Homework 2 Solutions

Problems

1. **Jesse goes out to dinner at Dali to celebrate the fact that he's not teaching calculus this year. On the menu are listed four possible seafood tapas and five possible vegetarian tapas. How many ways are there for Jesse to order if he intends to get a seafood dish, a vegetarian dish, and either lemonade or water to wash it down?**

   There are 4 choices for the seafood tapa; 5 choices for the vegetarian tapa; and 2 choices for the drink. So by the multiplication principle there are a total of $4 \cdot 5 \cdot 2 = \boxed{40}$ ways to order dinner.

2. **How many 4 digit numbers are there using the digits 0, 1, 2, 3, 4, 5 and 6? Be careful: the first digit can't be zero! How many of these are even?**

   There are 6 choices for the first digit (anything but zero) and 7 choices for each of the remaining 3 digits, for a total of $\boxed{6 \cdot 7^3}$ choices.

   If the number must be even, there are 4 choices for the last digit (0, 2, 4 or 6), 6 choices for the first digit (anything but zero), and 7 choices for each of the middle digits. Thus the total number of choices is $\boxed{6 \cdot 4 \cdot 7^2}$.

3. **How many license plates are there of the form 3 letters, then 3 numbers? What if we restrict the 3 numbers, considered as a 3-digit number, to be between 387 and 971, inclusive? What if we also require that the letters not include the letter "Q" on the grounds that it looks too much like an "O"?**

   There are 26 choices for each of the first three letters and 10 choices for each of the three numbers. Thus there are $\boxed{26^3 \cdot 10^3}$ such license plates.

   For the second part, there are still 26 choices for each of the first three letters, and then $971 - 387 + 1 = 585$ choices for the 3-digit number, for a total of $\boxed{26^3 \cdot 585}$ possibilities.

   For the final part, instead of 26 choices for each letter we only have 25, so the total is $\boxed{25^3 \cdot 585}$.

4. **By tricolor flag we shall mean a flag composed of three equal vertical bands of color (like the French one, or the one of the Ivory Coast). If we allow ourselves the colors blue, green, orange, red, yellow, and white, how many flags can we make? (We allow neighboring bands to have the same color). Suppose we want to save our country money on dye by requiring that at least one of the bands is white - how many flags can we make then?**

   There are 6 possible colors for each of the three bands so, by the multiplication principle, there are $\boxed{6^3 = 216}$ possible flags.

   For the second part first consider the number of flags that *don't* have any white bands. By the multiplication principle there are $5^3 = 125$ flags that don't have any white bands. Therefore there must be $\boxed{216 - 125 = 91}$ flags which have at least one white band.