

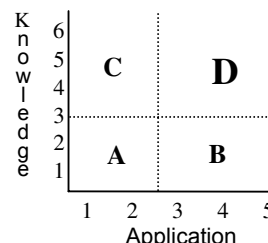
**GOLD  
SEAL  
LESSON**



**Cell Phone Challenge**

**Subject(s)**  
Mathematics

**Rigor/Relevance  
Framework**



**Grade Level 8–11**

**Instructional  
Focus**

**Number Operation and Concepts:** Students use number, number sense, and number relationships in a problem-solving situation. Students communicate the reasoning used in solving these problems.

**Algebraic Concepts and Relationships:** Students use algebraic methods to investigate, model, and interpret patterns and functions involving numbers, shapes, data, and graphs in a problem-solving situation. Students evaluate and communicate the reasoning used in solving these problems.

**Tools and Technology:** Students use appropriate tools and technologies to model, measure, and apply the results in a problem-solving situation. Students communicate the reasoning used in solving these problems.

**Problem Solving and Mathematical Reasoning:** Students apply a variety of problem-solving strategies to investigate and solve problems from across the curriculum as well as from practical applications.

**Student  
Learning**

- Students will learn how to model a situation using a system of equations.
- Students will understand the usefulness of the process of solving systems of equations.
- Students will learn how to use the intersect tool of a graphing utility to find the solution to a system of linear equations.

**Performance  
Task**

**Overview**

Students will investigate a scenario involving two cell phone plans that will introduce them to the concept of solving systems of equations. They will use estimation techniques to decide which plan is best.

Students will model the cost for two cell phone plans using linear functions, graph the functions using a graphing utility, and use the graphing utility to find the intersection of the two functions.

**Description**

1. Ask who owns a cell phone and what service they use.
2. Place students in groups of two to four.
3. Give students the attached Cell Phone Challenge Problem 1 and the attached Scoring Guide. Ask them to try and solve the problem using their current knowledge.
4. Through trial and error students may come up with the solution. Allow students to try and come up with their own way to solve the problem. If students struggle, the teacher can give the students a hint by suggesting to the students that they test out possible answers to the problem.
5. Now direct students to create a linear function to represent the cost of each cell phone plan, using two variables. After groups have had a

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**Performance Task**  
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- chance to do this, ask for their response and place the two equations on the board.
6. Discuss with students what the graph of these two equations would look like, based on their previous knowledge. Also discuss at this time the meaning of the intersection point of the two equations in the context of the problem.
  7. Instruct students to type the equations into their graphing utility. Students will need to adjust the window of the graphing utility to see where the two lines intersect. During this time, the teacher circulates throughout the room to offer help and check for understanding.
  8. Students will use the graphing utility to find the intersection of the two lines.
  9. Give students the attached Cell Phone Challenge Problem 2 and Scoring Guide to demonstrate their understanding of setting up and solving a system of equations using their graphing utility. This can occur either in class, if time permits, or as a homework assignment.

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**Assisting English Language Learners**

When a complex math assignment is given to the class, always check to make sure English Language Learners understand. Do not ask, "Do you understand?" Instead, ask questions that require students to explain the instructions back to you and show they understand.

Write key words and formulas on the board as you explain the assignment, and be sure to provide visual examples of what the students are expected to do.

In this exercise, cooperative grouping is essential to encourage participation and language practice.

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**Essential Skills**

- M11 Apply variables in expressions and equations to solve problems (i.e., write mathematical equations for given situation, create a mathematical model to understand the relationships between variables, or make connections between the structures of mathematically abstract concepts and the real world).
- M30 Know and apply the components and properties of the rectangular coordinate system:  $x$ - $y$  axis, origin, quadrants, abscissa ( $x$ -coordinate) and ordinate ( $y$ -coordinate), and general representation of a point  $(x,y)$ .
- M44 Know the equation of a line and interpret graphically using the slope-intercept form ( $y = mx+b$ ) and the point-slope form ( $y-b = m(x-a)$ )
- M40 Solve systems of linear equations algebraically or graphically.

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**Attachments/ Resources**

Cell Phone Challenge Problem 1

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Submitted by: Matthew Hopkins, Champaign Schools

**Scoring Guide**  
**Cell Phone Challenge Problem 2**

Model the two plans using linear equations	_____ / 4 points
View the two plans intersecting on the graphing utility	_____ / 4 points
Locating the intersection point of the two functions	_____ / 4 points
Interpreting the results in the context of the question.	_____ / 4 points
<b>Total</b>	_____ / 16 points

## **Attachments/Resources**

### **Cell Phone Challenge Problem 1**

You are at Market Place Mall searching for a new cell phone. You have identified two plans that work for you. The first plan is through Vextel Communications. The second plan is through Perizon Wireless. Vextel charges a monthly fee of \$20 for text messaging, call waiting, and caller ID. Vextel also charges you 6 cents per minute to use the phone. Perizon Wireless charges a monthly fee of \$10 for text messaging, call waiting, and caller ID. Perizon Wireless charges you 8 cents per minute to use the phone. How many minutes per month do you need to use for the Vextel plan to be the better choice?

### **Cell Phone Challenge Problem 2**

You are at The Mall of America searching for a new cell phone. You have identified two plans that work for you. The first plan is through Fast Communications. The second plan is through Alltell Wireless. Fast Communications charges a monthly fee of \$15.20 for text messaging, call waiting, and caller ID. Fast Communications also charges you 7 cents per minute to use the phone. Alltell charges a monthly fee of \$9.50 for text messaging, call waiting, and caller ID. Alltell Wireless charges you 9 cents per minute to use the phone. How many minutes per month do you need to use for the two plans to cost the same?