 2, 3, ___? Find as many different answers and explanations as you can.

Activity 4: Reflection activity: Skills for thinking about patterns
Take a closer look at the four skills for thinking about patterns.
1. Finding patterns involves looking for regular features of a situation that repeats.
2. Describing patterns involves communicating this regularity in words or in a mathematically concise way that other people can understand.
3. Explaining patterns involves thinking about why the pattern continues forever, even down the line in cases you haven't looked at.
4. Predicting with patterns involves using your description to predict pieces of the situation that aren't given.

Think-Pair-Share activity: Look back at the questions in Activity 3.
- Think about how you used these skills in each problem.
- Describe to your partner how you used these skills in each problem.
- Share with the class a summary of your reflection.

Instructor Summary at end of sharing segment:
- Finding is observing the pattern you see.
- Describing is putting what you see into words or symbols.
- Explaining is figuring out why the pattern continues.
- Predicting is using your description or rule for a new value.

Assessment -
Completed table from Activity 3, Question 2
Think-Pair-Share summary shared with the class

ELL Supports / Instructor Notes -
Consider a vocabulary review before the lesson (*finding, describing, explaining, and predicting*).

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Outcome #3 - Discover and create algorithms for daily activities

Module Content - Identification, creation, description, and analysis of algorithms
Targeted ABE/ASE Content Standards - **5.S.CC.1** Initiate and participate effectively in a range of collaborative discussions with diverse partners on texts, topics and issues appropriate to skill level, building on others' ideas and expressing their own clearly and persuasively. **5.S.CC.2** Demonstrate active listening skills. **5.S.PK.5** Present formal and informal speeches including discussion, information requests, interpretation, and persuasion. **5.W.WL.3** Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. **5.R.FW.1** Understand and use technology systems. **d.** Apply basic algorithmic concepts and methods (e.g., problem decomposition, data representation and abstraction, iteration, ordering of steps) to solve problems **3.OA.6** Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.
Targeted ESL Content Standards - **ELP Standard 2 / AE.2.1** - participate in conversations, discussions, and written exchanges about a range of topics, texts, and issues. **ELP Standard 9 / AE.9.2** - introduce and develop an informational topic with facts, details, and evidence. **ELP Standard 3 / AE.3.1** - deliver oral presentations about a variety of texts, topics, or events.
Activities & Resources - ● Explain what is meant by an algorithm. ● Create algorithms for everyday activities. ● Discuss algorithms in your everyday life. **Activity 1:** What is an algorithm and why should you care ● Show the video "What is an Algorithm and Why You Should Care" - https://www.khanacademy.org/computing/computer-science/algorithms/intro-to-algorithms/v/what-are-algorithms ● Ask students to write a description of an algorithm as they understand it. Review these to check comprehension. Ask select students to share their written descriptions with the class. ● Ask students: Think about what we have been doing with number patterns and describing the steps to create them. Is this an algorithm? **Activity 2:** Create an algorithm of a guessing game ● Have students play the guessing game, either independently or with a partner, or the teacher can project the game on screen and play as a class.

https://www.khanacademy.org/computing/computer-science/algorithms/intro-to-algorithms/a/a-guessing-game
- Scroll down the Khan Academy page after the game to discuss the game's strategies, including the concept of binary search.

Activity 3: Route finding
- Project on screen the route finding article from Khan Academy and walk through the content as a whole group. .

https://www.khanacademy.org/computing/computerscience/algorithms/intro-to-algorithms/a/route-finding
- Play Pac Man or Go for Goal as a class.
- Describe the steps to win the game or reach the goal.

Activity 4: Discussion—Algorithms in everyday life
Think- Pair-Share activity
- Think about your answers to these questions:
  - What algorithms do you use in everyday life? Do you think you could write a program to make them more efficient?
  - What algorithms do you think are used by your favorite games and apps?
  - Have you ever made an algorithm for a program? What did it do? Was it correct and efficient?
- In pairs: Answer one or more of these questions.
- Share; listen to what other students say.
- As a whole class, each partner group reports out their reflections. Add these to a collaborative document or white board.

Activity 5: Reflection
- Ask students to review their written description of an algorithm from the beginning of the lesson. Students revise their description based on what they learned, adding details and examples from the activities conducted during class.

Assessment -
Completed written description of an algorithm
Revised written description of an algorithm

ELL Supports / Instructor Notes -
Consider allowing students to work with a language partner during the whole class Khan Academy activities. ELL students may need additional time to work on the writing revision in Activity 5.

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Outcome #4 - Create budget spreadsheets; understand and analyze income statements

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Module Content -
 Text and numeric entry; formatting; formulas

Targeted ABE/ASE Content Standards -
5.R.FW.1 Understand and use technology systems. **d.** Apply basic algorithmic concepts and methods (e.g., problem decomposition, data representation and abstraction, iteration, ordering of steps) to solve problems.
5.S.CC.1 Initiate and participate effectively in a range of collaborative discussions with diverse partners on texts, topics and issues appropriate to skill level, building on others' ideas and expressing their own clearly and persuasively.
5.S.CC.2 Demonstrate active listening skills.
5.W.WL.3 Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
4.EE.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number or, depending on the purpose at hand, any number in a specified set.

Targeted ESL Content Standards -
ELP Standard 2 / AE.2.1 - participate in conversations, discussions, and written exchanges about a range of topics, texts, and issues.
ELP Standard 2 / AE.2.3 - express his or her own ideas.
ELP Standard 4 / AE.4.1 - construct a claim about a variety of topics.

