Phone Number Frenzy – April 29, 2024

Problems & Solutions

According to the North American Numbering Plan Administration (NANPA) standards, U.S. phone numbers contain a 3-digit area code, followed by a 3-digit exchange code and end in a 4-digit subscriber number. The first digit of both the area code and exchange code cannot be 0 or 1. How many different combinations of area code and exchange code are possible? Express your answer in scientific notation.

> *For the 3-digit area code, the first digit can be any digit from 2 through 9, and each of the two digits that follow can be any digit from 0 through 9. That's a total of 8 × 10 × 10 = 800 different combinations. The same restrictions apply to the 3-digit exchange code. So, there are 800 different combinations for that as well. Therefore, the number of different combinations of area code and exchange code possible is 800 × 800 = 640,000 = $\mathbf{6.4 \times 10^5}$ combinations.*

In the state of Maryland, the 301 area code took effect in 1947, and by 1991 every possible phone number with a 301 area code had been assigned to a Maryland phone subscriber. At that time, the state instituted the 410 area code. Just six years later the state had exhausted its pool of available phone numbers with a 410 area code. So in 1997, the 240 and 443 area codes took effect in the state. In 2012, once again on the verge of running out of phone numbers, the state of Maryland introduced a new 667 area code to expand its pool of available phone numbers. What is the total number of unique phone numbers possible (in compliance with NANPA standards) using the 301, 410, 240, 443 and 667 area codes?

> *For each of the five area codes, there are 8 × 10 × 10 = 800 possible exchange codes, and 10 × 10 × 10 × 10 = 10,000 possible subscriber numbers. Therefore, the total number of unique phone numbers possible for these five area codes is 5 × 800 × 10,000 = $\mathbf{40{,}000{,}000}$ phone numbers.*

It took 44 years (1947 to 1991) to deplete the pool of available numbers with a 301 area code in the state of Maryland, but only 6 years (1991 to 1997) to exhaust all possible numbers with a 410 area code. The proliferation of cell phone use is the main cause for the drastic increase in the rate at which phone numbers were assigned. What is the percent increase from the rate at which 301 area code phone numbers were assigned to the rate at which numbers with a 410 area code were assigned? Express your answer to the nearest whole number.

> *There are a total of 8 × 10 × 10 × 10 × 10 × 10 × 10 = 8,000,000 unique phone numbers for the 301 area code. If these numbers were exhausted in 44 years, that's an average of 8,000,000 ÷ 44 = $181{,}818.\overline{18}$ phone numbers assigned per year. Similarly, there are 8,000,000 unique phone numbers for the 410 area code. If these numbers were exhausted in 6 years, that's an average of 8,000,000 ÷ 6 = $1{,}333{,}333.\overline{3}$ numbers assigned per year. For the 410 area code, there were an additional $1{,}333{,}333.\overline{3} - 181{,}818.\overline{18}$ = $1{,}151{,}515.\overline{15}$ phone numbers assigned per year. That's an increase of $1{,}151{,}515.\overline{15} ÷ 181{,}818.\overline{18}$ = $6.\overline{3} ≈ \mathbf{633}\%$.*

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