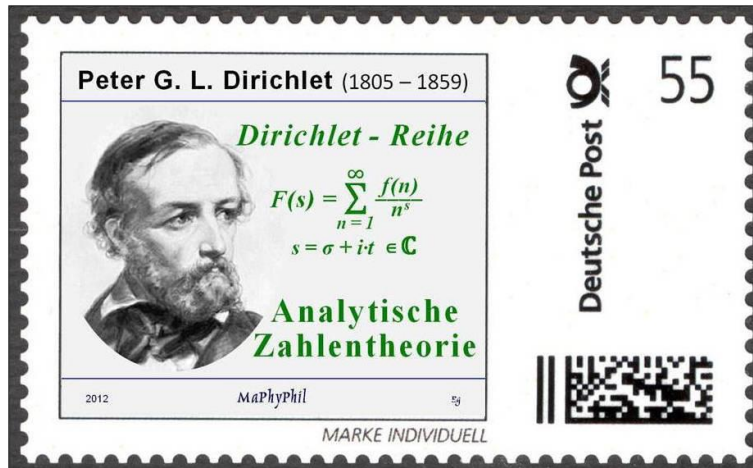


Handout 2 August 27, 2015



1. Alphaville high school has 500 students. Show that at least two of them were born on the same day of the year.
2. Suppose that Albertine and Marcel live in a home with their 12 children.
 - (a) Prove that at least two of the children were born on the same day of the week.
 - (b) Prove that at least two family members (including mom and dad) are born in the same month.
 - (c) Assuming that there are 4 children's bedrooms in the house, show that there are at least 3 children sleeping in at least one of them.
3. If there are 16 students in German 102 this semester and 5 possible grades, show that at least 4 students must have the same final grade.

4. There are 50 baskets of pears at the Betaville Farmer's Market. Each basket contains no more than 24 pears. No basket is empty. Show that there must be at least 3 baskets containing the same number of pears. Who are the pigeons and what are the pigeon holes?

5. Prove that if 7 distinct numbers are selected from the set $\{1, 2, \dots, 11\}$, then there exist two of these 7 numbers that sum to 12. Who are the pigeons and what are the pigeon holes?

Hint: Let the pigeon holes correspond to the 6 sets $\{1, 11\}$, $\{2, 10\}$, $\{3, 9\}$, $\{4, 8\}$, $\{5, 7\}$, $\{6\}$.