

Phoning Your Friends

An In-Depth Analysis of the Evils of Phone Companies

Or

Clever Schemes to Get Rich Quick by Starting a Phone Company

Catchy
Introduction

When plotting an evil scheme to take over the world, the first step is to make lots of money. One devilishly ingenious way of doing this is apparently to start a telephone company. Phone companies find several ways to charge you, but if you're clever enough to analyze the data using skills used to solve systems of linear equations, you can figure out which company is cheapest to use.

List of the three
companies

For my analysis, I chose to look at three different telephone companies: Bubba's Telephone Service, 10-10-MATH-IS-AWESOME, and MIT-Speak. I chose Bubba's

Reason why I
chose each one

Telephone Service because Bubba is a friend of mine who's getting rich from his company, and I wanted to see if his rates are any different from other companies. 10-10-MATH-IS-AWESOME seemed like a great company, and who can argue with their slogan? MIT-Speak is a phone company I'm considering using, but I want to check out how much it costs.

Defining my
variables

For this report, I'll define the variable m to stand for the length of the phone call, as measured in minutes. The variable c will represent the total cost, in dollars, of the phone call. The cost will depend on the length of the phone call, so m is the independent variable and c is the dependent variable.

Phone Company
#1

Bubba's Telephone Service charges no monthly or per-call rate. Instead, they have what they call a "flat rate" for placing telephone calls. The rate they charge is 10 cents a minute. The rate is modeled by the equation

$$c = 0.1m$$

In this equation, the slope is 0.1, which means that each minute costs \$0.1, or 10 cents. The y-intercept represents the other charges that don't depend on how long the phone call is. In this case, the y-intercept is zero, which means that there are no additional charges.

Phone
Company #2

10-10-MATH-IS-AWESOME has a much lower rate than Bubba's. MATH-IS-AWESOME only charges 5 cents a minute. The catch is that every time you place a call with their company, they automatically charge you \$2. The equation that represents this situation is

$$c = 0.05m + 2$$

In this equation, the slope is 0.05 and the y-intercept is 2. The slope in this case represents the rate of a nickel for each minute of the phone call. The y-intercept is the two dollars that they charge you no matter how long your call lasts.

