Name: KEY Date: _____ Period: _____

Day 04 - Analyzing Numerical Data: Estimating Large Numbers

I.A Student Activity Sheet 3: Not Enough Numbers

Telephone Numbers

During the past few years, there have been several statements of the form: "It is conceivable that we may run out of area codes and telephone numbers within the next 10 years." The shortage of phone numbers is due to the proliferating use of cell phones, pagers, and fax machines. In the next few problems, you will estimate the number of possible telephone numbers in North America. The assignment of telephone numbers is coordinated by the North American Numbering Plan Administration (www.nanpa.com). (NANPA actually covers only the United States and its territories, Canada, and the Caribbean. Mexico is not included.)

A telephone number in the form *NYZ-ABC-XXXX* has three sections:

NYZ	**ABC**	**XXXX**
area code	exchange code	station code

(example 470-254-7600 is Chattahoochee High School's phone number)

Before 1995, all area codes had the form **NYZ** with the following restrictions:

- ***N*** was any digit from 2 to 9 (2–9) 8 options
- ***Y*** was 0 or 1 2 options
- ***Z*** was any digit from 1 to 9 (1–9) if ***Y*** was 0 9 options
- ***Z*** was any digit from 2 to 9 (2–9) if ***Y*** was 1 8 options

After 1995, some restrictions were removed. The following guidelines apply today:

- ***N*** is any digit 2–9 8 options
- ***Y*** is any digit 0–8 9 options
- ***Z*** is any digit 0–9 10 options

*The exception to these rules is codes of the form 37**Z** and 96**Z**, which are being reserved for future use.

1. How many area codes were possible before 1995? (Just area codes)

$\underset{N}{8} \cdot \underset{Y}{1} \cdot \underset{Z}{9} + \underset{N}{8} \cdot \underset{Y}{1} \cdot \underset{Z}{8} = 72 + 64 =$

N: 2–9, Y: 0, Z: 1–9 | N: 2–9, Y: 1, Z: 2–9

136 area codes

2. According to the post-1995 rules, how many area codes are possible today?

$\underset{N}{8} \cdot \underset{Y}{9} \cdot \underset{Z}{10} = 720$ options $- (10 + 10) =$ exceptions (37Z & 96Z)

700 area codes

The 7-digit numbers grouped with any given area code have the form ***ABC-XXXX*** have the following guidelines:

- ***B, C,*** and ***X*** can be any digit 0 – 9
- ***A*** can be any digit 2 – 9

3. How many 7 – digit phone numbers are possible giving these restrictions (not including area code)?

$\underset{A}{8} \cdot \underset{B}{10} \cdot \underset{C}{10} \cdot \underset{X}{10} \cdot \underset{X}{10} \cdot \underset{X}{10} \cdot \underset{X}{10} = 8{,}000{,}000$ numbers

2-9 0-9

What if we added the following restrictions:

- ***B*** and ***C*** cannot both equal 1 since these values are designated for other purposes such as *911* (emergency) and *411* (information), and
- 555-0100 through 555-0199 are reserved for fictional uses such as in television shows or movies.

NO 211, 311, 411, 511, 611, 711, 811, 911 for ABC and then X can be anything

4. According to these conditions, how many 7-digit numbers are possible with any given area code? (Use your answer from question 3 to help you answer this one).

NOT possible: fictional uses = 100

3 1 $\underset{ABC}{8} \cdot \underset{X}{10} \cdot \underset{X}{10} \cdot \underset{X}{10} \cdot \underset{X}{10}$

$= 80{,}000$

$8{,}000{,}000 - 100 - 80{,}000 = 7{,}919{,}900$ phone #'s

5. Using your answer from question 2, determine how many 10-digit numbers are possible in North America.

700 area codes $\times$ 7,919,900 phone #'s $=$ **5,543,930,000 10 digit phone #'s**