CECS 229: HW 3 (Modular Arithmetic, Integer Representation,)

Spring 2021

Remember, we will not be collecting or grading homework. The homework is optional but highly recommended. Quiz questions will be similar to the homework questions but not identical. Solutions to these problems are posted on BeachBoard.

1. If $a \equiv 10 \ (mod\ 37)$ and $b \equiv 27 (mod\ 37)$, find a value $0 \leq c < 37$ when…

   a. $c \equiv a + b \ (mod\ 37)$

   b. $c \equiv 38a - 36b \ (\text{mod}\ 37)$

   c. $c \equiv (\ 2a + 2b)^{1000} (mod\ 37)$

   d. $c \equiv (\ 56a - 7b)^{9999} (mod\ 37)$

2. Using the following ASCII Table, decode the following various encoded strings into their proper characters. * I realized that I messed up this ASCII table after I made the solutions and I really don't want to do everything all over again. Please use this table for this particular hw assignment ONLY. Sorry ☹

Character	Hex	Octal	Character	Hex	Octal	Character	Hex	Octal	Character	Hex	Octal
A	41	101	N	4E	116	a	61	141	n	6E	156
B	42	102	O	4F	117	b	62	142	o	6F	157
C	43	103	P	50	120	c	63	143	p	70	160
D	44	104	Q	51	121	d	64	144	q	71	161
E	45	105	R	52	122	e	65	145	r	72	162
F	46	106	S	53	123	f	66	146	s	73	163
G	47	107	T	54	124	g	67	147	t	74	164
H	48	110	U	55	125	h	68	150	u	75	165
I	49	111	V	56	126	i	69	151	v	76	166
J	4A	112	W	57	127	j	6A	152	w	77	167
K	4B	113	X	58	130	k	6B	153	x	78	170
L	4C	114	Y	59	131	l	6C	154	y	79	171
M	4D	115	Z	5A	132	m	6D	155	z	7A	172

   a. $(72)_{10}\ (97)_{10}\ (80)_{10}\ (112)_{10}\ (121)_{10}$

   b. $(1100010)_2\ (1000001)_2\ (1010100)_2\ (1101000)_2$

   c. $(99)_{10}\ (97)_{10}\ (84)_{10}$

3. Convert the following numbers
    a. 28 to binary
    b. 93 to hexadecimal
    c. 101 to octal
    d. $(11011011)_2$ to decimal
    e. $(3517)_8$ to decimal
    f. $(1E4F)_{16}$ to decimal
    g. $(1000101)_2$ to octal
    h. $(10010001)_2$ to hexadecimal
    i. $(501)_8$ to binary
    j. $(29F)_{16}$ to binary

4. Which of the following are prime numbers?
    a. 323
    b. 571
    c. 851
    d. 997

5. Write the prime factorization of….
    a. 24480
    b. 120^5
    c. 20!

6. Find the number of 0's at the end of 20! (hint: use 5c)

7. Find the last digit of $7^{2021}\ mod\ 10$ knowing that $7^2 \equiv 49 \equiv -1(mod\ 10)$

8. Find the remainder of 7^n when divided by 3. (Hint: $1 \equiv 7\ (mod\ 3)$)