Phone
Company #3

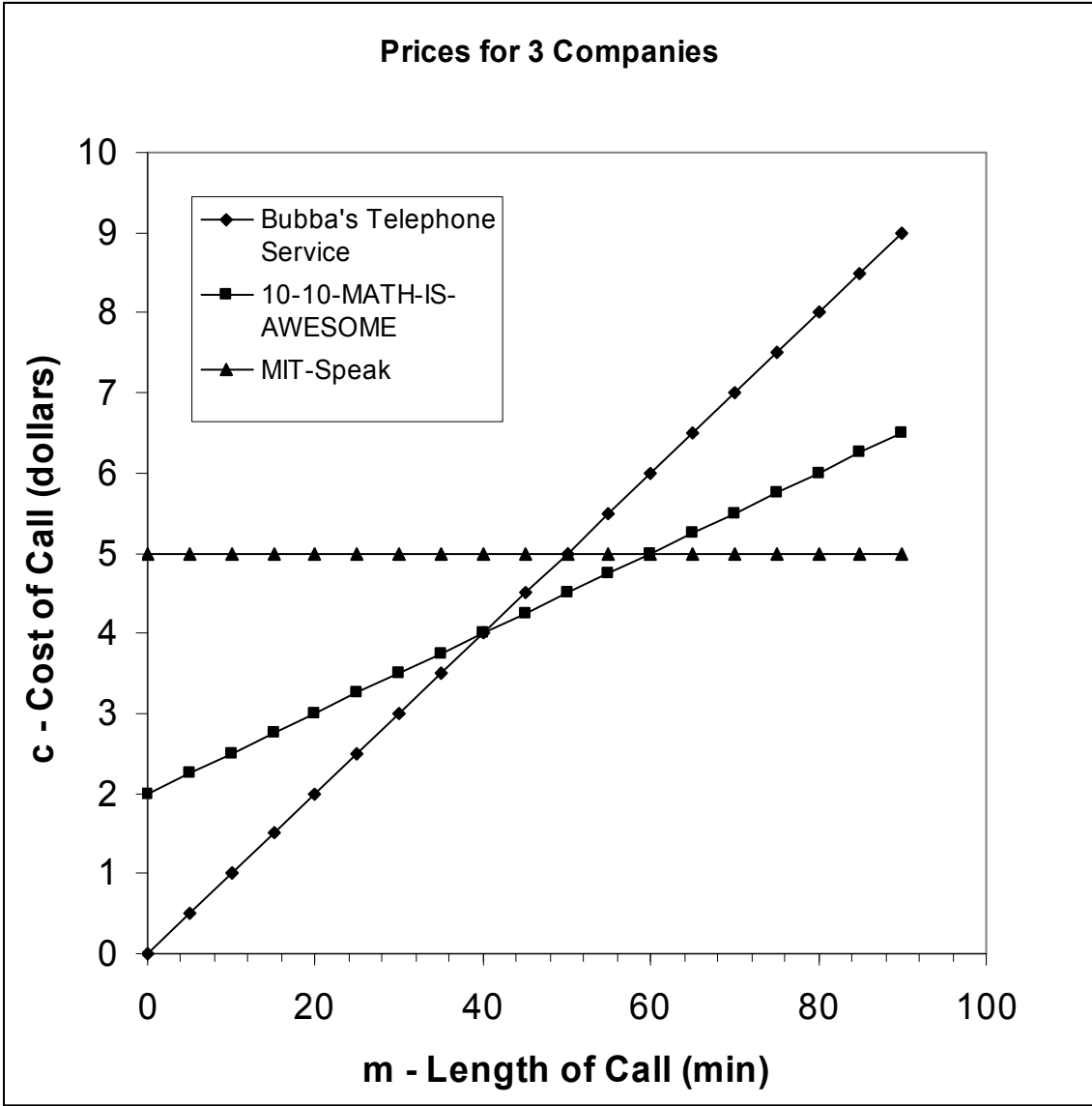
MIT-Speak doesn't charge you at all for the phone calls you make. Instead, they charge a \$75 monthly fee that allows you to use their service. The pricing equation for this company is

$$c = 5$$

In this case, the slope is zero, which means that they charge nothing for every minute that you talk. The y-intercept represents the extra charge of \$75 each month. However, the y-intercept is 5 instead of 75 because you can assume that you place about 15 phone calls in a month, so 75 divided by 15 gives you a \$5 charge every call you make.

Introduce
graph and
graphically
solve for a
point of
intersection

The graph showing all three equations is shown on the next page. It's important to notice that for some value of m , each of the three lines can be the cheapest. By looking at the graph, you can tell that the line for Bubba's intersects the line for MATH-IS-AWESOME at a length of 40 minutes and a price of \$4.00.



**Note that this graph is computer-made, which is not acceptable for your work. In addition, this graph is in black-and-white so I could copy it, whereas yours should be colorful. As a final reminder, don't forget the arrowheads on your axes and lines!

Let's check that point by substituting values into both equations and simplifying:

	Bubba's	MATH-IS-AWESOME
Check answers in BOTH equations	$c = 0.1m$	$c = 0.05m + 2$
	$4.00 = 0.1 \cdot 40$	$4.00 = 0.05 \cdot 40 + 2$
	$4 = 4$	$4 = 2 + 2$
		$4 = 4$

Because both equations simplify to an identity, the intersection point must be correct.

