

Problem 2. Use the Pigeonhole Principle, to determine the following.

1. Among any 11 integers, what is the least number of integers that must have the same last digit.

Pigeonholes: 10 digits - $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$

Pigeons: 11 integers

$$\lceil \frac{11}{10} \rceil = \lceil 1.1 \rceil = 2$$

At least 2 integers have the same last digit.

2. For a class with 60 students, what is the least number of students that must have last names that begin with the same letter.

Pigeonholes: 26 letters of the alphabet

Pigeons: 60 student names.

$$\lceil \frac{60}{26} \rceil = \lceil 2.3... \rceil = 3.$$

At least 3 students must have last names that begin with the same letter.