Targeted IL IEL/CE Competencies -
CE3. Prepare a household budget.

Activities & Resources -
- Learn basic Google Sheet features to create a personal budget and enter into a spreadsheet. *(This activity could be completed using Microsoft Excel.)*
- Use the following skills:
  - Cell usage and access
  - Basic formulas
  - Text entry
  - Numeric entry
  - Cell format
  - Simple 'if' statement
  - Merge and center
  - Pie charts

Activity 1: My Budget Project
Create a personal budget spreadsheet that lists expenses and income for 12 months. *(If students*

need to invent some of this data, that is acceptable. Otherwise, they should use their actual budget information from their household.)

- The spreadsheet will cover 12 months starting in January.
- The spreadsheet will have three separate entries: variable expenses, fixed expenses, and income.
- In variable expenses you must include at least 12 items over the 12 months. Examples include groceries, gas, babysitting, food, etc. Make up your own list.
- In fixed expenses you will enter at least 6 items that recur such as rent and cable. Each item should have the same value for each month.
- In the income section there must be at least two entries. One should be the salary from your regular job and the other from another type of income such as part time work, investments, consulting, etc.
- Make sure you:
  - Use two sheets and name each sheet.
  - Use at least 3 different formulas.
  - Use at least one function.
  - Format text to use at least 3 colors and/or italics, bold or underlined.
  - Create a graph or chart of part or all of your data. *(Students may need a brief review of activities from Outcome #1 before completing this step.)*

Activity 2: Predict outcomes
Challenge students to predict how their data sheet would change if certain components of their data.were changed.

- Describe a scenario that introduces a variable that will affect student data (5% raise at their job, one additional adult living in the home, etc.)
- Ask students to write a brief description of how this scenario will impact the data on their budget sheet.
- Students make the data change on their sheets, check the outcome of their new data, and compare it to the prediction they made in writing.
- As a class (or in small groups) ask students to explain how accurately they predicted the changes to their budget data.

Assessment -
Completed budget sheets
Completed prediction paragraph

ELL Supports / Instructor Notes -
Instructor may choose to expand Activity 2 to incorporate additional writing and discussion components.

Statewide IT Bridge Curriculum
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Outcome #5 - Make spending and purchasing decisions; calculate costs/discounts; make consumer comparisons

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Module Content -
Cost analysis and comparison

Targeted ABE/ASE Content Standards -
5.R.RS.10 Select and use appropriate computer research tools and resources to obtain information (e.g., search engines).
5.R.RS.11 Transcribe and interpret information, data, and observations to apply information learned from reading to actual practice.
5.W.RB.1 Conduct short as well as more sustained research projects to answer a question (including a self-generating question) or solve a problem.
5.S.PK.1 Present information, findings and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning **…**
4.RP.6 Use proportional relationships to solve multistep ratio and percent problems. (Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).

Targeted ESL Content Standards -
ELP Standard 5 / AE.5.1 - carry out both short and more sustained research projects to answer a question.
ELP Standard 5 / AE.5.2 - gather information from multiple print and digital sources
ELP Standard 9 / AE.9.2 - introduce and develop an informational topic with facts, details, and evidence.

Activities & Resources -
- Make spending and purchasing decisions
- Calculate costs and discounts
- Make consumer comparisons

Activity 1: Buying and selling online
- Ask students about their experiences of buying and selling online. *(If students have not done this themselves, ask them about experiences of others they are familiar with, or to share what they know about the online market.)*
- Demonstrate Ebay, Etsy and other selling sites to students.
- Students independently search for an item online, identify cost and discount, and note any shipping costs or taxes.
- Students report back to the whole class about their search results. Draw conclusions about student findings.

Activity 2: The sharing economy
- Ask what we mean by the sharing economy. *Definition: In what is called collaborative consumption, the sharing economy, or the peer economy, owners rent out something they*

are not using such as a car, house or bicycle to a stranger using these peer-to-peer services. The company typically has an eBay-style rating or review system so people on both sides of the transaction can trust the other. With the popularity of these services, many people don't need to buy when they can rent from others.

- Discuss Airbnb as an example of the sharing economy - https://www.airbnb.com/help/article/2503
  - Other examples: TaskRabbit, Getaround, Uber & Lyft, Sparetoolz, Lending Club
- Project slideshow for students to explore: https://www.forbes.com/pictures/eeji45emgkh/airbnbsnapgoods-and-12-more-pioneers-of-the-shareeconomy/#1e25786c52cf
- Students investigate one or more of these sites and report back to the group on the products or services offered, the pros and cons of sharing, etc.

Activity 3: Pros and cons of the sharing economy
- Students identify an item they could rent via one of the sharing economy sites. They will record the item, the rental price, and any other fees, etc. they will pay.
- Then students find that same item on an online purchasing site and record the purchase price, fees, shipping, etc.
- Students will compare the total cost for obtaining the item via both methods and indicate which method they consider the best option. They can record their findings in a written paragraph or a slide presentation.
- After the class has heard a presentation of each of these findings, the class should draw some general conclusions about the pros and cons of the sharing economy versus the online marketplace.

Assessment -
Completed paragraph or slide presentation about the pros and cons of the sharing economy and the online marketplace

ELL Supports / Instructor Notes -
Consider allowing students to work in language partnerships for Activity 3, as needed.