Homework 1
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Question 1: Find Collision
a) collision: 1 and $7^{12}+1$
b) collision: 011000 and 100001
c) collision: 011000 and 110000

Question 2: Prove
1. There are 365 days in a regular year and 366 days every 4 years
2. The maximum number of days in a year is 366.
3. The number of students in the class is 500.
4. According to the pigeon hole priciple, since 500 is larger than 366, there must be two students who have their birthdays on the same day of a year.

Question 3: find x -- please see java code
10 possible values of x: (output of my main method)

3A7D1C06F1E39F857EDA043D5F472856DF877C68DF7A1498CD6C91B9051A849F
D4185B292630DE2289D30F5EC7E92BFB56D91EA7329B3008D7E88AF46832BE76
C9C607A938353A964A7531A29AB89E27045C2CFD65A4FFF7AD5BE7BE5F9A1320
E3335C6E95B0BFEFD55A746223A09011610FE5EF2B797A5875825212AC899FB9
40F5C9B05C6058C3F3905C829998044535FE2E8D75B8897278B4766424F54ED9
04F35BC238896241DBD7A1C1324A1AE6CDD50093FB53A1D3DF96A93828C21B77
C7295A6B24FF702277D83DD88D6A075AF9FFA01500CC781335F6F42C1303EC82
7B7966DAA146BAE5B5871CA682ED57D569A7E24A5B4482B3C5C1F5402BFDA1B7
D615C9C6B358E223B56ACF655F513E1400425504A8347C6DFF5C0734D176E5BF
1B8880F6EFA7AFC55447889956E96E5484887ED75DB9E2CC2CB51B319A0CB724

Question 4: SMS text game

Alice can "hash" the number in her head and send the hash to Bob in SMS text.

An example of hashing mechanisim (if she thinks 9 in head):
1. Change the number from decimal to binary (9 ----> 1001)
2. Randomly choose 2 numbers from 0-9 and concatenate them with the binary string at the beginning (choose 4 and 7: 1001---->471001)
3. Transform the new number to hexadecimal as the hash (471001 ----> 72FD9)
4. Send the hash to Bob in SMS text

In step 2 the numbers chosen can be different each round of the game.