Unique Buildings

You are the mayor of a small town and are given the mandate to build 10 floors of residential housing. For example, you could build a single skyscraper of 10 floors, or three buildings of 1, 2 and 7 floors...

The people who will live in the buildings want each one to be unique, so you decide that they should all have a different height.

How many ways can you do this?

Organize your building combinations in a table. Is there only one good way to do this?

Extensions:

- The next year the same request was made, but this time 11 new floors were needed.
- Because you were so successful, the following year you become mayor of a new city. This time you are given the mandate to create 90 floors of residential housing. The people like your idea of making sure that the buildings are of different heights, but they want more: They also want to know that for each of your buildings there is another 1 floor higher. "Impossible!" you complain, "There must be a tallest building, and that means there is not a building 1 higher!" They eventually agree, so they say that for all buildings, except the tallest, a building 1 floor higher must exist. So buildings of height 11, 39, and 40 do not work because the building of height 11 requires a building of height 12.

  How many ways is it possible to do this?

- Sometimes you have nightmares when you fall asleep at night. In one nightmare you a besieged by angry people who want buildings built immediately. They say you have 75 floors and that the only requirement is that no building may be a multiple height of another building. For example: 2, 3, 70 doesn't work because 2 multiplied by 35 = 70. The real nightmare comes next: they demand EIGHT buildings!!!

The Math in This Problem:

In this math investigation, students are challenged to construct buildings of all different heights, with the floors of all buildings combining to a total of ten floors. Organizing the combinations in a table, students will have to figure out the various ways of doing this, as well as the total number of ways, and evaluate which way(s) actually makes for a good plan.