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CS-225: Discrete Structures in CS
Homework 7, Part 2
Exercise Set 9.4: Problem #6.b, #8, #11, #18 (provide justification for your answer), #28, #30(provide justification for your answer)

6. b) No. Because theres are 8 possible remainders when a number is divided by 8 [the pigeon holes]. If seven integers are selected [the pigeons] there is a likelihood of them ending up in different holes.

8. There are four pigeon holes, 9+1, 8+2, 7+3, 6+4. If you choose five pigeons, at least two are ultimately going to have a sum equal to 10, because there are more "pigeons" than "holes".

11. Yes. There are n odd numbers in the set, $2\times 1=1$. $2\times 2=4$, $2\times 3=6$, $2\times 4=8$. Thus if n+1 is chosen there exists at least one that is even.

18. (With justification) 15 because there are 0,1,2,3,4,5,6,7,8,9,10,11,12,13,14 chances of having leftover when dividing by 15. In order for at least two "pigeons" to be in the same "hole", you would need 16 integers picked.

28. 500/17= 29 with one line of code left over due to the decimal. This means yes there must have been at least one day where the programmer wrote at least 30 lines of code in order to make this possible.

30. (With justification). If you picked one by one and tallied then up by likelihood from the total of 30 pennies: you have 3 "holes" or year possibilities. If you picked 12 pennies randomly, you would most likely have 4 in each year or hole. So the 13th penny picked would create the fifth penny or add to whatever hole, and then will you know you have at least five pennies in at least one of the holes or years given. 13 pennies would have to be picked.