Name_____

Phoning Your Friends

Investigation

Solving Systems of Linear Equations

In this investigation, you will demonstrate your knowledge of *Systems of Linear Equations* by solving, graphing, and explaining several systems. You will model real-life pricing schemes of telephone companies as linear equations, then interpret and analyze the results to determine which company is least expensive in different situations.

Requirements:

- Name
- Title
- Introduction
  - What are the purposes, both mathematical and practical, of this investigation?
  - What phone companies did you choose and why?
    - Give a reason for each phone company. (ex: My parents use it.)
  - Definition of variables for the rest of the report. (ex: m stands for the number of minutes)
- Phone Company #1—a "normal" long-distance phone company
  - Name
  - Description in words of pricing scheme
  - Linear equation that models the price in slope-intercept form.
  - Explanation in words of what the slope and y-intercept represent in the real world.
- Phone Company #2—a 10-10 number company
  - Name
  - Description in words of pricing scheme
  - Linear equation that models the price in slope-intercept form.
  - Explanation in words of what the slope and y-intercept represent in the real world.
- Phone Company #3—a cell phone company or an internet-based phone company
  - Name
  - Description in words of pricing scheme
  - Linear equation that models the price in slope-intercept form.
  - Explanation in words of what the slope and y-intercept represent in the real world.
- Graph
  - Must include all 3 phone companies
  - Title
  - Graph is spread out, taking up the whole page and clearly showing all intersections.
  - Legend showing which color is which company
  - Axes labeled and numbered
  - Hand-drawn with a straight edge, with arrowheads drawn on the lines.
- Data Analysis (Show **all** work.)
  - Solve at least one point of intersection ***graphically***.
  - Solve at least one point of intersection using the ***substitution method***.
  - Solve at least one point of intersection using the ***elimination method***.
  - All answers are checked by substituting into **both** equations.
- Results & Discussion
  - In which situations is each company least expensive (or at least less expensive than another company)?
    - Be specific about lengths of phone calls.
    - Refer to intersections points.
  - In which situations is Company #2 least expensive?
  - In which situations is Company #3 least expensive?
- Conclusion
  - What are the major differences in how phone companies charge you?
  - Which method of solving systems of linear equations is easiest for you and why?
  - Which phone company do you think would be best for your family and why?
- Appendix
  - Print-outs of websites or copies of pamphlets where you found the pricing schemes.

Resources: Below are some resources you may use for this project:

Possible Phone Companies

Company #1	Company #2	Company #3
AT&T Verizon IDT SBC Qwest BellSouth Pioneer Opex GTC Telecom PowerNetGlobal	10-10-987 10-10-565 PNG PowerDial DialAround 1010 101-5335 10-10-629 Lucky Dog Clear Choice 10-10-321 *Challenge:* 10-10-220	<u>Cell Phones</u> Verizon Wireless Cingular Sprint Wireless T-Mobile Nextel <u>Internet-Based</u> Vonage Comcast Digital Voice SunRocket ITP VelocityTel

Choose your three companies carefully—you must have at least three intersection points!

<u>http://10-10phonerates.com/state.html</u> has lots of 10-10 rates.

**Phone companies can charge you in at least three different ways. The first and most obvious way is by charging you a certain rate for your calls, like 5 cents a minute. Another way is to charge a fee every time you place a call, like 75 cents per call. A third way is to charge a monthly fee, like 30 dollars a month.

For your analysis, I'm looking for equations that model the cost of a phone call based on how many minutes you use. Therefore, we must figure out a way of breaking down the monthly rate into a per-call basis. It is reasonable to estimate that you make about one phone call a day, which is about 30 a month. Therefore, to turn a monthly fee into a per-call fee, you can divide by 30.

Important Dates

Project Assigned	Friday, January 6
Research Due—bring in your print-outs	Tuesday, January 10
Linear Equations Due	Wednesday, January 11
Graph Due	Wednesday, January 18
Everything Due	Friday, January 20

Name_____

Systems of Linear Relationships Investigation Rubric

Category	Beginning	Approaching	Meeting	Exceeding
Completeness	Several days late. Several sections from assignment are missing.	One day late. One or two sections from assignment are missing.	On-time. Includes every section from assignment.	On-time. Extra phone companies are compared.
Equations & Graphing	Linear equations are incorrect. Many answers are not checked. Graph is missing several items from checklist. Graph is incorrect or incomplete.	Linear equations are correct but not in slope-intercept form. OR One linear equation is incorrect. One answer is not checked. Graph is missing one or two items from checklist.	Linear equations are correct and in slope-intercept form. All answers are checked. Graph is correct and includes everything from checklist.	Calculations are correct, showing all steps. Answers are checked. Graph is visually appealing.
Connections	Few or no connections are made between the data, equation, graph, and situation. Analysis of data is incorrect.	Some connections are made between the data, equation, graph, and situation, but there are some missed connections. Analysis of data is unclear or slightly incorrect.	Several appropriate connections are made between the data, equation, graph, and situation. Analysis of data is reasonable.	Extra connections are made, some showing deep thought. Analysis of data shows good critical thinking skills.
Communication	Writing is not in complete sentences or extremely unclear. Few or no mathematical terms are used appropriately.	Writing is slightly unclear or difficult to understand. Some mathematical terms are either missing or used inappropriately.	Writing is clear and concise in complete sentences. Mathematical terms are used appropriately.	Writing is easy to read and flows nicely. Mathematical terms are used appropriately and explained in great detail.

Graph checklist:

- All lines drawn with a straight edge, with arrowheads
- Axes numbered evenly, with labels and units
- Graph is in color, with a legend showing all companies
- Graph has title
- Graph is spread out and shows all intersections

Draft Number _____

Overall Grade _____