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11.9.17
Homework Assignments - Set 9.4 - 6, 7, 16, 27
Reading : pp. 554- 557, 559-561

6. a. Given any set of seven integers, must there be two that have the same remainder when divided by 6? Why?
   b. Given any set of seven integers, must there be two that have the same remainder when divided by 8? Why?

a.

There must be two integers in the set of seven, because due to the pigeonhole principle, there are 6 possible remainders (holes) and 7 integers (pigeons). So two integers will have the same remainder when divided by 6.

b.

No, when dividing by 8, there are 8 possible remainders (holes), and 7 integers (pigeons), so one cannot use the pigeonhole principle and it is possible that no two integers will have the same remainder.

***H* 7.** Let $S = \{3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$. Suppose six integers are chosen from S. Must there be two integers whose sum is 15? Why?

1(7,8), 2(6,9), 3(5,10), 4(4,11), 5(3,12). So, 5 sets whose sum is 15. Since there are 5 subsets (holes), and 6 integers chosen (pigeons), there must be two integers whose sum is 15 by the pigeonhole principle.

16. How many integers from 1 through 100 must you pick in order to be sure of getting one that is divisible by 5?

There are 20 integers out of 100 that are divisible by 5. If there are 80 integers that are not divisible by 5, then if you pick 81 integers at least one will be divisible by 5. (By the pigeonhole principle)

27. In a group of 2,000 people, must at least 5 have the same birthday? Why?

2000 / 365 yields 5.4 people per day. So, at least 5 people will have the same birthday because with 365 days in a year and 2000 people, there will be 5.4 people that could have the same birthday.