

## Cell Phone Plans

In this module, we will look at cell phone plan pricing. Some cell plans have a volume pricing structure where the amount you pay for the next unit depends on how many units you have used. That structure has some similarity to tax brackets. Do you see how?

*Note that we have **not** given you the numeric details of the plans in a spreadsheet file. Try to figure out a good way to lay out your spreadsheet to make it easier to write and drag your formulas.*

***Also note: selected answers are on the last page.***

### Background

Here are cell phone pricing plans from two different carriers. Let's assume that the phone you want, or a comparable one, is available at each of these carriers, and that you are not concerned about the differences in service coverage across the plans.

#### Carrier A

- Plan A-1: \$80 per month. Includes 450 minutes, 1,000 texts, and 3 GB of data.
- Plan A-2: \$110 per month. Includes unlimited talk, unlimited texts, and unlimited data.

Overage charges for Carrier A:

- If you exceed the plan minutes, the charge is \$0.25 per minute.
- If you exceed the plan texts, the charge is \$0.18 per text message for the first excess 500 and \$0.35 per text message for any additional texts.
- If you exceed the data limit, the charge is \$0.000015 per KB.

#### Carrier B

- Plan B-1: \$60 per month. Includes 300 minutes, 1,000 texts, 2 GB of data.
- Plan B-2: \$85 per month. Includes 500 minutes, unlimited texts, 3.5 GB of data.

Overage charges for Carrier B:

- If you exceed the plan minutes, the charge is \$0.20 per minute.
- If you exceed the plan texts, the charge is \$0.20 per text message.
- If you exceed the data limit, the charge is \$0.01 per MB.

In addition to the plan charges above, each of these plans (Carriers A and B) has a 19% tax on **all** plan charges (including overage charges) plus a \$2.52 regulatory and administrative fee. You do **not** pay the tax on the regulatory and administrative fee.

### Part 1: Plan Calculations

- 1) Kilobytes, Megabytes, Gigabytes
  - a. How many kilobytes are in a megabyte?
  - b. Where did you find the answer?
  - c. How many kilobytes are in a gigabyte?

**For all of these questions, you should include taxes and fees.**

- 2) Say you are on **Plan A-1**.
  - a. If you talk 78 minutes, send 859 texts, and use 1.5 GB of data in a month, how much do you pay?
  - b. If you talk 120 minutes, send 1,200 texts, and use 3.6 GB of data in a month, how much do you pay?
  - c. If you talk 120 minutes, send 3,200 texts, and use 2.4 GB of data in a month, how much do you pay?
- 3) Say you are on **Plan B-1**.
  - a. Answer Question 2a for this plan.
  - b. Answer Question 2b for this plan.
  - c. Answer Question 2c for this plan.

## Part 2: Plan Comparisons

### 1) Compare Plans A-1 and A-2.

- a. Say you are on Plan A-1 and you keep getting overage charges for texts. You have no problem staying within the 450 minutes and the 3 GB of data, but the 1,000 texts are not enough. You are thinking about switching to Plan A-2. How many texts would you have to be using to make Plan A-2 a better choice for you (i.e., cost less given your usage)?

Write out by hand the equation to answer this question and solve it.

Do you need to include taxes and/or fees?

- b. Create a graph in Excel that shows the comparison of the costs of Plans A-1 and A-2, as a function of the number of texts. Assume that minutes are under 450 and data is under 3 GB.
- c. Show the answer to part a on the graph you built in part b.

### 2) Compare Plans B-1 and B-2.

- a. Say you are on Plan B-1 and you keep getting overage charges. Most months you use about 350 minutes, so you are paying the overage charges for minutes each month. Your data usage is under the limit on the plan (so no overage charges for data), but your number of texts per month varies widely. You are thinking about switching to Plan B-2. How many texts would you have to be using to make Plan B-2 the better choice for you, assuming you are using 350 minutes?

Write out by hand the equation to answer this question and solve it.

Do you need to include taxes and/or fees?

- b. Create a graph in Excel that shows the comparison of the costs of Plans B-1 and B-2, as a function of the number of (plain) texts. Assume that you use 350 minutes and your data is under 2 GB.
- c. Show the answer to part a on the graph you built in part b.

## **Selected Answers**

### **Part 1**

2b) If you use 1024 KB in a MB, the answer is \$151.79.

3a) \$73.92

### **Part 2**

Hints for Question 1, so you can check to see if you are on the right track:

*Plan A-1 has a total cost of \$97.72 if you use 1000 texts and \$204.82 if you use 1500 texts.*

*Plan A-2 has a total cost of \$133.42, independent of the number of texts.*

Hints for Question 2, so you can check to see if you are on the right track:

*Plan B-1 has a total cost of \$85.82 when you use 350 minutes and 1000 texts and a cost of \$204.82 when you use 350 minutes and 1500 texts.*

*Plan B-2 has a total cost of \$103.67 when you use 350 minutes, independent of the number of texts.*