

## Telephone Numbers

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How many different telephone numbers are possible? Are all of these probable?

**Grade Levels 6 - 8**

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### **Context**

We had worked with exponents and combination problems. I wanted a problem that would combine the two concepts.

### **What This Task Accomplishes**

This is a real-world application. I was looking to see who could come up with the idea of combinations, but also to see who would take this task realistically. Some research would be necessary for a deep understanding of the problem.

### **What the Student Will Do**

Many students began with 10 possibilities for each slot in the telephone number. Many used exponents successfully. There were many different levels of understanding of what numbers were probable.

### **Time Required for Task**

50 minutes

### **Interdisciplinary Links**

This problem could be nicely integrated with a social studies discussion of communication systems. The dialing system will be changed because the country is running out of numbers for telephone exchanges.

### **Teaching Tips**

You may want to have telephone books available (I may not hand them out, but if asked for one I would be ready) to give an opportunity for more students to reach a higher level of understanding.

### **Suggested Materials**

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# Exemplars

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- Telephone books
- Graph paper

## Possible Solutions

See the Expert solution.

## Benchmark Descriptors

### Novice

There is no accurate solution, little evidence of a strategy or reasoning and little explanation.

### Apprentice

The student uses a strategy that is partially useful. There is some evidence of reasoning, but an incomplete explanation for finding how many numbers were not probable.

### Practitioner

This student has a broad understanding of the problem and uses a strategy that finds all numbers if 10 digits are allowed for each slot. S/he uses effective reasoning in subtracting out the improbable numbers. His/her explanation is clear.

### Expert

This student shows a deep understanding of the problem and is solving a realistic interpretation of the problem efficiently. S/he is explaining and subtracting out the impossible combinations as s/he sets up the problem.