The intersection of the lines for MATH-IS-AWESOME and MIT-Speak can be determined using substitution, as shown below:

Solving for a point of intersection using substitution.	MIT-Speak	$c = 5$
	MATH-IS-AWESOME	$c = 0.05m + 2$
	Substitute for c	$5 = 0.05m + 2$
	Subtract 2 from both sides	$3 = 0.05m$
	Divide both sides by 0.05	$m = 60$
	From the top equation	$c = 5$

Now, let's check:

	MIT-Speak	MATH-IS-AWESOME
Check answers in BOTH equations	$c = 5$	$c = 0.05m + 2$
	$5 = 5$	$5 = 0.05 \cdot 60 + 2$
		$5 = 3 + 2$
		$5 = 5$

Therefore, both MATH-IS-AWESOME and MIT-Speak charge \$5 for a 60-minute phone call.

The length of phone call that Bubba's and MIT-Speak charge the same amount

can be determined using the subtraction method:

Solving for a point of intersection using addition or subtraction.

Bubba's Telephone Service	$c = 0.1m$
MIT-Speak	$c = 5$
Subtract	$0 = 0.1m - 5$
Add 5 to both sides	$5 = 0.1m$
Divide both sides by 0.1	$m = 50$
From the second equation	$c = 5$

Checking:

Check answers in BOTH equations

Bubba's Telephone Service	MIT-Speak
$c = 0.1m$	$c = 5$
$5 = 0.1 \cdot 50$	$5 = 5$
$5 = 5$	

From this, we can see that both Bubba's and MIT-Speak charge \$5 for a 50-minute phone call.

From the graph, we can tell that Bubba's is the cheapest company when your

Situations in which each company is cheapest.

phone calls are shorter than 40 minutes in length ($m \leq 40$). 10-10-MATH-IS-AWESOME is cheapest when talking on the phone anywhere from 40 minutes to 50 minutes ($40 \leq m \leq 50$). For calls longer than 50 minutes ($m \geq 50$), MIT-Speak is the cheapest company.

Different ways phone companies charge you.

There are three basic ways that these companies charge for telephone calls. The first way is a flat rate, which is just a certain amount of money for each minute. The second way is a per-call rate, which is a certain amount of money for each call you make,

no matter how long your call is. The third kind of charge is a monthly one, where each month you're billed a certain amount.

Which method of solving systems of linear equations is easiest.

By practicing solving systems of equations different ways, I've decided that the easiest method for me is the subtraction method. It reminds me of my elementary days, where I had to write out subtraction problems, instead of doing the problem in my head like I usually do now. It's also neat to see how you can subtract variables and equations just like numbers.

Which company is best for your family.

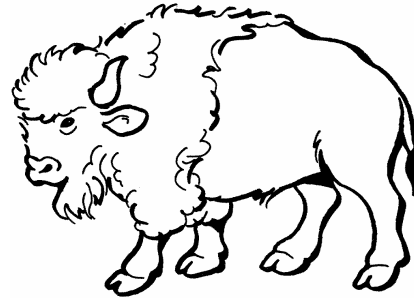
Of these three companies, I think Bubba's Telephone Service is best for me because I like to make prank phone calls that usually last just a minute or two, so Bubba's is cheapest. In addition, Bubba's my friend, and I want to do what I can to help him out.

Appendix

Below are copies of my research showing the pricing schemes for each of my three companies.

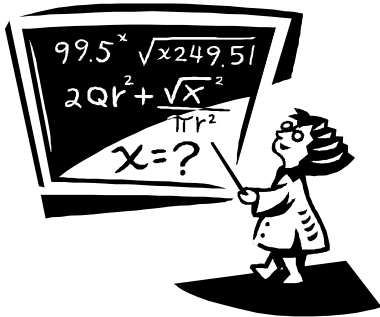
BUBBA'S TELEPHONE SERVICE

One low FLAT RATE
10¢ a minute



Sign up or Bubba will trample you.

10-10-MATH-IS-AWESOME



only 5¢ a minute
plus a \$2 per-call fee

Join today

Ask your Math teacher

MIT-Speak

A new internet-based telephone company

FREE, UNLIMITED
phone calls to anywhere!

for a low, \$75 monthly fee.

Catch the power of MIT