<u>**WAMC Lab Template**</u>

Math Concept(s): The student applies understanding of mathematic concepts and systems to analyze the part of mathematics in which letters and other general symbols are used to represent numbers and quantities in formulae and equations in real world situations.

Source / Text: Financial Algebra 2E
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Date: Summer Conference 2019

<u>**Attach the following documents:**</u>
- Lab Instructions
- Student Handout(s)
- Rubric and/or Assessment Tool

<u>**Short Description (Be sure to include where in your instruction this lab takes place):**</u>

<u>**Lab Plan**</u>
Lab Title: FA Electronic Utilities 11-2 Cell Phone and Service Plan Product

Prerequisite skills: Linear Function and Average Cost Rational Function

Lab objective: To develop 3 options for purchasing a cell phone and service plan

<u>**Standards:**</u> *(Note SPECIFIC relationship to Science, Technology, and/or Engineering)*
Mathematics K–12 Learning Standards: Math COMMON CORE
N-Q   Reason quantitatively and use units to solve problems
N-VM   Perform operations on matrices and use matrices in applications
A-SSE   Interpret the structure of expressions.
A-REI   Represent and solve equations and inequalities graphically
F-IF   Interpret functions that arise in applications in terms of the context.
           Analyze functions using different representations.
F-BF   Build a function that models a relationship between two quantities.

Standards for Mathematical Practice:
-
K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):
- Communications COMMON CORE Speaking and Listening Standards
- SL4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

- SL5 Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
- SL6 Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
- Reading COMMON CORE
- RST7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- Writing COMMON CORE
- WHST4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

K-12 Science Standards

- HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Technology

- 3. Knowledge Constructor - Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.

Engineering

- Mathematics K–12 Learning Standards:
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- Social Studies
- 2.1:   Understands that people have to make choices between wants and needs and evaluate the outcomes of those choices.

- Educational Technology
- 1.3.3 Analyze, synthesize and ethically use information to develop a solution, make informed decisions and report results.
- 1.3.4 Use multiple processes and diverse perspectives to explore alternative solutions.
- 2.1.2 Practice ethical and respectful behavior.
- 2.2.2 Use a variety of hardware to support learning.
- 2.3.1 Select and use common applications.
- 2.4.1 Formulate and synthesize new knowledge.

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
- ☒ Reason Effectively
- ☐ Use Systems Thinking
- ☒ Make Judgments and Decisions
- ☒ Solve Problems
Communication and Collaboration
- ☒ Communicate Clearly
- ☐ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS
Information Literacy
- ☒ Access and Evaluate Information
- ☒ Use and manage Information
Media Literacy
- ☐ Analyze Media
- ☒ 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
- ☐ Manage Projects
- ☒ Produce Results
Leadership and Responsibility
- ☒ Guide and Lead Others
- ☒ Be Responsible to Others

<u>Teacher Preparation: (What materials and set-up are required for this lab?)</u>

Materials

- Cell Phone Bills
- Computer

Set-Up Required:

- None

<u>Lab Organization Strategies:</u>

Leadership (Connect to 21st Century Skills selected):

- Guide and Lead Others
- Be Responsible to Others

Cooperative Learning:

- The students need to divide the work equally and hold each other accountable for finishing their assigned parts.

Expectations:

The expectations are for the students to complete the lab over two class periods and work cooperatively with their group. 3 cell phone plans and 3 graphs are to be completed.

Timeline:

- 2 Hours

<u>Post Lab Follow-Up/Conclusions:</u>

Discuss real world application of learning from lab

- The real-world application is to be able to use Average Cost Rational Function to compare costs of purchases over time.

Career Applications

- Communications Industry
- Finance
- Sales

Optional or Extension Activities

- Create Average Cost Rational Function graph for gas mileage cost for two cars over a five years.

Applied Math Financial Algebra 2E

Lab Instructions 11-2 Electronic Utilities

1. Assign students in groups of 3
2. Each group will create a multimedia presentation marketing 3 cell phone and service plan packages. All plans are unlimited data, text and minutes and two-year contracts.
3. Each student is given one of three monthly allowances to purchase a cell phone and service plan. Allowance 1 $50 per month ($500 for phone purchase), Allowance 2 $80 per month ($400 for phone purchase), Allowance 3 $120 per month ($300 for phone purchase).
4. Each group will create an average cost rational function for one other groups 3 cell phone and service plan package.
5. Each group will present their findings from their average cost rational function.
6. Students will purchase a plan with their assigned allowance, but can not purchase their own package.
7. The group that generates the most revenue over the two-year contract wins the competition.

