

CSI 30, Homework 8 on sections 4.5, 4.3, 4.2

Extra Credit

Due by Wed, Apr 26.

These questions are for extra credit so you can use them to make up for any earlier low scores. Please use lots of space and explain your answers, showing clearly any work you had to do. Each question is worth 3 points for a total of 27.

(1) Use modulus 17, multiplier 6 and increment 3 to make a pseudorandom sequence of numbers with the linear congruential method. Choose your own seed and give the 3 numbers in the sequence after that.

(2) Use the Luhn algorithm to check if this is a valid credit card number:

1234 5678 9000 6780

(Hint: as we saw in class, change the first digit, third digit, fifth digit and so on by doubling them. If any doubles are bigger than 9 then add their digits to get a single digit. Then check if the sum of all 16 digits is congruent to 0 modulo 10.)

(3) Draw factor trees and give the prime factorizations of these numbers

(a) 34

(b) 420

(c) 715

(4) Show that 283 is prime.

(Hint: check that the primes 2, 3, . . . do not divide into it evenly. You only need check primes up to the square root of the number.)

(5) List the integers 1 to 60 in a 10 by 6 grid. Use the sieve of Eratosthenes to find the primes in your list and circle them.

(Cross out 1. Then repeat this step: circle the next number and cross out its multiples. You do not need to remember the primes - the algorithm finds them for you.)

(6) Use the Euclidean algorithm to find $\gcd(420, 343)$

(7) Write these numbers in their usual decimal expansions:

(a) $(1101001)_2$

(b) $(234)_5$

(c) $(987)_{100}$

(8) Write the number 187

(a) in base 8

(b) In base 2

(Hint: divide by the base to get a quotient and remainder. Repeat dividing the new quotient by the base until you get a zero quotient. Show this work to get credit.)

(9) Give the hexadecimal representation of 9999. Show your work to get credit.

If you get stuck on a question or aren't sure if you understand it:

- Go over the relevant class notes and section in the textbook.
- Check if you get the right answer for a similar odd-numbered question in the textbook (answers at the back of the book).
- Ask me about it after class.
- Come to my office hours: Tue 3 - 4, Wed 3 - 4 in CP 317.
- Go to the Math Tutorial Lab in-person in CP 303 or online.