Applied Math Financial Algebra 2E

Lab Handout 11-2 Electronic Utilities

1. Use desmos.com to graph the average cost rational function.
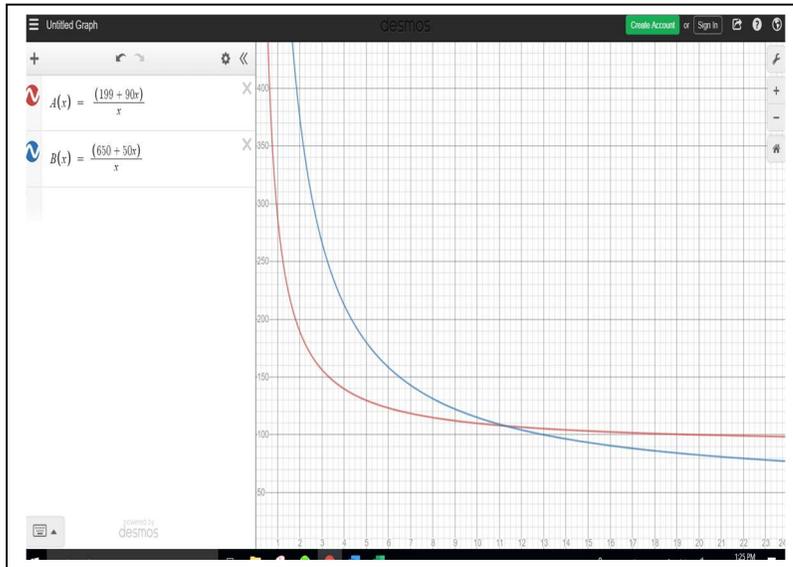
Name(s): Mario Martinez
Email Address: mmmartinez@seattleschools.org
Lesson Title: 11-2 Electronic Utilities Page 668
Date: 06-25-19
Text: Financial Algebra 2E   STEM Correlation: Math
        Lesson Length: 2 Hours

Big Idea (Cluster): Preparing A Budget

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Mathematical Practice(s): The student applies understanding of mathematic concepts and systems to analyze the part of mathematics in which letters and other general symbols are used to represent numbers and quantities in formulae and equations in real world situations.	
Content Objectives: Compute the cost of cell phone calls, text messaging, internet service and cable television. Compare different plans for these services. Set up, graph, and interpret an average cost function.	Language Objectives (ELL): Language COMMON CORE L4 Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, choosing flexibly from a range of strategies.
Vocabulary: Electronic Utilities	Connections to Prior Learning: Utility Expenses
Questions to Develop Mathematical Thinking: • How many times a day do you use your cell phone and what do you use it for? How do you know if you are charged the correct amount for your use?	Common Misconceptions: • The Cell phone plans includes federal, state and local charges in base fee (Fine Print) • Additional features cost extra (Marketing)

Assessment (Formative and Summative):

• Using proximity, conversation to check for learning (formative) and quizzes (summative)

Materials:

• Cell phone bills from different providers • Computer • Cell Phones

Instruction Plan:

Introduction: How did we communicate before cell phones? How did infrastructure have to change to accommodate the large amounts of data smart phones use today?
Explore: Use web to research 3 service providers and their offerings.
When I observe students: I am looking for pier to pier conversation about their findings and drawing conclusions about the data. Students are working together create pricewise functions to find cost of plans.
Questions to Develop Mathematical Thinking as you observe: How much data do you use each month? How many text messages to you send each month? What happens to rates if you are out of the country? Where is your data stored? Who owns your data?
Answers: Will vary based on student research and cell phone usage habits.
Summarize: Humans use our cell phones every day for a variety of task, so finding a plan that matches your usage habits is important.

Career Application(s):

• Communications Industry • Finance • Sales

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1. Burner Phone Company sells $50 cell phones with the following rate schedule for an m-minute call. c(m) = {0.50 when m ≤ 5

   {0.50 + 0.30(m-5) when m > 5 and m is an integer

   {0.50 + 0.30(m-5) when m > 5 and m is not an integer

   a. What is the cost for a call that is under 5 minutes?

   b. What is the cost of a 17-minute call?

   c. What is the cost of a 6.75-minute call?

2. Bill's cell phone plan includes 1GB of data and 200 minutes of talk and unlimited text for $25 each month. For every megabyte of usage or part thereof, of data costs $0.15. For every minute of usage or part thereof, of minutes costs $0.03. Express the charges for this plan as a piecewise function.

3. Vernel is considering two different way to buy a new cell phone and service plan that goes with it. There are two options. Option 1, buy the cell phone from a non-service provider and find a plan from a service provider that fits your needs. Option 2, Buy the phone at a discount from a service provider and the service plan that comes with it. Vernel found the cell phone and service plan he wanted in each option.

   Option 1, $700 for the phone and $45 per month for 1GB data, unlimited talk and text.

   Option 2, $225 for the phone and $85 per month for 1GB data, unlimited talk and text.

   How can Vernel compare the two options to determine which is a better deal over the life of the phone?